| INCH-POUND |

XX-C-2816
August 9, 1993
SUPERSEDING
MIL-C-17596F
19 August 1988

FEDERAL SPECIFICATION

COMPRESSOR, AIR, RECIPROCATING OR ROTARY, ELECTRIC MOTOR DRIVEN, STATIONARY, 10 HP AND LARGER

This specification is approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

1. SCOPE

1.1 Scope. This specification covers stationary service, lubricated or non-lubricated (oil-free), electric motor driven, reciprocating or rotary air compressors with frame ratings of 10 horsepower (hp) and larger.

1.2 Classification. The compressor unit will be of the types, styles, classes, groups, drives, air end, rated capacity in cubic feet per minute (cfm) and rated discharge pressure in pound-force per square inch gage (psig) as specified (see 6.2).

Type I - Reciprocating (single acting)
Type II - Reciprocating (double acting)
Type III - Rotary (asymmetrical screw)
Type IV - Rotary (sliding vane)

Style A - Base mounted
Style B - Skid mounted
Style C - Tank mounted

Class 1 - With horizontal air receiver
Class 2 - With vertical air receiver
Class 3 - Without air receiver

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commanding Officer (Code 156), Naval Construction Battalion Center, 621 Pleasant Valley Road, Port Hueneme, CA 93043-4300, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

FSC 4310

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

Group a - With air-cooled aftercooler
Group b - With water-cooled aftercooler
Group c - Without aftercooler

Drive 1 - Multiple V-belt
Drive 2 - Direct connected

Air end A - Lubricated
Air end B - Non-lubricated (oil-free)

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. The following specifications and standards form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

Military Specifications

MIL-V-173 - Varnish, Moisture and Fungus Resistant (For Treatment of Communications, Electronic, and Associated Equipment)
MIL-C-3600 - Compressors, Air and Gas (Except Oxygen and Refrigerant) Packaging of

Federal Standards

FED-STD-123 - Marking for Shipment (Civil Agencies)
FED-STD-595 - Colors Used in Government Procurement

Military Standards

MIL-STD-129 - Marking for Shipment and Storage
MIL-STD-209 - Slinging and Tiedown Provisions for Lifting and Tying Down Military Equipment

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Bldg. 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.1.2 Other Government documents. The following Government document forms a part of this specification to the extent specified herein. Unless otherwise specified, the issues shall be those in effect on the date of the solicitation.

ENVIRONMENTAL PROTECTION AGENCY (EPA)

40 CFR 204 - Noise Emission Standard for Construction Equipment

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

2.2 Other publications. The following document(s) form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted shall be those listed in the issue of the DODISS specified in the solicitation. Unless otherwise specified, the issues of the documents not listed in the DODISS shall be the issue of the non-Government documents which is current on the date of the solicitation.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

Section VIII, Division 1 - Rules for Construction of Pressure Vessels.
Power Test Code PTC 9 - Displacement Compressors, Vacuum Pumps and Blowers.

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

COMPRESSED AIR AND GAS INSTITUTE (CAGI)

PN2CPTC2 - Acceptance Test Code for Electrically Driven Packaged Displacement Air Compressors

(Application for copies should be addressed to the Compressed Air and Gas Institute, 1300 Sumner Avenue, Cleveland, OH 44115).

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA ICS 2 - Industrial Control Devices, Controllers and Assemblies.
NEMA ICS 6 - Industrial Controls and Systems.
NEMA MG 1 - Motors and Generators.
NEMA MG 10 - Energy Management Guide for Selection and Use of Polyphase Motors.

(Application for copies should be addressed to the National Electrical Manufacturers Association, 2101 L Street, N.W., Washington, DC 20037.)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 - National Electrical Code.

(Application for copies should be addressed to the National Fire Protection Association, Battery March Park, Quincy, MA 02269.)

SOCIETY OF AUTOMOTIVE ENGINEERS, INC. (SAE)

SAE J534 - Lubrication Fittings.
SAE J551 - Performance Levels and Methods of Measurement of Electromagnetic Radiation of Vehicles and Devices.

