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AEROSPACE STANDARD

SAE AS26805

REV. A

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Superseding AS26805

Compressor Units, Air/Gas, General Requirements For

RATIONALE

This document has been made noncurrent and is hereby retained only for historical purposes by the A-6C6 Power Sources Panel.

NONCURRENT NOTICE

This specification has been declared "NONCURRENT" as of April 2008. It is recommended, therefore, that this document not be specified for new designs.

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NOTICE

This document has been taken directly from U.S. Military Specification MIL-C-26805G(USAF), Amendment 2, Notice 1 and contains only minor editorial and format changes required to bring it into conformance with the publishing requirements of SAE technical standards. The initial release of this document is intended to replace MIL-C-26805G(USAF), Amendment 2, Notice 1. Any part numbers established by the original specification remain unchanged.

The original Military Specification was adopted as an SAE standard under the provisions of the SAE Technical Standards Board (TSB) Rules and Regulations (TSB 001) pertaining to accelerated adoption of government specifications and standards. TSB rules provide for (a) the publication of portions of unrevised government specifications and standards without consensus voting at the SAE Committee level, and (b) the use of the existing government specification or standard format.

Under Department of Defense policies and procedures, any qualification requirements and associated qualified products lists are mandatory for DOD contracts. Any requirement relating to qualified products lists (QPL's) has not been adopted by SAE and is not part of this SAE technical document.

1. SCOPE:

1.1 Scope:

This specification covers the general requirements for the design and construction of air/gas compressor units (see 6.4.1). The detail requirements for a particular air compressor unit shall be as specified in the individual equipment specification for that particular air compressor unit (see 6.2).

1.2 Classification:

Compressor units shall be of the following types and classes, as specified (see 6.2):

Type I Air Compressor Unit - Portable Construction
Type II Air Compressor Unit - Aircraft and Missile Support - Low Pressure

Class 1 Gasoline engine, trailer-mounted
Class 2 Electric motor, trailer-mounted
Class 3 Electric motor, skid-mounted

Type III Air Compressor Unit - Aircraft and Missile Support - High Pressure

Class 1 Diesel Engine, trailer-mounted
Class 2 Electric motor, trailer-mounted
Class 3 Electric motor, skid-mounted
Class 4 as specified

Type IV Air Compressor Unit - Base-Mounted Stationary
Type V Air Compressor Unit - Special Purpose

Class 1 Gasoline engine, trailer-mounted
Class 2 Electric motor, trailer-mounted
Class 3 Electric motor, skid-mounted
Class 4 as specified

Type VI Air Compressor Unit - Paint Spray and Garage

2. APPLICABLE DOCUMENTS:

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

SPECIFICATIONS

Federal

CC-M-641	Motor, Alternating Current (Integral Horsepower)
GG-G-76	Gage, Pressure and Vacuum, Dial Indicating (for Air, Steam, Water, Amomina, Chloro-fluoro Hydrogen Gases, and Compressed Gases)
TT-C-490	Cleaning Method and Pretreatment of Ferrous Surfaces for Organic Coatings
VV-F-800	Fuel Oil, Diesel

Military

MIL-V-173	Varnish, Moisture-And-Fungus-Resistant (For Treatment of Communications, Electronic, and Associated Equipment)
MIL-L-2104	Lubricating Oil, Internal-Combustion Engine, Heavy-Duty
MIL-G-3056	Gasoline, Automotive, Combat
MIL-C-3432	Cable and Wire, Electrical (Power and Control, Flexible and Extra Flexible, 300 and 600 volts)
MIL-F-3541	Fittings, Lubrication
MIL-C-3600	Compressors, Air and Gas (Except Oxygen) Packaging of
MIL-H-4607	Heater, Engine and Shelter, Ground, Type H-1
MIL-C-4952	Cartridge, Oxygen Purifier, Type MA-1
MIL-A-5070	Adapter, Hose to Tube, Pipe and Flange, Reusable, Hydraulic, Fuel and Oil Lines
MIL-G-5572	Gasoline, Aviation, Grades 80/87, 100/130, 115/145
MIL-T-5624	Turbine fuel, Aviation, Grades JP-4 and JP-5
MIL-L-6082	Lubricating Oil, Aircraft Reciprocating Engine (Piston)
MIL-I-6866	Inspection, Penetrant Method of
MIL-I-6868	Inspection Process, Magnetic Particle
MIL-H-7365	Hose, Air Duct, for Ground Heaters
MIL-M-8090	Mobility, Towed Aerospace Ground Equipment, General Specification for
MIL-A-8421	Air Transportability Requirements, General Specification for
MIL-L-9000	Lubricating Oil, Internal Combustion Engine, Diesel
MIL-L-10295	Lubricating Oil, Internal-Combustion Engine, Sub-Zero
MIL-B-11188	Batteries, Storage, Lead-Acid
MIL-L-17331	Lubricating Oil, Steam Turbine (Noncorrosive)
MIL-C-17596	Compressors, Reciprocating, or Rotary Power Driven (E.M.D), Air, Base Mounted, 10 HP to 300 HP
MIL-P-23377	Primer Coating, Epoxy Polyamide, Chemical and Solvent Resistant
MIL-L-23699	Lubricating Oil, Synthetic Base
MIL-C-26058	Cartridge, Gas Purifier, Extremely Low Dewpoint, Type MA-2

2.1 (Continued):

MIL-L-26087	Lubricating Oil, Reciprocating Compressor, Ground Support
MIL-H-26666	Hose Assembly, Pneumatic, High Pressure
MIL-H-27462	Hose Assembly, Pneumatic, High Pressure (8500 PSI)
MIL-H-38390	Hose Assembly, Tetrafluoroethylene, Pneumatic, High Pressure
MIL-C-83286	Coating Urethane, Aliphatic Isocyanate, for Aerospace Applications
MIL-C-83959	Cylinder, Air Purifier

STANDARDS

Military

MIL-STD-129	Marking for Shipment and Storage
MIL-STD-130	Identification Marking of U. S. Military Property
MIL-STD-143	Standards and Specifications, Order of Precedence for the Selection of
MIL-STD-431	Compressors: Construction, Paint Spray and Garage; Classification of Types, Classes, Styles, Groups, and Capacities
MIL-STD-461	Electromagnetic Interference Characteristics Requirements for Equipment
MIL-STD-470	Maintainability Program Requirements (For Systems and Equipment)
MIL-STD-471	Maintainability Demonstration
MIL-STD-785	Requirements for Reliability Program (For Systems and Equipment)
MIL-STD-810	Environmental Test Methods
MIL-STD-882	System Safety Program, for Systems and Associated Subsystems and Equipment: Requirements for
MIL-STD-1410	Methods for Selection of Industrial Engines for End Item Application
MS33586	Dissimilar, Metals

Federal

FED-STD-595	Colors

Air Force - Navy Aeronautical

AN6235	Filter Element - Hydraulic Replaceable Micronic Line Type

DRAWINGS

Air Force

7347114	Chuck Assembly - High Pressure Air
50C24046	Coupling - Male, 6 Inch Air Duct
50C24033	Coupling - Male, 12 Inch Air Duct

(Copies of specifications, standards, drawings, and publications required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications:

The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

SOCIETY OF AUTOMOTIVE ENGINEERS

SAE 100R6 Hydraulic Hose and Hose Assemblies

(Application for copies should be addressed to the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.)

AMERICAN SOCIETY OF MECHANICAL ENGINEERS

ASME Power Test Codes

Auxiliary Material; General Instruction and Internal-Combustion Engines Supplements on Instruments and Apparatus

Part 2, Pressure Measurement; Chapter 6
Part 3, Temperature Measurement; Chapter 6
Part 4, Head Measuring Apparatus
Part 5, Measurements of Quality of Materials
Part 6, Electrical Measurements

Displacement Compressors and Blowers
Unfired Pressure Vessels Code

(Application for copies should be addressed to the American Society of Mechanical Engineers, United Engineering Center, 345 East 47th Street, New York 17, NY 10017.)

COMPRESSED GAS ASSOCIATION

Safety Device Standards
Pamphlet S-1 Safety Relief Device Standard

(Application for copies should be addressed to the Compressed Gas Association, 11 West 42nd Street, New York, NY 10036.)

AMERICAN STANDARDS ASSOCIATION

Standard Z24.3 Sound Level Meters
Standard Z24.10 Octave-Band

(Application for copies should be addressed to the American Standards Association, 70 East 45th Street, New York, NY 10017.)

2.2 (Continued):

NATIONAL FIRE PROTECTION ASSOCIATION

Pamphlet 70 National Electrical Code

(Application for copies should be addressed to the National Fire Protection Association, 60 Batterymarch Street, Boston, MA 02110.)

DEPARTMENT OF LABOR, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

Occupational Safety and Health Act (OSHA) with Supplemental Revisions

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

NATIONAL BUREAU OF STANDARDS

Handbook H 28 Screw-Thread Standards for Federal Services

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

3. REQUIREMENTS:

3.1 Preproduction:

This specification makes provisions for preproduction testing.

3.2 Selection of standards and specifications:

Standards and specifications for necessary commodities and services not specified herein shall be selected in accordance with MIL-STD-143.