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

(Non-Government standards and other publications are normally available from the organizations which prepare or which distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Description. The compressor unit or the equipment, as referred to in this specification, consists primarily of sub-assemblies such as the air end (compressor), drive end (electric motor), required type of mounting, instruments and control panel, safety devices, wiring, interconnected piping, and when applicable, include the intercooler, aftercooler, oil cooler, air/oil separator, air receiver, and metal enclosure.

3.2 Standard commercial product. The compressor unit shall, as a minimum, be in accordance with the requirements of this specification and shall be the manufacturer's standard commercial product. Additional or better features which are not specifically prohibited by this specification but which are a part of the manufacturer's standard commercial product, shall be included in the compressor unit being furnished. A standard commercial product is a product which has been sold or is being currently offered for sale on the commercial market through advertisements or manufacturer's catalogs or brochures, and represents the latest production model.

3.3 Materials. Materials used shall be free from defects which would adversely affect the performance or maintainability of individual components or of the overall assembly. Materials not specified herein shall be of the same quality used for the intended purpose in commercial practice. Unless otherwise specified herein, all equipment, material, and articles incorporated in the work covered by this specification are to be new and fabricated using materials produced from recovered materials to the maximum extent possible without jeopardizing the intended use. The term "recovered materials" means materials which have been collected or recovered from solid waste and reprocessed to become a source of raw materials, as opposed to virgin raw materials. None of the above shall be interpreted to mean that the use of used or rebuilt products is allowed under this specification unless otherwise specified.

3.4 First article. When specified in the contract or purchase order (see 6.2), a complete compressor unit shall be subjected to first article inspection (see 4.3 and 6.3).

3.5 Interchangeability. All units of the same classification furnished with similar options under a specific contract shall be identical to the extent necessary to insure interchangeability of component parts, assemblies, accessories, and spare parts.

3.6 Performance. The compressor unit shall be capable of delivering not less than the specified rated capacity (cfm) under dry air atmospheric conditions of 14.7 pound-force per square inch absolute (psia) pressure and 60 degrees Fahrenheit (^{o}F) temperature when operating at the specified discharge pressure (psig). The power required by the compressor shall be within ± 3 percent of the manufacturer's indicated rating. Rated capacity, pressure, and horsepower shall be measured in accordance with ASME PTC 9 or CAGI PN2CPTC2.

3.7 Design and construction. The compressor unit shall be designed for constant speed and continuous operation. The compressor shall be unitized, completely assembled to the required type of mounting, to form a single unit ready for service upon hook-up to field power supply and distribution piping. Instruments and controls, for both the compressor and driver, shall be panel mounted and conveniently located so as not to be affected by vibration, and to provide ease of operation and maintenance. All electrical components and installation shall meet the requirements of NFPA 70.

3.7.1 Environmental condition. The compressor shall be designed for outdoor or indoor installation as specified (see 6.2). Unless otherwise specified (see 6.2), the environmental condition (minimum and maximum temperature range) shall be as follows:

a. Outdoor installation: Zero to 110 ^{o}F
b. Indoor installation: 40 to 90 ^{o}F

3.8 Safety. Rotating parts or parts subject to high temperatures that could be hazardous to operating personnel shall be fully enclosed or provided with protective guards or shields.

3.9 Noise level. For outdoor installation, the noise level shall conform to the requirements and test procedure of EPA 40 CFR 204. For indoor installation, the noise level, shall not exceed 85 dBA at 3.28 feet, when measured in accordance with nationally recognized industry standards for sound measurement.

3.10 Ease of maintenance. The compressor and components shall be so arranged to provide adequate clearance area and safe access to all components for safe operation and maintenance.

3.11 Reciprocating compressor.

3.11.1 Compressor stages. Compressor shall be single stage or two stage as specified (see 6.2).

3.11.2 Cylinder arrangement. Cylinder arrangement or cylinder layout shall be in accordance with manufacturer's recommendation best suited for the compressor classification (see 1.2) as specified herein. Type I compressor cylinder heads shall be air-cooled or water-cooled (water jacketed) as specified (see 6.2). Type II compression cylinder shall be with replaceable cylinder liner or insert sleeves, or designed with allowance for future and use of oversized piston rings.