3.3 Materials:

3.3.1 Fungus resistance: Materials not naturally resistant to the effects of fungi and moisture shall be treated with type I varnish conforming to MIL-V-173.

3.3.2 Dissimilar metals: The use of dissimilar metals, as defined by MIL-STD-889, in direct contact with each other shall be prohibited. Metal plating or spraying of dissimilar base metals to provide suitable mating surfaces, or separation by suitable insulating materials, shall be permissible.

3.3.3 Corrosion resistance: Materials selected shall be corrosion resistant or shall be protected by plating, painting, or other surface treatment to resist corrosion.

3.3.4 Tubing: Tubing of ¼-inch outside diameter and larger which is used at pressures above 500 psi, shall be seamless, corrosion-resistant steel. All other tubing may be seamless copper.

3.3.5 Tube fittings, valves and components: All tube fittings, valves and components shall be fabricated from corrosion-resistant materials not adversely affected by extended contact with fluids such as water or corrosion cleaning solvents (trichloroethylene).

3.3.6 Threads: All screw threads shall be in the inch system or metric system and shall conform to Handbook H-28. All pipe threads shall be in the inch system and shall conform to Handbook H-28. Threaded components designed for a working pressure in excess of 100 psi shall have established torque limits to prevent overstressing.

3.3.7 Reclaimed materials: Recycled and recovered raw materials shall be used to the maximum extent possible in lieu of virgin raw materials as long as these materials do not jeopardize the intended use and fully comply with all contract requirements. Materials used shall be free from defects which would adversely affect the performance or maintainability of individual components or the overall assembly. Materials not specified herein shall be of the same quality used for the intended purpose in commercial practice. None of the above shall be interpreted to mean that the use of used or rebuilt products will be allowed.

3.4 Design and construction:

Design and construction shall be as stated herein and in the detailed specification for each compressor unit type.

3.4.1 Safety: Provisions for the safety of personnel shall be incorporated to the maximum extent possible with regard to anticipated operating conditions and the capability of operating personnel. The unit shall be free of category III and category IV hazards as determined in accordance with MIL-STD-882.

3.4.1.1 Guards: Guards shall be provided for moving parts such as belts, gears, and linkages to protect the operator during normal operation and guards or enclosures shall be provided for electrical portions of the compressor. High-temperature parts shall be guarded or so located that contact will not occur during normal operation. The guards shall be removable for access to the guarded parts.

3.4.1.2 Sharp edges: Sharp edges, projections, and hinged devices with hazardous characteristics are prohibited.

3.4.2 Reliability: The air compressor units shall have at 0.9 confidence the minimum reliability, for a mission time of 1000 hours and a minimum mean-time-between-failure (MTBF) of 500 hours. A reliability program shall be as specified in MIL-STD-785. Reliability testing and demonstration may be included in the preproduction test, para 4.4.

3.4.3 Maintainability: Maintainability program requirements shall be as specified in MIL-STD-470 and shall be demonstrated as required by MIL-STD-471.

3.4.3.1 Operating clearances: Maintainability provisions shall incorporate proper clearances for equipment operation, minor maintenance, and routine servicing at low ambient temperatures by personnel handicapped by wearing heavy gloves and mittens and bulky clothing.

3.4.3.2 Fastening devices: All screws, pins, belts, and similar parts shall be installed in such a manner as to prevent loss of tightness. Those subject to removal or adjustment shall not be swaged, peened, staked or otherwise permanently deformed.

3.4.3.3 Cover plate fasteners: Covers or plates that must be removed for component replacement or adjustments shall be equipped with substantial quick disconnect fastenings.

3.4.3.4 Foolproofness: Where improper installation of an item could cause malfunctioning of that item or the system in which it is installed, an unsymmetrical mounting means shall be provided. The mounting shall be so designed that the item can only be installed in its proper operating position.

3.4.4 Pressure relief devices: Pressure relief devices conforming to the Compressed Gas Association Safety Device Standards or the ASME Unfired Pressure Vessels Code shall be provided to protect against excessive pressure in any component of the compressor unit. Provisions shall be incorporated, including consideration as to direction, to permit discharge of pressure without danger to operating or maintenance personnel. Rupture disc relief devices shall be designed to use commercially available rupture discs.

3.4.5 Safety factor: All pressurized components shall be fabricated in accordance with good engineering practice with not less than a 4 to 1 safety factor based on the minimum tensile strength of the material as tabulated in the ASME Unfired Pressure Vessels Code.

3.4.6 Compressor: The compressor shall be as specified herein for each specific type and class of compressor unit.

3.4.6.1 Number of stages: The number of stages for a reciprocating compressor shall depend upon rated pressure (see 6.4.2). Maximum compression ratio permitted shall be 4.5 to 1 for continuous operation.

Typical Pressure Range (psi gage)	Minimum Number of Stages
0 to 50	1
51 to 250	2
251 to 1,000	3
1,001 to 4,000	4
4,001 up	as specified

3.4.6.2 Capacity and pressure regulation: A compressor powered by a gasoline engine shall be provided with a continuous-engine-running type unloader, and a compressor powered by an electric motor shall be provided with a combination constant-speed unloader and a start-stop control. Simple selector controls shall be provided to permit the desired operation. The range between loading and unloading or stop-start operation shall be at the option of the contractor, and the loading-unloading and start-stop pressure range shall be adjustable with common handtools. When the compressor unit is shut down, the unloader on electric-motor-driven and gasoline-engine-driven compressor units shall automatically unload the compressor to decrease the starting load on the drive mechanism.

3.4.6.3 Pressure relief devices: Intercoolers when required shall be equipped with adjustable, spring-loaded type pressure relief valves designed and adjusted to operate at a pressure that will protect the compressor. The receivers shall have a rupture-disc type pressure relief device in addition to an adjustable, spring-loaded relief valve. The relief valve shall be set at a lower pressure than the rupture-disc device. Relief valves shall be set at 10 per cent above the maximum working pressure.

3.4.6.3.1 Regulator safety device: Regulators shall be provided with a rupture disc or spring-loaded type pressure relief valve on the outlet side to protect the hose, regulator, and equipment being serviced. The relief valve shall be set at 10 percent above the maximum working pressure.

3.4.6.4 Air filter: An oil-bath or dry cartridge type air filter shall be provided to filter the air being inducted into the first stage of the compressor. The filter shall be designed to remove harmful dust and sand particles from the intake air.

3.4.6.5 Balancing: Compressor parts that require balancing to minimize wear and vibration shall be balanced by:

a. The removal of material
b. The use of noncorroding balancing weights that are securely attached in place.
c. Rivets
d. Steel weights securely welded in place.

3.4.6.6 Lubrication failure protection device: Compressor units shall be equipped with a means of protecting the compressor in the event of a lubrication failure. The protective device shall be of the type that will cause the compressor to stop operating in the event of oil pressure failure or when the oil level falls to a point where adequate lubrication cannot be maintained. For compressors which maintain a positive crankcase pressure, the protective device shall be of the differential-pressure type to provide positive oil pressure above crankcase pressure. The device shall operate in such a manner that the compressor will not run until the deficiency has been corrected. A manual override shall be provided to operate the engine without the compressor running.

3.4.7 Explosion-proof requirements: Electrical components of electric motor driven compressor units shall be of explosion-proof design suitable for use in class I, division II, group D hazardous locations in accordance with Pamphlet 70, National Fire Protection Association (see 6.3).

3.4.8 Power drive unit: The compressor shall be driven by a gasoline engine, a diesel engine, or an electric motor, as specified in 1.2.

3.4.8.1 Internal combustion engine: The power source for compressor units shall be a single engine in accordance with MIL-STD-1410.

3.4.8.1.1 Deleted

3.4.8.1.2 Deleted

3.4.8.1.3 Deleted

3.4.8.1.4 Deleted

3.4.8.1.5 Deleted

3.4.8.1.6 Fuels and lubricants: The engine power source shall be designed to operate as specified herein when supplied with grade 80/87 gasoline conforming to MIL-G-5572, type I or II gasoline conforming to MIL-G-3056, or diesel fuel oil in accordance with VV-F-800 or jet fuel, JP-4 or JP-5, conforming to MIL-T-5624. Lubricating oils for the engines shall be in accordance with MIL-L-2104, MIL-L-6082, or MIL-L-9000.

3.4.8.1.7 Clutch: A manually controllable clutch shall be provided on types III and V compressor units to permit disengagement of the engine from the compressor for starting and operating the engine without load. The clutch shall be designed to withstand repeated engagement without damage when the compressor is loaded, or a means shall be provided to prevent engagement when the compressor is loaded.

3.4.8.1.8 Variable speed control: A variable speed control for all engines shall be provided to permit manual control of the engine speed. The engine speed shall be controllable from idling to rated capacity power.

3.4.8.1.9 Engine accessories: The following minimum engine accessories shall be provided:

a. An oil pressure gage (for pressure lubrication systems), a cylinder head high temperature safety cut off switch, a governor, and a fuel gage.

b. A tachometer shall be provided for diesel engines.

c. In addition to those specified herein, all accessories that are necessary for safe and efficient operation and control of the engine shall be provided.

3.4.8.1.10 Fuel tank: A fuel tank designed for use with the fuels specified in 3.4.8.1.6 shall be provided. The installation of the fuel tank shall be made in such a manner that the tank can be easily removed for repair or replacement, and the connections necessary for securing the tank to the compressor unit shall be made in a manner that will prevent fatigue failure in the tank or in the connections as a result of vibrations induced by operation of the compressor unit. The fuel tank shall have sufficient capacity to operate the compressor at rated output for 8 continuous hours. The filler neck shall have a minimum inside diameter of 1-¾ inches for fuel tanks of 25-gallon capacity or less, and 2-½ inches for larger fuel tanks. The filler shall be located for easy external access and shall not permit spilled fuel to collect within the compressor access unit. The tank shall be vented to the outside of the compressor unit. The tank shall be equipped with a drain port. The area around the drain port shall be dimpled or lower than the bottom of the tank to facilitate complete and easy drainage of fuel.

3.4.8.1.10.1 Fuel level indicator: A fuel level indicator shall be mounted adjacent to the fuel filler. The indicator shall be accurate to within 5 percent of the full-scale range when the fuel tank is being serviced. The tank shall be so baffled that the rate of tank filling will have no adverse effects on the accuracy of the indicator.

3.4.8.1.11 Electrical starting system: Gasoline-engine-powered compressors shall be equipped with an electrical starting system. The electrical starting system shall include an electrical cranking motor, generator/alternator, battery, voltage regulator, ignition switch, and other related components. Starting system voltage shall be as specified in the detail specification.

3.4.8.1.11.1 Storage batteries: Commercial batteries may be furnished provided they meet or exceed the minimum capacity ampere - hour rating as specified in MIL-B-11188. Batteries shall be shipped charged and dry without electrolyte.

3.4.8.1.11.1.1 Battery box: Compressor units requiring batteries shall be provided with a corrosion and acid-resistant box incorporating provisions for gas venting, drainage, winterization when required, rigid support, and accessibility for examination of battery terminals and electrolyte level, and liquid replenishment of all cells. The box shall be so located that the battery can be easily removed.

3.4.8.1.11.1.2 Terminals: Standard noncorrosive, screw type terminals shall be provided on the battery end of the battery cables.

3.4.8.1.11.2 Starter motor: The electric starter motor shall be designed to repeatedly crank the engine at sufficient starting speed when the engine is serviced with lubricants as specified herein and with the engine at a temperature not exceeding 0° F. When winterization is required the drive mechanism for engaging the starter motor with the engine flywheel shall be designed to operate and release without the application of heat down to an ambient temperature of -65° F.

3.4.8.1.11.3 Charging generator/alternator: The charging system shall be as specified in MIL-STD-1410.

3.4.8.1.11.4 Ammeter: An ammeter shall be provided to indicate charge and discharge of the battery current.

3.4.8.1.12 Exhaust system: A multiple-baffled muffler or mufflers shall be provided and shall be capable of handling the exhaust gasses without causing more than 2 inches Hg backpressure in the engine-exhaust-manifold system under any operating condition. Exhaust pipes shall be of such length to insure discharge of exhaust gasses to a safe location with respect to the operator and unit including raised drawbar or any other compressor enclosure surface.

3.4.8.2 Electric motor requirements: Electric motors shall be of the squirrel-cage induction type in accordance with CC-M-641. The ambient temperature referenced shall be 122° F, and the motors shall be capable of operation under the conditions specified herein. The continuous load on the motor shall not exceed the nameplate rating for continuous operation. When explosion-proof motors are specified, the motors shall be capable of operating under all specified conditions without exceeding the nameplate rating.

3.4.8.2.1 Motors rated 1 hp and under: Motors rated 1 hp and under shall be designed to operate on 120/230-V (1-phase, 3-wire), 60-hertz, a-c power. Either manual or magnetic-type across-the-line starting may be provided.

3.4.8.2.2 Motors rated 1 to 20 hp: Motors rated above 1 hp shall operate on 230/460-V (3-phase, 4-wire), 60-hertz, a-c power. Magnetic connectors for across-the-line starting shall be furnished for motors up to 20 hp and shall be capable of operation on 230- or 460-V power. Alternate thermal protectors not used in initial wiring shall be securely fastened inside the starter box to prevent loss. The motor starter shall be wired as shown in figure 1.

3.4.8.2.3 Motors rated above 20 hp: Motors rated above 20 hp shall have reduced voltage, partial winging, or other means to limit starting current to 200 percent of the normal full-load value. Equipment shall be connected for 460-V operation. Control circuits shall be nominal 110 V and components shall be equipped with fused or automatic breaker devices to protect the circuits from overload conditions.

3.4.8.2.4 Reverse rotation protection: Three-phase electric motors on compressor units that will be damaged by reverse rotation shall be provided with equipment to prevent rotation of the compressor in the wrong direction in event the phase sequence is wrong. Means shall be provided to reverse the phase sequence in one simple operation without resorting to rewiring of plugs or switches, on all three-phase electric motors.

3.4.8.2.5 Electrical power: The compressor unit shall be designed and constructed to perform as specified herein when suppled with 115 V ± 10 percent, 230 V ± 10 percent or 460 V ± 10 percent, at 60 ± 3 hertz ac, as applicable.

3.4.8.2.6 Motor protection: Overload thermal protection devices of applicable power-handling capacity shall be provided for each electric motor.

3.4.8.2.7 Electric cables: Electric cables shall conform to MIL-C-3432, Class HD or HO, flexibility E. Strain relievers shall be provided on the cables.

3.4.8.2.7.1 Input cables (single-phase motors): Single-phase electric motors shall be provided with a permanently attached 6-foot, 3-conductor cable. The third conductor shall serve as a ground for the compressor unit, and the compressor unit shall be capable of operation without the third conductor connected.

3.4.8.2.7.2 Input cables (3-phase motors): The input cable for 3-phase electric motors shall be a 50-foot, 6-conductor cable and shall be connected as shown in figure 1. Cable leads L_1, L_2, L_3 shall be sized as required. Ground lead L_o shall not be smaller than size 8. Control leads C1 and C2 shall not be smaller than size 12. For power conductors (L_1, L_2, and L_3) smaller than size 8, the power and ground conductors shall be the same size, but not smaller than size 12. The free end of the cables shall have the outer sheath removed for a distance of 12 inches to permit the attachment of a plug by the using activity.

3.4.8.2.7.3 Rack or reel: A rack or reel capable of containing the electric power cable shall be provided. It shall provide a simple, hand-operable means of positively holding the free end of the cable to prevent unwinding during storage and transportation. It shall be permanently attached to the compressor unit in a conveniently accessible place.

3.4.8.3 Shutoff and control valves: Manually operated shutoff and control valves shall be provided as required. The valves shall be designed and constructed to provide positive shutoff when closed and minimum restriction to flow when open. The valve shall be so designed that the bonnet or stem packing nut will not come loose while turning the valve handle while under pressure. The valves shall be designed and mounted to permit replacement of the valve seats and seals without removing the valve from the compressor or the valves shall be located to permit removal and replacement without removing any other item on the air compressor unit.

3.4.8.3.1 Valve handles: Each manually operated shutoff or control valve shall be provided with a tee, cross, or other easily turned type handle with a diameter of not less than 3 inches per inch of nominal size, but in no case less than 1 inch.

3.4.8.3.2 Valve leakage: The valve shall show no indication of leakage with the outlet plugged or capped, with the maximum working pressure of the component in which it will be installed applied to the inlet, and with the valve either open or closed. The valve shall not leak more than 2.5 cubic inches of free gas per hour per half-inch or fraction thereof of nominal size from the maximum working pressure of the component in which it will be installed to a downstream pressure of atmospheric under the specified environmental conditions and when closed with a torque of 60 ± 5 pound-inches per inch of nominal size. In addition, the valve shall be capable of completing not less than 2,000 cycles of operation (see 6.4.8), including 1,000 cycles with both inlet and outlet subjected to maximum working pressure and 1,000 cycles exhausting from maximum working pressure to atmospheric pressure, without exceeding the specified leakage limit.

3.4.8.3.3 Valve overtorque performance: The valve shall not require more than a closing torque of 60 ± 5 pound-inches per inch of nominal size to seal against a differential pressure equal to the maximum working pressure of the component in which the valve will be installed when used under the specified environmental conditions. In addition, the valve shall be designed and constructed to withstand a closing torque of 300 ± 10 pound-inches per inch of nominal size under any of the specified environmental conditions without parts failure or leakage in excess of that permitted by 3.4.8.3.2 when subsequently closed with a torque of 60 ± 5 pound-inches per inch of nominal size.

3.4.8.3.4 Valve mounting: All manually controlled valves shall be so mounted that they can be readily opened or closed by an operator standing at the equipment control panel. All valves shall be so mounted to supporting members or large size piping so that the forces applied to the control handles in opening or closing the valves will not damage the equipment piping.