3.11.3 Frame lubrication. The reciprocating compressor's frame lubrication shall be a complete pressurized oil system, however, splash lubrication systems are acceptable when used on horizontal compressors with frame ratings of 200 hp and below and type I compressors with frame ratings of 25 hp or less. Compressors that are rated above 200 hp shall be furnished with a separate, independently driven, full capacity, full pressure, auxiliary oil pump with an automatic start feature activated by a low lube oil pressure. When specified (see 6.2), the gear case or reservoir shall be equipped with an electric, thermostatically controlled immersion heater with a maximum watt density not to exceed 15 watts per square inch.

3.11.4 Force-feed lubricator. When cylinder and packing lubrication requires a mechanical lubricator, single-plunger-per-point force-feed lubricators shall be provided. The lubricators shall be driven by the crankshaft and shall be independent from frame lubrication system. Ratchet lubricator drives are unacceptable. The oil feed to each lubricating point shall have a sight flow indicator and the oil feed regulation shall be adjustable.

3.12 Rotary compressor.

3.12.1 Frame lubrication. The rotary compressor's frame lubrication shall be furnished with a complete pressurized oil system. The air/oil receiver shall conform to ASME Section VIII, Division 1. When specified (see 6.2), the gear case or reservoir shall be equipped with an electric, thermostatically controlled immersion heater with a maximum watt density not to exceed 15 watts per square inch.

3.12.2 Metal enclosure. When specified (see 6.2), the rotary compressor shall be provided with metal enclosure which houses the motor, compressor, and instrument panel. When specified (see 6.2), the enclosure shall be furnished with electrical space heating equipment for maintaining satisfactory minimum temperature during periods of non-operation. The housing shall include quick opening side panels or hinged access openings to the motor, compressor, and instrument panel. Sheet metal for the housing and panels shall be not less than 0.0598-inch (US revised standard gage No. 16) thick. Panels shall be sized to provide maximum accessibility to the compressor components. Upward-opening hinged access panels shall be equipped with quick-disconnect fasteners. Enclosures for outdoor installation shall have provisions for preventing rain and snow ingestion.

3.13 Mounting. Each type of mounting shall be furnished with bolt holes for anchoring the unit to a concrete foundation, wood, or steel decking. The number and size of bolt holes shall be designed under the most severe condition of vibration or thrust likely to develop during operation, or to resist a horizontal force with a value of not less than 1/3 of the total weight of the whole unit and applied at the center of gravity of the unit, whichever is larger.

3.13.1 Base mounted. The baseplate shall be a single fabricated steel unit, with provisions to allow for grouting the load carrying structural members for installation on a concrete foundation. When specified (see 6.2), the baseplate main frame shall be provided with openings designed for forklift lifting of the whole compressor unit.

3.13.2 Skid mounted. The skid shall consist of two parallel steel skid runners with an integrally formed, welded, or bolted base plate for mounting components of the unit. The skid runners shall be upturned or beveled at each end to permit skidding the unit into place. Each end of the skid shall be furnished with lifting attachment designed for a four-point lifting and for pulling the equipment.

3.13.3 Tank mounted. The tank (horizontal or vertical) shall be welded to the bottom supports.

3.14 Air receiver. The receiver shall be of sufficient volume required for delivery of non-pulsating flow of compressed air at the rated capacity and discharge pressure. The receiver shall be designed and constructed in accordance with ASME Section VIII. The receiver shall be provided with an automatic condensate drain valve.

3.15 Intercoolers and aftercoolers. Air-cooled intercoolers, aftercoolers, and oil coolers shall be of finned construction. Water-cooled intercoolers, aftercoolers, and oil coolers shall be the shell and tube type. When water-cooled aftercoolers are required, the intercoolers and oil coolers (when applicable) shall also be water-cooled. When air-cooled aftercoolers are required, the intercoolers and oil coolers (when applicable) shall also be air-cooled. Water-cooled intercoolers and aftercoolers shall be provided with sight-flow indicator to visually observe the flow of water to the cooler. All intercoolers and aftercoolers shall be provided with a moisture separator and automatic drain trap.

3.16 Drive. Direct drive units shall be either of the close-coupled, integral-coupled, or flexible-coupled type as specified (see 6.2). Multiple V-belts for belt driven compressors shall be oil resistant and shall be designed with a service factor not less than 1.75 times the motor horsepower rating. Belt-driven units shall have means for adjusting belt tension. Belt drives shall be limited to compressor applications with frame rating of 100 hp or less.

3.17 Air filter. The compressor air intake shall be fitted with an air filter-silencer which is readily removable for cleaning.

3.18 Safety valves. When no receiver is supplied, a safety valve shall be installed in the discharge piping. A safety valve shall also be furnished between compressor stages. When the receiver is supplied, the safety valve shall be installed on the receiver. The safety valve(s) shall be the spring-loaded type, marked to show its capacity and pressure rating, and stamped with the ASME code symbol to identify conformance to ASME Section VIII.

3.19 Discharge shut-off valve. When specified (see 6.2), the compressor discharge shall be equipped with the shutoff valve installed downstream of the safety valve.

3.20 Regulation. Regulation of the compressor shall be accomplished by one of the following methods of control as specified (see 6.2). The regulation shall have adjustments for changing discharge and differential pressures. The compressor shall automatically unload after every shutdown, and the cooling water, when applicable, shall automatically shut off.

3.20.1 Constant speed control. The compressor shall run continuously and shall automatically load and unload at the preset minimum and maximum pressure setting. An adjustable (with up to 30 minutes adjustments) timed control device to shut down the motor after periods of operating unloaded shall be furnished. Loading and unloading on two-stage double acting reciprocating compressors shall be accomplished by a minimum of two steps (full load and no load).

3.20.2 Dual control. The dual control consists of a combination of constant speed control and start/stop control through a manual selector switch. When set to constant speed control, the compressor shall operate the same way as in 3.20.1. When set to start/stop control, the motor shall stop automatically when the discharge pressure reaches the maximum pressure setting and start automatically when the discharge pressure falls to the minimum setting.

3.20.3 Start/stop control. The motor shall stop automatically when the discharge pressure reaches the maximum pressure setting and start automatically when the discharge pressure falls to the minimum setting. This type of control shall be limited to compressors with frame rating of 25 hp and below.

3.21 Safety devices. The safety devices, as applicable to the compressor classification (see 1.2), shall include but not be limited to, those listed in table I and table II. Alarm indicator shall be by flashing red lights. When specified (see 6.2), a sounding horn alarm (with reset button) shall be furnished. Alarms, including gages or microprocessors and indicating lights, shall be wired or piped to the control panel.

TABLE I. Reciprocating compressor safety devices.

Control point	Type I		Type II	
	Alarm	Shut Down	Alarm	Shut Down
High-lubrication oil temp	-	x	x	x
Cylinder lubrication failure	-	-	-	x
High main bearing temperature	-	x	-	x
High discharge air temperature	x	x	x	x
High discharge air pressure	x	x	x	x
High intercooler air temperature	x	x	x	x
High water temperature	x	x	x	x
High intercooler moisture separator level	x	x	x	x
Low lube oil reservoir level	-	x	-	x
Low lube oil pressure	x	x	x	x
Low force-feed lubricator oil pressure	-	-	x	-
Low cooling water flow	-	x	-	x
Low water pressure	-	x	-	x
Motor overload	-	x	-	x
Excessive vibration	-	x	-	x

TABLE II. Rotary compressor safety devices.