3.4.8.4 Hourmeter: An hourmeter shall be furnished and mounted on the control panel of all compressor units that include a dehydration system to provide clean, dry air or when specified in the detail specification (see 6.2). The hourmeter shall record total operating time of the compressor unit and shall have a range from 0 to 9,999 hours and accuracy of 1 minute per hour.

3.4.9 Lubrication system, military lubricants shall be used: Sufficient lubrication shall be provided to all moving parts of the compressor unit. The lubricating system shall include an oil level indicator or bayonet gage, a drain, and, when applicable, a crankcase ventilator. The lubrication system shall be designed to operate under the range of conditions specified herein. Compressor unit lubrication fittings shall conform to MIL-F-3541, types I, II, and III, and shall be located in accessible, protected positions.

3.4.9.1 Parts subject to wear: Provisions shall be made for lubrication of all parts subject to wear. Wherever practicable, permanently lubricated components or units not requiring lubrication shall be used. Grease and oil seals shall be designed and located to provide maximum accessibility for inspection and replacement.

3.4.10 Mounting provisions: The compressor unit shall be mounted on a trailer assembly, a skid-mounted assembly, or a stationary base (see 1.2).

3.4.10.1 Trailer mounting: The compressor shall be mounted on either a 2- or 4-wheel trailer conforming to the requirements of MIL-M-8090 as specified in the detail specification. Trailers may be a separate component or may be formed by attaching the running gear, towbar, and necessary trailer components directly to the compressor unit.

3.4.10.1.1 Four-wheel running gear:

3.4.10.1.1.1 Towbar latch: Compressor units shall be provided with a positive-type latch to hold the towbar in the up, vertical position at any position of the front wheels. The towbar shall have a stop in the up position to prevent contact with the frame or enclosure.

3.4.10.1.1.2 Bushings and lubrication fittings: All pivot points associated with the steering mechanism of four-wheel running gear assemblies shall be equipped with bushings and lubrication fittings.

3.4.10.1.2 Two-wheel running gear: Two-wheel-mounted compressors shall have a two-wheel running gear and a full-swivel landing wheel.

3.4.10.1.3 Tilted operation: The compressor unit shall be designed to deliver full-rated capacity at rated pressure when tilted in any position at an angle of 15° from the horizontal.

3.4.10.1.4 Center of gravity: The center of gravity of all trailer-mounted compressor units shall be such that the compressor unit will not overturn when the axles form a 45° angle with the horizontal. The use of excessive tread width will not be permitted.

3.4.10.2 Skid mounting: Skid-mounted compressor units shall include a heavy, welded, structural-steel frame consisting of two skids with a closure between them. The skids shall be sufficiently far apart and the center-of-gravity of the unit such that no tipping of the unit will occur when it is placed in any direction on a 15° slope. All members shall be so braced and gusseted that there will be no objectionable sagging or distortion of the unit. Both ends of the frame shall be reinforced, and each end shall be provided with rings or other means to permit pulling the unit. The bottom plates of the skids forming the runners shall be renewable and shall be curved or turned up at the ends to prevent snubbing when the compressor unit is pulled over rough ground. Skids of boxed or closed construction shall be provided with drains.

3.4.10.3 Stationary mounting: The compressor unit shall be designed for mounting on a single, permanent, concrete slab base. Multilevel slab-type mounting will not be permitted.

3.4.11 Enclosure: A weatherproofed metal enclosure shall be provided for the compressor unit when required. Controls shall be incorporated into the enclosure to maintain normal operating temperature around the power source, compressor, and any components susceptible to freezing. Provisions shall be incorporated to provide ventilation for the engine and compressor to prevent overheating.

3.4.11.1 Control panel: A control panel shall be provided upon which the compressor unit controls, power unit controls, receiver valves, and gages shall be mounted. The control panel shall be located within the enclosure, shock-mounted, and accessible through a large door, and with the control panel door in the opened-and-locked position, the enclosure shall not be vented.

3.4.11.2 Lighting of enclosed compressor units: Lighting provisions shall be incorporated on the control panel to permit night operation. The lights shall be shielded from above to direct minimum light away from the control panel. The lights shall operate from the electrical system of the compressor unit and shall be controlled by a switch on the control panel.

3.4.11.3 Winterization provisions: When winterization is required, the enclosure of the compressor unit shall be designed for connection to a type H-1 heater conforming to MIL-H-4607. Provision shall be included for attachment one 12-inch diameter duct or three 6-inch diameter duct connection openings. Insofar as applicable, duct connections and covers shall be in accordance with MIL-H-7365. The coupling at the compressor unit shall be a male coupling in accordance with Drawing 50C24046 or 50C24033. Dust covers shall be securely fastened to the enclosure by a chain or other means to prevent loss. If necessary, heater ducting shall be provided within the compressor unit enclosure to direct the heated air to thoroughly free all critical moving parts that may be restricted due to congealed oil or ice. Duct attachments shall not project beyond the enclosure of the compressor unit.

3.4.11.4 Doors and covers: Doors and hinged covers shall be provided for convenient access to the power drive unit, compressor, and control equipment. They shall be reinforced as required to provide rigidity. The doors and covers shall be furnished with positive flush latches or fasteners to hold them securely in the closed position and positive locks to hold them in the open position.

3.4.11.5 Roof: The roof of the enclosure shall be readily removable so that installed components can be vertically removed or replaced. The roof fastening device shall be positive to preclude loss of the roof when traveling at highway speeds.

3.4.11.6 Winds: The enclosure shall be designed to withstand winds up to 70 mph without damage. Doors and hinged covers that are normally locked in the open position for operation shall also withstand the 70 mph winds.

3.4.11.7 Utility compartment: A compartment shall be provided on all but type IV compressor units for the storage of inspected forms, and special tools. The compartment shall be covered to protect the contents from oil, grease, dirt, and rain. The compartment shall be a minimum size of 9 by 11-½ by 4 inches.

3.4.12 Pressure gages: Pressure gages shall be in accordance with Federal Specification GG-G-76.

3.4.13 Air transportability: Types II, III, and V compressor units shall comply with MIL-A-8421.

3.4.14 Lifting provisions: Lifting provisions are applicable to the types I, II, III, V, and VI compressor units.

3.4.14.1 Lifting rings: The compressor unit shall be provided with one or more lifting rings for cable attachment and hoisting without damage to the compressor unit. The lifting ring or rings shall be so located on the compressor unit that transportation personnel can rig a safe lifting sling from common cable and spreader bar components for lifting by a single-hook, overhead crane. The lifting ring or rings shall be constructed and installed to permit lifting the compressor unit without damage. The ability of the compressor unit to withstand the lifting attachment acceleration loadings shall be demonstrated by supporting engineering data.

3.4.14.2 Lifting eyes: Lifting eyes shall be provided or other arrangements shall be made for hoisting or removing major individual compressor unit components whose weight exceeds 75 lbs. such as the compressor and power unit so that they may be readily removed from or replaced on the compressor unit chassis or base.

3.4.15 Individual type requirements:

3.4.15.1 Type I: Type I compressor units shall comply with MIL-STD-431.

3.4.15.2 Type II: Type II compressor units shall consist of the following major components:

a. Compressor
b. Power drive unit
c. Receiver
d. Trailer chassis with or without enclosure, or skid mounting without enclosure.

3.4.15.2.1 Compressor: The compressor shall be of the reciprocating or rotary type with a continuous output of 200 psi and an intermittent output of 250 psi as follows:

3.4.15.2.1.1 Reciprocating type: The compression shall be carried out in two or more separate and distinct stages. Intercoolers shall be provided to cool the air between stages, and an aftercooler shall be provided to cool the air before entering the receiver. The intercoolers and aftercooler shall be designed to cool the air to within 30° F of ambient temperature, in ambient temperatures of 20° to 125° F. Intercoolers and aftercoolers shall be equipped to automatically drain off condensed moisture and oil. Traps to collect condensed moisture and oil shall have a full-load operation capacity of 2 hours.

3.4.15.2.1.2 Rotary type: The air shall be oil-cooled, and means provided to remove and recover the oil from the air. Air temperature during compression shall not exceed 250° F during operation in ambient temperatures up to 125° F. An aftercooler shall be provided to cool the air after compression and before entering the receiver to within 30° F of ambient temperature in an ambient temperature range of 20° to 125° F. Provisions shall be made in the aftercooler installation to automatically drain all moisture and oil into a trap with full-load operation capacity of 2 hours.

3.4.15.2.2 Power unit: Type II, class I compressor units shall be powered by gasoline engines. Type II, classes 2 and 3 compressor units shall be powered by explosion-proof electric motors.

3.4.15.2.3 Outlet pressure regulator: The compressor unit shall be provided with a pressure regulator designed to regulate the outlet pressure within the range of from 5 to 250 psi. The regulator shall regulate the outlet pressure at the desired pressure within ±5 percent. The outlet hose connection shall be on the outlet side of the pressure regulator.

3.4.15.2.4 Air hose: A 50-foot length of 5/16 inch nominal inside diameter air hose conforming to SAE100R6 shall be provided. The hose shall be equipped with end fittings in accordance with MIL-A-5070.