Control point	Non-lubricated Type III		Lubricated Type III and Type IV	
	Alarm	Shut Down	Alarm	Shut Down
High-lubrication oil temp	x	x	x	x
High discharge air temperature	x	x	x	x
High discharge air pressure	x	x	x	x
High intercooler air temperature	x	x	x	x
High water temperature	x	x	x	x
High intercooler moisture separator level	x	x	x	x
Low lube oil reservoir level	-	x	-	x
Low lube oil pressure	x	x	-	-
Low cooling water flow	-	x	-	x
Low water pressure	-	x	-	x
Motor overload	-	x	-	x
High air/oil separator pressure differential	-	-	x	-
High oil filter pressure differential	x	-	x	-

3.22 Gages. Dial type pressure indicating gages or microprocessors shall be provided to indicate the discharge or receiver air pressure, air pressure between stages (as applicable), and oil pressure for pressurized or force feed lubrication system. Gages shall have an approximate range of twice the rated pressure or normal operating pressures.

3.23 Motors. The compressor motor shall conform to NEMA MG-1. The motor shall be designed for operation with electrical power supply having characteristics as specified (see 6.2). The motor shall have a hp nameplate rating equal to or greater than 110 percent of the hp required for continuous operation of the compressor at full load. Dripproof motors shall be polyphase induction type. When specified (see 6.2), motors 125 hp and larger shall be the synchronous type. Motors that drive auxiliary components shall conform to NEMA MG-1 and shall have electrical power supply characteristics as specified (see 6.2).

3.23.1 Motor efficiency. Motor efficiency shall be in accordance with the criteria of NEMA MG-10 and efficiency tables of NEMA MG-1. When specified (see 6.2), a high efficiency motor shall be furnished.

3.23.2 Motor starter. A magnetic starter conforming to NEMA ICS-2 shall be furnished. When specified (see 6.2), motors rated above 50 hp shall have reduced voltage, partial winding, or other means to limit starting current inrush to 200 percent of the normal full load value for reciprocating and non-lubricated rotary compressors, 260 percent for lubricated rotary compressors with standard efficiency motors, and 300 percent for lubricated rotary compressors with high efficiency motors. The starter shall include thermal overload protection and type 1 enclosure conforming to NEMA ICS-6.

3.24 Starting control circuit. Unless otherwise specified (see 6.2), the control circuits for motors shall be nominal 110 volts alternating current. When specified (see 6.2), a spare thermal overload relay shall be furnished and securely fastened inside the starter enclosure.

3.25 Electromagnetic interference characteristics. When specified (see 6.2), the compressor shall conform to the electromagnetic interference suppression requirements and test limits of SAE J551.

3.26 Fungus resistance. When specified (see 6.2), electrical components and circuit elements, including terminal and circuit connections, shall be coated with varnish conforming to MIL-V-173, except that:

a. Components and elements inherently inert to fungi or in hermetically sealed enclosures need not be coated.
b. Current-carrying contact surfaces, such as relay contact points, shall not be coated.

3.27 Cleaning, treatment, and painting. Surfaces normally painted in good commercial practice shall be cleaned, treated, and painted as specified herein. The color of the finish coat, conforming to FED-STD-595, shall be as specified (see 6.2). Surfaces to be painted shall be cleaned and dried to insure that they are free from contaminants such as soil, grease, welding slag and spatter, loose mill scale, water, dirt, corrosion product, or any other contaminating substances. As soon as practicable after cleaning, and before any corrosion product or other contamination can result, the surfaces shall be prepared or treated to insure the adhesion of the coating system. The painting shall consist of at least one coat of primer and one finish coat. The primer shall be applied to a clean, dry surface as soon as practicable after cleaning and treating. Painting shall be with manufacturer's current materials according to manufacturer's current processes and the total dry film thickness shall be not less than 2.5 mils over the entire surface. The paint shall be free from runs, sags, orange peel, or other defects.

3.28 Lubrication. Unless otherwise specified (see 6.2), means for lubrication shall be in accordance with the manufacturer's standard practice. The lubricating points shall be easily visible and accessible. Hydraulic lubrication fittings shall be in accordance with SAE J534. Where use of high-pressure lubricating equipment, 1,000 pound-force per square inch (psi) or higher, will damage grease seals or other parts, a suitable warning shall be affixed to the equipment in a conspicuous location.

3.29 Lifting and tiedown attachments. When specified (6.2), the compressor shall be equipped with lifting and tiedown attachments. Lifting and tiedown attachments shall conform to type II or type III of MIL-STD-209. A nonferrous transportation plate shall be provided and mechanically attached to the compressor. Transportation plates shall be inscribed with a diagram showing the lifting attachments and lifting slings, the capacity of each attachment, and the required length and size of each sling cable. A silhouette of the item furnished showing the center of gravity shall be provided on the transportation plate. Tiedown attachments may be identified by stenciling or other suitable marking. Tiedown marking shall clearly indicate that the attachments are intended for the tiedown of the compressor on the carrier when shipped.

3.30 Instruction plates. The compressor unit shall be equipped with instruction plates or decals suitably located, describing any special or important procedures to be followed in operating and servicing the equipment. Plates or decals shall be of a material which will last and remain legible for the life of the equipment. Plates shall be securely affixed to the equipment with nonferrous screws or bolts of not less than 1/8-inch diameter.

3.31 Identification marking. Identification shall be permanently and legibly marked directly on the compressor and sub-assemblies or on a corrosion-resisting metal plate securely attached to the compressor and sub-assemblies at the source of manufacture. Identification shall include the manufacturer's model and serial number, name, and trademark to be readily identifiable to the manufacturer.

3.32 Rotation arrow. Rotation arrow shall be cast-in or attached near the drive end of the compressor. If attached, the rotation arrow and attachment pins shall be of corrosion resisting materials.

3.33 Spare parts and maintenance tools. When specified (see 6.2), spare parts and maintenance tools shall be furnished. Special tools shall be kept to a minimum.

3.34 Toolbox. When specified (see 6.2), a toolbox shall be provided. The toolbox shall be large enough to store specialized tools not carried in mechanics' toolbox, and required for field service or maintenance, but shall not have external closed dimensions less than 14 inches in length, 6 inches in width and 6 inches in height. The toolbox shall be nominal 0.0747-inch (U.S. revised standard gage No. 14) thick steel with a hinged lid and a trunk drawbolt to keep the lid secured. The toolbox shall be mounted in a protected, accessible location.

3.35 Workmanship.

3.35.1 Steel fabrication. The steel used in fabrication shall be free from kinks, sharp bends, and other conditions which would be deleterious to the finished product. Manufacturing processes shall not reduce the strength of the steel to a value less than intended by the design. Manufacturing processes shall be done neatly and accurately. All bends shall be made by controlled means to insure uniformity of size and shape.

3.35.2 Bolted connections. Boltholes shall be accurately punched or drilled and shall have the burrs removed. Washers or lockwashers shall be provided in accordance with good commercial practice, and all bolts, nuts, and screws shall be tight.

3.35.3 Riveted connections. Rivet holes shall be accurately punched or drilled and shall have the burrs removed. Rivets shall be driven with pressure tools and shall completely fill the holes. Rivet heads, when not countersunk or flattened, shall be of approved shape and of uniform size for the same diameter of rivet. Rivet heads shall be full, neatly made, concentric with the rivet holes, and in full contact with the surface of the member.

3.35.4 Welding. Welding procedures shall be in accordance with a nationally recognized welding code. The surface of parts to be welded shall be free from rust, scale, paint, grease, or other foreign matter. Welds shall be of sufficient size and shape to develop the full strength of the parts connected by the welds. Welds shall transmit stress without permanent deformation or failure when the parts connected by the weld are subjected to proof and service loadings.

3.35.5 Castings. All castings shall be sound and free from patching, misplaced coring, warping, or any other defect which reduces the casting's ability to perform its intended function.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use 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.

4.1.1 Responsibility for compliance. All items must meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

4.1.2 Component and material inspection. Components and materials shall be inspected in accordance with all the requirements specified herein and in applicable referenced documents.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

a. First article inspection (see 4.3).
b. Quality conformance inspection (see 4.4).