3.4.15.2.4.1 Hose reels: A live hose reel shall be provided to accomodate stowage of the servicing hose. The reel shall be located in a position that will afford protection to the reel from inadvertent damage from other vehicles, stationary objects, etc. The reel shall be equipped with a spring drive for automatic hose retrieval and the drive spring tension shall be adjustable. The reel shall be equipped with a mechanism to assure a positive latch or unlatch with each pull of the hose and shall maintain any desired working length of hose. The reel shall be designed to operate over the temperature range of -65°F to +160°F.

3.4.15.2.5 Receiver: The receiver shall be designed, constructed, and stamped in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII. The receiver shall be equipped with pressure relief and drain valves. The drain valves shall be so designed and located that they will not be damaged or exposed to damage when the compressor unit is being towed over obstructions. A siphon-type drain shall not be used. The drain valves shall drain off all condensed moisture that collects in the receiver.

3.4.15.2.6 Gages: Gages shall be provided to indicate the pressure in the receiver and at the outlet of the pressure regulator. The gages shall cover a range of from 0 to 300 psi, with 5-psi or smaller increments, and shall be permanently redlined on the gage face at 250 psi. The gages shall have a dial diameter of not less than 2½ inches. They shall be accurate to within ± 2 percent of rated maximum pressure.

3.4.15.2.7 Air filter: An oil-bath or dry cartridge type air filter shall be provided to filter the air being inducted into the first stage of the compressor. The filter shall be designed to remove harmful dust and sand particles from the intake air to the maximum practicable extent.

3.4.15.2.8 Unloader: The range between loading and unloading shall not exceed 50 psi. The unloader pressure shall be adjustable from 100 to 250 psi. The compressor unit shall be set to unload at 200 psi.

3.4.15.2.9 Pressure: The compressor unit shall be required to deliver the specified capacity of free air (see 6.4.3) at a pressure of 200 psi for continuous operation. The compressor unit shall be designed to deliver the specified capacity of free air at a pressure of 250 psi for intermittent operation.

3.4.15.2.10 Endurance: The compressor unit shall be designed for continuous operation under the conditions specified herein. It shall be capable of 1,000 hours of operation between major overhauls.

3.4.15.2.11 Valves: Valves shall be in accordance with 3.4.8.3.

3.4.15.3 Type III compressor units: Type III, classes 1, 2, and 3 compressor units shall be in accordance with the following requirements and shall consist of the following major components:

a. Compressor
b. Dehydrator and filter assembly
c. Trailer or skid mounting as specified
d. Controls

3.4.15.3.1 Compressor: The compressor shall be of the reciprocating, air-cooled type equipped with intercoolers and an aftercooler. The intercoolers when required shall cool the air to within 30° F ambient temperature for ambients of 10° to 125° F. Each intercooler moisture separator when required and the aftercooler moisture separator shall be designed to automatically drain off all condensed moisture and oil upon shutdown of the unit. The intercooler and aftercooler moisture separators shall also be provided with a manual drain for draining off all condensed moisture and oil. The aftercooler shall cool the air to within 25° F of ambient temperature at the inlet to dehydration equipment for ambients of 10° to 125° F. In its passage to the servicing valve, the air shall not be reheated above the outlet temperature from the dehydration equipment.

3.4.15.3.1.1 Separators: When mechanical separators are used, they shall be constructed from materials that will not deteriorate or break up during use. If periodic servicing is required, the units shall be designed to permit servicing with a minimum of disassembly.

3.4.15.3.1.2 Compressor oil filter: Type III compressors shall be equipped with lubrication oil filters. If full-flow, cartridge-type replaceable filters are provided, they shall be in accordance with MIL-E-20707. If permanent filters are provided, they shall be of a type that can be easily removed and cleaned.

3.4.15.3.1.3 Crankcase vent: For type III air compressors the crankcase shall be vented through an oil separator into the inlet to the first stage cylinder. The separator shall separate the oil and return the oil the crankcase.

3.4.15.3.2 Control panel: A control panel shall be provided upon which the compressor unit controls, power unit controls, and receiver valves and gages shall be mounted. When the compressor unit requires an enclosure the control panel shall be located within the enclosure, shock-mounted, and accessible through a large door. With the control panel door in the opened-and-locked position, the enclosure shall not be vented. The control panel shall include the following gages and controls:

a. Pressure gages - intercoolers and aftercooler pressure (psi)
b. Pressure gage - compressor lubricating oil pressure (psi)
c. Servicing gage - high pressure
d. Servicing gage - low pressure
e. All engine controls and gages or all motor starting and running equipment.
f. Hourmeter, when applicable (see 3.4.8.4).

3.4.15.3.3 Dehydrator and filter assembly: Provisions shall be furnished to dry and clean the outlet air.

3.4.15.3.3.1 Type MA-2 gas purifier cartridges conforming to MIL-C-26058 shall be used for dehydration: Cylinders conforming to MIL-C-83959 shall be used to hold the cartridges when the operating pressures do not exceed 4,000 psi. Two cylinders shall be mounted in series with the gas entering the bottom of each cylinder. The cylinders shall be mounted in the upright, vertical position, measured when the compressor unit is in the normal, level position.

3.4.15.3.3.2 Backpressure control valve: A backpressure control valve shall be provided at the outlet of the dehydrator assembly to prevent passage of air through the dehydrator assembly below 3,000 psi unless otherwise specified in the detail specification.

3.4.15.3.3.3 Filter assembly: A filter assembly shall be provided after the dehydrator assembly to remove particles down to 10 microns. The filter shall be readily removable for cleaning or element replacement. When replaceable elements are used, they shall conform to filter element replacements in accordance with AN6235, if practicable.

3.4.15.3.3.4 Bleed valve: A bleed valve shall be provided downstream of the final compression stage and in advance of the 3000-psi back pressure control valve to permit bleeding the line pressure before changing cartridges or filter element.

3.4.15.3.4 Air hose: For operating pressures up to and including 4,000 psi, servicing hose assemblies shall be in accordance with MIL-H-38390 or MIL-H-2666 and, unless otherwise specified, shall be provided with a screw-on-type air chuck in accordance with Drawing 7347114-10. For pressures over 4,000 psi, but not exceeding 8,500 psi, servicing hose assemblies shall be in accordance with MIL-H-27462.

3.4.15.3.4.1 Hose reel: Hose reel/s conforming to paragraph 3.4.15.2.4.1 shall be provided.

3.4.15.3.5 Trailers: Type III, classes 1 and 2 compressor units shall be mounted on 2- or 4-wheel trailers, as specified.

3.4.15.3.6 Receiver: A receiver conforming to 3.4.15.2.5 shall be provided.

3.4.15.3.7 Continuous operation: The compressor unit shall be capable of continuous operation under the conditions specified. It shall be capable of 1,000 hours of operation between major overhauls.

3.4.15.3.8 Discharge air: Discharge air shall maintain a dewpoint (see 6.4.4) of -65° F, or less, based on the frequency of cartridge changes as determined during endurance testing.

3.4.15.3.9 Low-pressure servicing gage: In addition to the high-pressure servicing gage, another gage shall be provided to indicate servicing hose pressure for low-pressure pneumatic charging operations. The gage shall cover a range of from 0 to 600 psi, with 5-psi or smaller increments. The gage shall have a dial diameter of not less than 4½ inches, and shall be accurate to within ±2 percent of full-scale reading. The gage shall conform to Federal Specification GG-G-76 and shall withstand an overpressure of 900 psi.

3.4.15.3.10 Blowdown receiver: Provisions shall be incorporated to prevent visible condensates from blowing to the atmosphere when the compressor unit is unloaded. The condensate receiver shall be of sufficient capacity to provide for a minimum of 8 hours operation.

3.4.15.4 Type IV compressor unit: The type IV compressor unit shall be in accordance with MIL-C-17596.

3.4.15.4.1 Electric cables: Cables and plugs need not be furnished with type IV and V compressor units having electric motors of greater than 20 hp.

3.4.15.5 Type V compressor units: Type V compressor units shall be defined in the applicable specification.

3.4.15.6 Type VI compressor unit: The type VI compressor unit shall be in accordance with MIL-STD-431.

3.5 Performance:

3.5.1 Environmental conditions:

3.5.1.1 Operation at extreme temperatures: Types II, III, and V compressor units shall be capable of starting and operating in any ambient temperature (see 6.4.5) between 0° and 125° F without the aid of external heaters plus exposure to solar radiation on the surface of 359 BTU/sq ft/hr at the 125° F ambient temperature. Oil dilution will not be acceptable.

3.5.1.1.1 Low temperature starting and operation: When equipped with winterization provisions and an enclosure (see 3.4.11.3), the compressor unit shall be capable of starting and operating at -65° F. External heaters as specified herein and lubricating oil having a viscosity not lower than SAE No. 10 wt shall be used. The compressor unit shall be capable of starting within ½ hour and, once started, shall operate satisfactorily without external heating.

3.5.1.2 Rain: When equipped with an enclosure, the compressor unit shall be capable of starting and operating during exposure to rain.

3.5.1.3 Humidity: Types II, III, and V compressor units shall not be damaged by storage in relative humidities up to and including 100 percent, including condition wherein condensation takes place in the form of water and frost.