4.3 First article inspection. The first article inspection shall be performed on one compressor unit when a first article is required (see 3.4 and 6.3). This inspection shall include the examination of 4.5 and the tests of 4.6. The first article may be either a first production item or a standard production item from the supplier's current inventory provided the item meets the requirements of the specification and is representative of the design, construction, and manufacturing technique applicable to the remaining items to be furnished under the contract.

4.4 Quality conformance inspection. Quality conformance inspection shall include the examination of 4.5, the tests of 4.6.1, 4.6.2, and 4.6.4, and the preparation for delivery inspection of 4.7.

4.5 Examination. Each compressor unit shall be examined for compliance with the requirements specified in section 3 of this specification. Any redesign or modification of the contractor's standard product to comply with specified requirements, or any necessary redesign or modification following failure to meet specified requirements shall receive particular attention for adequacy and suitability. This element of inspection shall encompass all visual examinations and dimensional measurements. Noncompliance with any specified requirements or presence of one or more defects preventing or lessening maximum efficiency shall constitute cause for rejection.

4.6 Tests. Failure to pass any of the following tests shall constitute cause for rejection.

4.6.1 Receiver test. The receiver shall be hydrostatically tested in accordance with the requirements of ASME Section VIII, Division 1. Leaks or distortion shall constitute failure of this test.

4.6.2 Safety valve test. The safety valve shall be tested to determine if its relieving capacity and popping pressure are in accordance with requirements of ASME Section VIII, Division 1.

4.6.3 Performance test. The compressor shall be tested to determine conformance to 3.6. The test results shall be corrected from the atmospheric conditions on the test site to the atmospheric conditions in 3.6. Inability of the compressor to meet the performance requirements of the specification or to operate satisfactorily shall constitute failure of this test.

4.6.4 Operational test. Each compressor shall be tested for not less than 15 minutes to verify satisfactory operation of the compressor and all controls. During the test, all necessary adjustments in controls shall be made as required to insure that performance requirements relating to the compressor output and regulation shall be met.

4.6.5 Test for electromagnetic interference characteristics. When electromagnetic interference characteristics are required, the compressor shall be tested to determine conformance to SAE J551. In lieu of tests, the manufacturer may furnish a certification that the compressor meets the requirements, together with a list of the suppression devices installed. The list shall be sufficiently detailed to allow visual determination that the devices are installed.

4.7 Preparation for delivery inspection. The preservation, packaging, packing, and marking of the item shall be inspected to verify conformance to the requirements of section 5.

5. PREPARATION FOR DELIVERY

5.1 Preservation, packaging, packing, and marking. Preservation, packaging, packing, and marking shall be in accordance with the requirements of MIL-C-3600, with the level of preservation and level of packing as specified (see 6.2).

5.2 Marking.

5.2.1 Military agencies. Shipments to military agencies shall be marked in accordance with MIL-STD-129.

5.2.2 Civil agencies. Shipments to civil agencies shall be marked in accordance with FED-STD-123.

6. NOTES

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

6.1 Intended use. The air compressor is intended for stationary service in installations where a steady volume of air is required.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, and date of this specification.
b. Type, style, class, group, drive, air end, rated capacity (cfm), and rated discharge pressure (psig) required (see 1.2).
c. Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1).
d. When first article is required for inspection (see 3.4).
e. When installation is for outdoor or indoor (see 3.7.1).
f. When environmental conditions are other than as specified (see 3.7.1).
g. Number of stages required (see 3.11.1).
h. When air-cooled or water jacketed cooling is required for type I compressor (see 3.11.2).
i. When an electrically controlled immersion heater is required (see 3.11.3 and 3.12.1).
j. When enclosure is required (see 3.12.2).
k. When enclosure shall be furnished with space heating equipment (see 3.12.2).
l. When baseplate frame shall be provided with openings for forklift lifting (see 3.13.1).
m. When direct drive shall be close-coupled, integral-coupled, or flexible-coupled (see 3.16).
n. When a shutoff valve is required in compressor discharge (see 3.19).
o. Required method of compressor regulation (see 3.20).
p. When sounding horn alarm shall be furnished (see 3.21).
q. Required electrical power supply characteristics for compressor motor (see 3.23).
r. Required electrical power supply characteristics for auxiliary motor (see 3.23).
s. When motors 125 hp and larger shall be synchronous motor (see 3.23).
t. When high efficiency motor is required (see 3.23.1).
u. When reduced voltage, partial winding or other means of limiting starting current is required (see 3.23.2).
v. Required electrical power supply characteristics for control circuits if other than specified (see 3.24).
w. When a spare overload relay shall be furnished (see 3.24).