3.5.1.4 Fungus: Types II, III, and V compressor units shall not be damaged by exposure to fungus growth such as encountered in tropical and subtropical climates.

3.5.1.5 Salt atmosphere: Types II, III, and V compressor units shall not be damaged by operation or storage in an atmosphere containing salt-laden moisture such as encountered near bodies of salt water and in transportation on shipboard.

3.5.1.6 Sand and dust: Types II, III, and V compressor units shall not be damaged by operation or storage in an atmosphere containing airborne sand and dust particles such as encountered in desert locations.

3.5.2 Storage at extreme temperatures: The compressor units shall be capable of withstanding storage at temperatures of between -80° and + 160° F without damage for periods of up to and including 72 hours.

3.6 Part numbering of interchangeable parts:

All parts having the same manufacturer's part number shall be functionally and dimensionally interchangeable.

3.7 Electromagnetic interference:

The requirements of MIL-STD-461 shall apply as specified in the detail specification.

3.8 Audio noise levels:

The maximum permissible noise levels for types II, III, and IV compressors shall not exceed the following values when measured as specified in 4.7.16:

Octave Band Pressure Level (In Decibels Ref. 0.0002 Microbar)

Frequency Bands	Operator	Average at 25 Feet
35-75	106	91
75-150	96	81
150-300	88	73
300-600	85	70
600-1200	84	69
1200-2400	83	68
2400-4800	82	67
4800-9600	81	66

3.9 Finishes and protective coatings:

3.9.1 Cleaning, Surface Preparation and Painting: Type I, Type II Class 1, and Type III Class 1 compressors shall be finished as follows:

a. Cleaning, and surface preparation. Prior to painting, ferrous metal surfaces shall be blasted to remove all mill scale, products of corrosion, dirt, casting sand, slag or other foreign substances. Surfaces such as machined parts and sheet metal thinner than 0.0625 inch (16 gage US Standard) shall not be blasted. However, prior to blasting the surface shall be cleaned to insure that the surface is free of all oil, grease, dirt, or any other material that will contaminate the surface. Oil and grease contamination resulting from fabrication, machining, or handling subsequent to cleaning shall be completely removed by methods described in Federal Specification TT-C-490.

3.9.1 (Continued):

b. Priming. Prime with one coat of epoxy primer conforming to MIL-P-23377 to 0.7 to 1.0 Mil-inch (dry film) thickness. Allow primer to dry a a minimum of 45 minutes and no longer than 16 hours prior to top coating.

c. Top coating. Top coat with two coats of polyurethane paint conforming to MIL-C-83286, color (as specified in paragraph 6.2 (s)) per FED-STD-595, to a total thickness of 2.0 to 2.5 mils. Environmental controls shall be 60°F to 90°F and 40% to 80% relative humidity.

d. Total thickness. The total thickness of the primer and top coat shall be between 2.7 and 3.5 mils.

e. Decal. A decal shall be affixed to an interior surface of a door indicating the paint system applied and the date applied.

Example:

Primer - MIL-P-23377 - 1 coat
Top Coat - MIL-C-83286 - 2 coats
Date Applied - Jan 1983

All other types and classes of compressors covered by this specification shall be cleaned and finished in accordance with the manufacturer's standard commercial practice. The finish color to be as specified in paragraph 6.2(s) per FED-STD-595.

3.10 Operational markings:

3.10.1 Certification plate: All pressure vessels shall bear a permanent certification plate or permanent stamp stating that they conform to the ASME Unfired Pressure Vessel Code. The date of initial hydrostatic test shall be permanently recorded on the certification plate.

3.10.2 Operating instructions: Brief operating instructions shall be permanently affixed on or near the control panel. The instructions shall be clear, concise, and sufficient to enable operation without damage to the compressor unit or injury to personnel. The instruction plate shall be constructed of sheet aluminum or sheet zinc of not less than 0.050 inch thickness, anodized or etched to produce raised markings with a black or dark color background, and with a raised border not less than ¼ inch wide.

3.10.2.1 Identification: All valves, gages, and indicators shall be identified by nameplates or similar identification.

3.10.2.2 Operational pressure: All hose racks or reels shall be marked by decal or stencil to indicate the maximum operational pressure anticipated for the hose stored thereon.

3.10.3 Wiring diagram: A complete electrical wiring diagram shall be permanently affixed on or near the control panel in a readily accessible and protected location that will be within the housing assembly (if applicable) when it is closed for transport or storage. The diagram shall be of sufficient size for clear readability. It shall be constructed of sheet aluminum or sheet zinc of not less than 0.05 inch thickness, anodized or etched to produce raised markings with a black or dark color background, and with a raised border of not less than ¼ inch wide.

3.10.4 Voltage conversion instructions: Complete and readily understandable instructions for converting from one supply voltage to the other shall be either incorporated into the electrical wiring diagram or shown on a separate instruction plate adjacent to it. A separate conversion instruction plate shall be constructed of sheet aluminum or sheet zinc of not less than 0.05 inch thickness, anodized or etched to produce raised markings with a black or dark color background, and with a raised border of not less than ¼ inch wide.

3.10.4.1 Motor input voltage identification plate: A corrosion-resistant, reversible metal plate shall be provided and permanently marked with one input voltage on one side and the alternate voltage on the other side. The plate shall be located under or directly adjacent to the starter switch and so attached that it may be easily reversed to indicate the nominal voltage for which the machine is connected.

3.10.5 Airflow diagram: A schematic airflow diagram shall be attached to the inside panel or door to the control panel, along with the nomenclature of the controls and gages, and operating instructions.

3.10.6 Type of fuel and tank capacity: The type of fuel to be serviced and the capacity of the fuel tank shall be stenciled on the compressor unit adjacent to the filler opening.

3.10.7 Caution plates: Caution plates shall be attached close to the compressor unit lubrication fittings where high-pressure lubrication equipment, 1000 psi or higher, would damage grease seals or other parts.

3.10.8 Lubricating points: A bright red circle shall be painted around each lubricating point of the compressor unit.

3.10.9 Instructions for changing dehydrator cartridges (Type III Only): A corrosion-resistant, metal plate containing the following instructions for changing the cartridges in the cartridge holders shall be provided in an accessible location near the dehydrator assembly. The cartridge holders shall be labeled No. 1 (cartridge holder that air first enters) and No. 2 (cartridge holder following the No. 1 holder). A blank space shall be provided on the cartridge change instructions on which the hourmeter reading can be recorded by pencil and erased. Instructions for changing cartridges shall be as follows:

a. Use oxygen type MA-2 gas purifier cartridges conforming to MIL-C-26058.

b. Change cartridges at intervals indicated below. Record hourmeter reading at time of change.

Ambient Temp. Range °F	Total Hours of Operation Between Change
-65 to 0	50
0 to 70	20
70 to 100	15
100 to 125	7
Cartridges changed	

This space shall be of a material on which pencil markings can be placed or erased.

3.10.9 (Continued):

c. Change cartridges as follows:

(1) Discard cartridge in No. 1 (inlet) holder

(2) Transfer cartridge from No. 2 (outlet) holder to No. 1 holder

(3) Place fresh cartridge No. 2 holder.

d. Replace seals with No. (AN STD No.) O-rings when necessary.

3.10.10 Shipping data plate: A corrosion-resistant metal plate containing the length, width, height, curb weight, gross vehicle weight and the center or balance of the unit shall be provided in an accessible location.

3.11 Identification of product:

The nameplate markings shall be in accordance with MIL-STD-130.

3.12 Workmanship:

Attention shall be given to freedom from blemishes, defects, burrs, and sharp edges; accuracy of dimensions, radii of fillets, and marking of parts and assemblies; thoroughness of soldering, welding, brazing, painting, wiring, and riveting, alignment of parts, and tightness of assembly screws and bolts.

3.12.1 Cleaning: The compressor unit shall be thoroughly cleaned, and loose, spattered, or excess solder, metal chips, and other foreign material removed during and after final assembly.

3.13 Government-furnished property:

When specified in the contract the Government will furnish the following to the contractor, upon his request, for use in making or testing the compressor units:

Description	Quantity
Military standard engine and accessories	As specified
H-1 heater conforming to MIL-H-4607	As specified

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for inspection:

Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may utilize his own or any other facilities suitable for the performance of the inspection requirements specified herein unless disapproved by 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 supplies and services conform to prescribed requirements.

4.2 Classification of tests:

The inspection and testing of the compressor unit shall be classified as follows:

a. Preproduction tests ..... See 4.4

b. Acceptance tests ..... See 4.5

c. Preinstallation tests ..... See 4.6

4.3 Test conditions:

4.3.1 Test codes: Tests shall be in accordance with the following applicable ASME Power Test Codes. Method of testing shall be determined, instruments selected and calibrated, and tests run in accordance with the ASME codes to result in the degree of accuracy specified herein.

a. General instructions

b. Internal-combustion engines

c. Part 2, pressure measurement; chapter 1, 2, and 4

4.3.1 (Continued):

d. Part 3, temperature measurement; chapter 6

e. Part 4, head measuring apparatus

f. Part 5, measurements of quantity of materials

g. Part 6, electrical measurements

h. Displacement compressors and blowers

i. Unfired pressure vessels code.

4.3.2 Airflow: The airflow shall be measured by means of smooth approach orifices as specified in the ASME Power Test Codes.

4.3.3 Tolerances: The capacity, pressures, temperatures, and other data required for the performance demonstration shall be accurate within ± 2 percent. Data on compressor unit operation during endurance, environmental, and individual tests shall be accurate within ± 5 percent.

4.3.4 Fuels and lubricants: The engine shall use oils in accordance with MIL-L-2104, MIL-L-6082, and MIL-L-9000 and fuels as specified herein. The compressor shall use lubricants in accordance with MIL-L-17331, MIL-L-23699 or MIL-L-26087 as applicable. MIL-L-2104 and MIL-L-10295 may be used for compressor lubricant in the Type II compressor when supplied without a clutch.

4.3.5 Inspection, servicing, and adjustments: Planned stops shall be made at 8-hour intervals during the endurance test for inspection, servicing, and adjustments. Oil may be changed at 100-hour intervals, and added as required.

4.3.6 Test time: Endurance test time shall be credited in ½-hour intervals, except were shorter periods are a test requirement.

4.3.7 Barometric pressure: Barometric pressure shall be measured by means of a calibrated mercury or aneroid barometer and shall be corrected for temperature. When an aneroid barometer is used, a certified calibration shall be furnished, and an additional mercury barometer reading shall be supplied at weekly intervals during the testing.

4.3.8 Temperatures: Temperatures shall be measured by means of appropriately located thermocouples and calibrated potentiometers. Insofar as practical, thermocouples shall be insulated from contact with other metals. Temperatures shall be expressed in degrees Fahrenheit. When the temperature of the air is to be measured within a pipe or receiver, the thermocouple shall be exposed to the airstream and shall record the air temperature and not the pipe or receiver temperature.

4.3.9 Rotational speeds: Rotational speeds, measured in revolutions per minute, shall be determined whenever practicable by means of a directly coupled positive counter that will actually count the revolutions for not less than 1 minute. A combination unit that counts the revolutions while measuring the time required in connection with other data is preferred. Strobotachometers may be used provided calibration data can be furnished to attest to their accuracy. The use of hand tachometers will not be acceptable.

4.3.10 Oil consumption: Oil consumption shall be determined by accurately measuring the quantity necessary to maintain a given level in the oil reservoir.

4.3.11 Running-in: The nature and extent of running-in shall be as specified by the manufacturer.

4.3.12 Dewpoint measurements: Dewpoint measurements shall be made following the aftercooler separator and prior to the dehydration equipment and following the dehydration equipment (two readings).

4.4 Preproduction tests:

4.4.1 Preproduction test sample: One compressor unit shall be subjected to preproduction tests specified in 4.7.

4.5 Acceptance tests:

The acceptance tests shall consist of the following:

a. Individual tests ..... See 4.5.1

b. Periodic sampling plan and test ..... See 4.5.2

4.5.1 Individual tests: Each compressor unit shall be subjected to the following tests:

a. Examination of product ..... See 4.7.1.

b. Operational tests ..... See 4.7.2.

c. Hydrostatic pressure test ..... See 4.7.3.

4.5.1.1 Preinstallation tests: Each spring-loaded relief valve and automatic control device shall be subjected to the appropriate testing under 4.6.

4.5.2 Periodic sampling plans and tests:

4.5.2.1 Compressor sampling plan and test: One compressor unit shall be selected at random from every twenty-five or fraction thereof produced and shall be subjected to a performance demonstration test consisting of 10 percent of all testing hours required in paragraphs 4.7.7.1 thru 4.7.7.1.1. Specified cyclic rates shall remain unchanged and all required data shall be taken.

4.5.2.1.1 Rejection and retest: When a compressor unit selected from a production run fails to meet the specification, compressor units still on hand or produced later shall not be accepted until the extent and cause of failure have been determined and appropriately corrected. The contractor shall explain to the government representative the cause of failure and the action taken to preclude recurrence. After correction, all of the tests shall be repeated.

4.5.2.1.1.1 Individual tests may continue: For operational reasons, individual tests may be continued pending the investigation of a sampling test failure. FInal acceptance of compressor units on hand or produced later shall not be made until it is determined that the compressors meet all the requirements of the specification.

4.5.2.1.1.2 Defects in compressor units already accepted: The investigation of a test failure could indicate that defects may exist in compressor units already accepted. If so, the contractor shall fully advise the procuring activity of all defects likely to be found and methods of correcting them.

4.5.2.2 Shutoff and control valve sampling and test: One of each type (same design, size, and construction) control shutoff valve from each lot (see 6.4.7) of 50 or less shall be selected at random and subjected to the tests specified in 4.7.15.1. In case the valve fails to fulfill all specified test requirements, three additional sample valves from the lot shall be tested in the same manner.

4.5.2.2.1 Shutoff and control valve rejection and retest: If any of the three additional sample valves fail to fulfill all specified test requirements, the entire lot shall be rejected.

4.5.2.3 Burst disc sampling and test: Three burst discs from each lot (see 6.4.7) of 100 or less shall be selected at random and subjected to the test specified in CGA Pamphlet S-1. In case a disc fails at a pressure outside the limits specified, five additional samples from the same lot shall be tested in the same manner.

4.5.2.3.1 Burst disc rejection and retest: If more than one of the three original samples or any of the five additional sample burst discs fails at a pressure outside the limits specified, the entire lot shall be rejected.

4.5.2.4 Check valve sampling and test: One of each type (same design, size and construction) check valve from each lot (see 6.4.7) of 50 or less shall be selected at random and subjected to the tests specified in 4.7.15.2. In case the valve fails to fulfill all specified test requirements, three additional check valves from the lot shall be tested in the same manner.

4.5.2.4.1 Check valve rejection and retest: If any of the three additional sample check valves fail to fulfill all specified test requirements, the entire lot shall be rejected.

4.5.2.5 Automatic control device sampling and test: One of each type (same design, size, and construction) automatic control device from each lot (see 6.4.7) of 50 or less shall be selected at random and subjected to the tests specified in 4.7.15.3. In case the device fails to fulfill all the specified test requirements, three additional samples from the lot shall be tested in the same manner.

4.5.2.5.1 Automatic control device rejection and retest: If any of the three additional samples fail to fulfill all specified test requirements, the entire lot shall be rejected.

4.6 Preinstallation tests:

4.6.1 Spring-loaded relief valve test: Each spring-loaded relief valve shall be subjected to a gradually increasing pressure of clean, dry, oil-free air or nitrogen at its inlet until it opens. The pressure shall then be reduced until the valve completely reseals. This procedure shall be repeated until the valve has opened to discharge, and subsequently resealed, not less than three times. Following this testing, the valve shall then be checked for leakage by application of a soap film (film across the outlet and over all outside surfaces) with not less than the maximum working pressure of the component in which the valve will be installed, applied at the inlet. Beginning of discharge below or failure to seal at the pressures required, or indications of leaking during the soap film test, shall be cause for rejection.

4.6.2 Automatic control device test: If the compressor unit is provided with automatic control devices, the devices shall be subjected to not less than 10 full operating cycles under the conditions which they will experience in service. Faulty operation as indicated by failure to control within the limits specified shall be cause for readjustment or rejection. The adequacy of a readjustment operation shall be substantiated by subjecting the device to not less than 25 additional full operating cycles during which the controlled commodity shall be maintained within the specified limits or the device shall be rejected.

4.7 Test methods:

4.7.1 Examination of product: The compressor unit shall be inspected to determine compliance with applicable drawings and the requirements specified herein with respect to materials, workmanship, dimensions, and marking.

4.7.2 Operational test: The compressor unit shall be operated for 2 hours delivering rated capacity and pressure. Upon completion of the 2-hour period, the compressor unit shall show no signs of malfunctioning, leaks, rough operation, or other irregular operation.

4.7.3 Hydrostatic pressure test: All pressure vessels, including interconnecting piping, operating at pressures in excess of 75 psi shall be hydrostatically tested to not less than 1½ times maximum operating pressures and held at this pressure until examined for leaks and distortion. Leaks or distortion shall be cause for rejection

4.7.4 Initial teardown inspection: The compressor unit shall first be operated for a break-in period as determined by the manufacturer. The compressor unit shall then be disassembled and all major wearing parts measured and photographed for comparison with those taken after the tests. The photographs and measurements shall be properly identified and included in the test data. After reassembly, the compressor unit shall be serviced with fuels and lubricants, as applicable.

4.7.5 Acceleration test for types II, III, and V compressor units: Prior to conducting any other testing, the compressor unit shall be prepared for shipment. Unless necessary for protection of components from corrosion during testing, preservation for storage will not be required as part of this preparation. The compressor unit shall be subjected to acceleration forces in accordance with MIL-A-8421. After subjection to the 3-g load and prior to the 8-g load, the compressor unit shall be capable of meeting the remainder of the tests without modification, reconditioning, or repair.