x. When electromagnetic interference characteristic is required (see 3.25).
y. When fungus resistance is required (see 3.26).
z. Color of finished coat required (see 3.27).
aa. When lubrication shall be other than specified (see 3.28).
bb. When lifting and tiedown attachment is required (see 3.29).
cc. When spare parts and maintenance tools shall be furnished (see 3.33).
dd. When toolbox is required (see 3.34).
ee. Level of preservation and level of packing required (see 5.1).

6.3 First article. When a first article inspection is required, the item will be tested and should be a first production item or it may be a standard production item from the contractor's current inventory as specified in 4.3. The first article should consist of one unit. The contracting officer should include specific instructions in acquisition documents regarding arrangements for examination, test, and approval of the first article.

6.4 Data requirements. When this specification is used in an acquisition and data are required to be delivered, the data requirements shall be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved Contract Data Requirements List (CDRL), incorporated into the contract. When the provisions of DOD FAR Supplement, Part 27, Sub-Part 27.475-1 (DD Form 1423) are invoked and the DD Form 1423 is not used, the data shall be delivered by the contractor in accordance with the contract or purchase order requirements.

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

```
PIN designation ---------------- XX 2816   - X  X  X  X  X  X
                                   |        |  |  |  |  |  |
Federal Specification Number ______|        |  |  |  |  |  |
Type ____________________________________   |  |  |  |  |  |
Style ___________________________________________|  |  |  |  |
Class ____________________________________________|  |  |  |
Group ____________________________________________________|  |
Drive ____________________________________________________|  |
Air End ___________________________________________________|
```

6.5.1 Cataloging data. For cataloging data purposes, PIN code numbers are assigned to type, style, class, group, drive, and air end as follows:

a. PIN code for type
   1 = Type I
   2 = Type II
   3 = Type III
   4 = Type IV

b. PIN code for style
   A = Style A
   B = Style B
   C = Style C

c. PIN code for class
   1 = Class 1
   2 = Class 2
   3 = Class 3

d. PIN code for group
   a = Group a
   b = Group b
   c = Group c

e. PIN code for drive
   1 = Drive 1
   2 = Drive 2

f. PIN code for air end
   A = Lubricated
   B = Non-lubricated

6.5.2 Example of PIN. Requirements: Double acting reciprocating compressor, base mounted, furnished with vertical air receiver and water-cooled aftercooler, direct drive, and non-lubricated cylinder.

PIN designation: XX2816 - 2A2b2B

6.6 Supersession data. This specification replaces military specification MIL-C-17596F dated 19 August 1988.

6.7 Classification cross reference. Classifications used in this specification (see 1.2) are identical to those found in the superseded military specification MIL-C-17596, except for the following:

MIL-C-17596	XX-C-2816
Sizes A Through R	Not included
Not included	Air End A
Not included	Air End B

6.8 Subject term (key word) listing.

Axial screw
Base mounted
Double acting
Drive, direct connected
Drive, multiple V-belt
Lubricated
Oil-free
Single acting
Skid mounted
Sliding vane
Tank mounted

MILITARY INTERESTS:

Custodian
Navy - YD

Review Activity
DLA - CS

CIVIL AGENCY COORDINATING ACTIVITY:

GSA - FSS

Preparing activity:
Navy - YD

(Project 4310-0197)