4.7.6 Performance demonstration: The compressor unit shall be started and operated at rated capacity and pressure until temperatures have stabilized. Operation shall then continue for 2 hours with data being recorded every 10 minutes to determine the following:

a. Compressor rotational speed, rpm

b. Discharge pressure, measured at service valve outlet, psi

c. Temperature of air at receiver outlet, degrees Fahrenheit

d. Temperatures of air at the servicing valve, and inlet to the dehydration equipment, when applicable

e. Interstage and aftercooler pressures, psi

f. Free air delivery cfm

g. Intercooler(s) and aftercooler inlet and outlet air temperatures, degrees Fahrenheit

h. Ambient air temperature and pressures, degrees Fahrenheit, inches Hg, wet-bulb temperature, degrees Fahrenheit

i. Lubricating oil temperature, both engine, when applicable, and compressor, degrees Fahrenheit

j. Motor current, voltage, and power factor, or fuel consumption

k. Average temperature of air inside enclosure, when applicable

l. Oil consumption of the compressor, and, when applicable, the engine.

m. When applicable, engine intake manifold temperature and pressure and engine exhaust manifold backpressure

n. Dewpoint measurements for type III compressor units. Measuring instrument to be approved by the procuring activity.

4.7.7 Endurance test:

4.7.7.1 Types II and III compressor units: The compressor unit shall be operated for 1,000 hours as follows:

a. The compressor unit shall be operated for 750 hours delivering not less than rated pressure and capacity. For type II compressor units, 20 continuous hours of intermittent operation (20 cycles) at 250 psi discharge pressure shall be required. Each cycle shall consist of 30 minutes of operation at 250 psi and 30 minutes of operation at 200 psi discharge pressures.

b. The compressor unit shall be operated for 100 hours cycling a minimum of 10 times per hour between the cut-in and cutout pressures of the unloader.

c. Type II, class 1 and type III, class 1 compressor units shall be operated for 150 hours for alternate periods of 10 minutes loaded and 50 minutes unloaded. When provided with either a manually or an automatically actuated clutch, fluid coupling or a combination thereof, the coupling shall be actuated a minimum of 10 times per hour throughout the 150-hour period of operation. Type II, classes 2 and 3 and type III, classes 2 and 3 compressor units shall be operated for 150 hours with the controls set on stop-start. The compressor unit shall be required to stop and start approximately 10 times per hour, and where sufficient receiver capacity is available, the stop-start cycle shall be controlled by bleeding sufficient air from the receiver so that the compressor unit must stop and then start the 10 times in an hour.

4.7.7.1.1 Additional data requirements: Data listed under 4.7.6 shall be taken at 1-hour intervals for the 750-hour operation specified in 4.7.7.1. Capacity measurements for the endurance test shall be accurate to ± 5 percent. The amounts of power or fuel, and lubricants consumed shall be recorded for the 1,000 hours. The unloader cycles and the stop-start cycles shall be recorded for 4.7.7.1.1.

4.7.8 Performance demonstration: After completion of endurance testing, the compressor unit shall be resubjected to the testing in 4.7.6.

4.7.9 Final teardown inspection: After completion of the performance demonstration specified in 4.7.8, the compressor unit shall be completely disassembled for inspection. Parts subject to wear or distortion shall be measured or otherwise dimensionally inspected and the measurements compared with similar data compiled prior to the start of the testing for determination of wear or distortion. All parts shall be in an acceptable condition. Wear or distortion that would prevent continued satisfactory operation of the compressor unit shall be cause for considering the part affected as having failed to satisfactorily complete the test.

4.7.9.1.1 Photographs: Photographs shall be made of the corresponding parts which were photographed on the initial teardown inspection (see 4.7.4) and of any other parts which became defective as a result of testing. The photographs shall be properly identified and included in the test data.

4.7.9.2 Nondestruction inspection: Steel parts subject to high stress in operation shall be subjected to magnetic particle inspection (magnaflux) in accordance with MIL-I-6868, and shall exhibit no indications of failure attributable to the testing. Grind checks and subsurface indications of laps, seams, or other forging defects, noted before the test, shall not be cause for rejection. Nonmagnetic castings and forgings shall be subjected to inspection with fluorescent penetrant (black light) in accordance with MIL-I-6866, and shall exhibit no cracks or other defects.

4.7.10 Static pressure: All gaskets, valves, piping, and seals and fittings shall be tested to 1½ times normal maximum pressure.

4.7.11 Environmental tests: Types II, III, and V compressor units shall be subjected to the following environmental tests:

4.7.11.1 High-temperature exposure: The compressor unit shall be exposed to, but not operated in, an ambient temperature of 160° F for 72 hours. The compressor unit shall then be examined for damage. The ambient temperature shall be reduced to 125° F plus exposure to solar radiation on the surface of 359 BTU/ft/hr and the compressor unit exposed to this condition for 36 hours. While at this temperature, the compressor unit shall be started and operated for 4 hours, delivering rated capacity and pressure. During operation, the data listed under 4.7.6 shall be recorded at 10-minute intervals.

4.7.11.2 Winterized compressor starting: Winterized compressor units shall be exposed to an ambient temperature of -65° F for 36 hours. While exposed to that temperature, the compressor unit shall be heated with a type H-1 heater conforming to MIL-H-4607, or equivalent, in accordance with the manufacturer's instructions, and started. A maximum period of 30 minutes shall be permitted for heating and starting. After starting, the heater shall be disconnected, covers replaced, and the compressor unit operated for 2 hours delivering rated capacity and pressure, and for 2 hours at zero delivery. The data listed under 4.7.6 shall be recorded at 10-minute intervals.

4.7.11.3 Rain test: The enclosed compressor unit shall be exposed to simulated rain in accordance with procedure I of method 506 of MIL-STD-810. After 2 hours and while still being exposed to rain, the compressor unit shall start within 5 minutes and shall continue running for 15 minutes.

4.7.11.4 Wind test: The enclosed compressor unit shall be subjected to a simulated load equivalent to a 70-mph wind. No damage shall result to the doors, hinged covers, or enclosure.

4.7.11.5 Humidity test: The compressor unit or equipment samples representing applicable portions of the compressor unit that might be damaged in accordance with procedure I of method 507 of MIL-STD-810.

4.7.11.6 Fungus test: The compressor unit or equipment samples representing applicable portions of the compressor unit that might be damaged by exposure to fungus attack shall be subjected to the fungus-resistance test specified in procedure I of method 508 of MIL-STD-810.

4.7.11.7 Salt-fog test: The compressor unit or equipment samples representing applicable portions of the compressor unit that might be damaged by exposure to a salt atmosphere shall be subjected to salt-fog in accordance with procedure I of method 509 of MIL-STD-810.

4.7.11.8 Sand and dust test: Enclosed compressor units intended for field use shall be tested in accordance with procedure I, method 510, of MIL-STD-810. Units intended for inside use which do not have an integral enclosure shall be tested by the same procedure using the shipping container as the enclosure.

4.7.12 Electromagnetic interference test: The compressor unit shall be tested as specified in the detail specification to demonstrate compliance with the applicable requirement of MIL-STD-461.

4.7.13 Mobility tests: In addition to the tests specified in MIL-M-8090, all trailer-mounted compressor units shall be subjected to the following tests:

4.7.13.1 Tilt test: The compressor unit shall be tilted so that the axle(s) form not less than a 45° angle with the horizontal. While at this position, the lifting mechanism shall be removed, and the compressor unit shall be permitted to fall free. The compressor unit shall be subjected to this test from both sides. Overturning of the compressor unit or damage to any part of the compressor unit due to the impact shall be cause for rejection.

4.7.14 Tilted operation: Types II, III, and V trailer-mounted compressor units shall be tilted in four different positions at an angle of 15° from the horizontal. The compressor unit shall be operated for 30 minutes in each of these positions. The compressor unit shall be allowed to stand for 4 hours in the tilted position most likely to adversely affect the lubrication or fuel systems, after which the compressor unit shall be started and operated for 30 minutes. Fuel or lubrication difficulties or other difficulties due to tilted operation will not be permitted.

4.7.15 Valve and control test:

4.7.15.1 Shutoff and control valve tests: The valve shall be subjected to the following tests in the order specified:

4.7.15.1.1 Cycling test: With the valve outlet plugged or capped, the gas the valve will control shall be applied to its inlet at the maximum working pressure of the component in which the valve will be installed. The valve shall then be subjected to not less than 1,000 cycles of operation (see 6.4.8) without interim valve lubrication, adjustment, or repair. The test shall then be repeated for an additional 1,000 cycles with the outlet open to the atmosphere in which it vents the upstream pressure during the open part of the cycle and the stated working pressure is re-established on the upstream side of the valve during the closed part of the cycle. Damage to or improper operation of the valve as a result of the testing shall be cause for rejection.

4.7.15.1.2 Overtorque test: At the conclusion of the cycling specified in 4.7.15.1.1, without intervening adjustment or repair, the valve shall be opened, and then closed with a torque of 300 ± 10 pound-inches per inch of nominal size with the valve body at a temperature of not less than 125° F. The test shall be repeated with the valve body at a temperature of -65 ± 10° F. Damage to or improper operation of the valve as a result of the testing shall be cause for rejection.