INCH-POUND

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SUPERSEDING
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MILITARY SPECIFICATION

COMPRESSORS, RECIPROCATING AND ROTARY,

AIR, ELECTRIC MOTOR DRIVEN

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

1. SCOPE

1.1 Scope. This specification covers electric motor-driven, garage type, reciprocating and rotary air compressors.

1.2 Classification. The compressors shall be of the following types, classes, and sizes as specified (see 6.2).

Type I - Reciprocating.
Type II - Rotary.
Class 1 - Tank-mounted,
Class 3 - Caster-mounted.
Class 4 - Base-mounted.
Size - 5 cfm at 175 psig.
Size - 15 cfm at 175 psig.
Size - 25 cfm at 175 psig.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

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

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: USA Belvoir Research, Development, and Engineering Center, ATTN: STRBE-TSE, Fort Belvoir, VA 22060-5606 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A FSC 4310

SPECIFICATIONS

FEDERAL

W-C-586	- Conduit Outlet Boxes, Bodies, and Entrance Caps, Electrical: Cast Metal - for Shore Use.
FF-C-88	- Casters, Rigid and Swivel, Industrial, Heavy-Duty.
GG-G-91	- Gages, Tire Pressure, Self-Contained and Inflator-Gage, Pneumatic Tire.
WW-C-566	- Conduit, Metal, Flexible.

MTLITARY

MIL-V-173	- Varnish, Moisture- and Fungus-Resistant (for Treatment of Communications, Electronic, and Associated Equipment.
MIL-P-514	- Plate, Identification, Instruction and Marking, Blank
MTL-T-704	- Treatment and Painting of Materiel.
MIL-F-3541	- Fittings, Lubrication.
MIL-C-3600	- Compressors, Rotary, Power-Driven; and Compressors, Reciprocating, Power-Driven: Air and Gas (Except Oxygen and Refrigerant) , Packaging of.
MIL-G-3859	- Grease Guns, Hand-Operated, Lever, Push and Screw Type
MIL-G-10924	- Grease, Automotive and Artillery.
MIL-B-11040	- Belt, V: Drive .
MIL-S-12514	- Starters, Motor; Across-The-Line and Reduced Voltage Types , A-C Induction, 3/4 to 100 HP, Manual and Electric.
MIL-C-13486	- Cable, Special Purpose, Electrical: Low-Tension, Heavy Duty Single Conductor and Multiconductor.
MIL-G-23827	- Grease, Aircraft and Instrument, Gear and Actuator Screw.
MIL-C-46168	- Coating, Aliphatic Polyurethane, Chemical Agent Resistant.
MIL-C-53039	- Coating, Aliphatic Polyurethane, Single Component, Chemical Agent Resistant.

STANDARDS

FEDERAL

FED-STD-H28	- Screw-Thread Standard for Federal Services.

MILITARY

MIL-STD-130	- Identification Marking of US Military Property.
MIL-STD-209	- Slinging and Tied.own Provisions for Lifting and Tying Down Military Equipment.
MIL-STD-838	- Lubrication of Military Equipment.
MIL-STD-889	- Dissimilar Metals.
MIL-STD-1472	- Human Engineering Design Criteria for Military Systems, Equipment, and Facilities.
MIL-STD-1474	- Noise Limits for Military Materiel.

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

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

B15.1 - Mechanical Power Transmission Apparatus, Safety Standard for.

(Application for copies should be addressed to the American National Standards Institute, 1430 Broadway, New York, NY 10018.)

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

Boiler and Pressure Vessel Code, Sections VIII and IX.
Performance Test Code 9 - Displacement Compressors, Vacuum Pumps and Blowers.

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

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ICS 6 - Enclosures for Industrial Controls and Systems,
MG-1 - Motors and Generators.

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

SOCIETY OF AUTOMOTIVE ENGINEERS, INC (SAE)

J492 - Rivets and Riveting.

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

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Rule 422 - Usage of Solvents.

(Application for copies should be addressed to the South Coast Air Quality Management District, 9150 Flair Drive, El Monte, CA 91731.)

UNDERWRITERS LABORATORIES INC. (UL)

UL6 - Rigid Metal Conduit.
UL 514 - Nonmetallic Outlet Boxes, Flush Device Boxes, and Covers.
UL 1242 - Intermediate Metal Conduit.

(Application for copies should be addressed to the Underwriters Laboratories, Inc ., 333 Pfingsten Road, Northbrook, IL 60062.)

(Non-Government standards and other publications are normally available from the organizations that prepare or 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 document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Description The air compressor shall be of the commercial classification "garage type" and shall consist of either an air-cooled, piston compressor unit or air-oil cooled, rotary compressor unit, both types with an air reservoir, airhose, and power unit.

3.2 First article. Unless otherwise specified (see 6.2), a sample shall be subjected to first article inspection (see 6.3) in accordance with 4.3.

3.3 Material, Material shall be as specified herein. Materials not specified shall be selected by the contractor and shall be subject to all provisions of this specification.

3.4 Material deterioration Prevention and control. The air compressor shall be fabricated from compatible materials, inherently corrosion resistant or treated to provide protection against the various forms of corrosion and deterioration that may be encountered in any of the applicable operating and storage environments to which the air compressor may be exposed.

3.4.1 Dissimilar metals. Dissimilar metals shall not be used in intimate contact with each other unless protected against galvanic corrosion. Dissimilar metals and methods of protection are defined and detailed in MIL-STD-889.

3.4.2 Cadmium plating Cadmium plating and cadmium plated parts shall not be used.

3.4.3 Identification cation of materials and finishes The contractor shall identify the specific material, material finish or treatment for use with component and subcomponent, and shall make information available upon request to the contracting officer or designated representative.

3.4.4 Recovered materials For the purpose of this requirement, recovered materials are those materials which have been collected from solid waste and reprocessed to become a source of raw materials, as distinguished from virgin raw materials. The components, pieces and parts incorporated in the air compressor may be newly fabricated from recovered materials to the maximum extent practicable, provided the air compressor produced meets all other requirements of this specification. Used, rebuilt or remanufactured components, pieces and parts shall not be incorporated in the air compressor.

3.5 Operating temperature. the compressors shall perform as specified herein in any ambient temperature from 120 to -25 ^{0}F.

3.6 Safety. All rotating or reciprocating parts and other parts subject to high operational temperatures that are of such a nature or are so located as to be a hazard to operating personnel, shall be guarded or insulated to the extent necessary to eliminate the hazard. Protective devices shall not impair the operating functions.

3.7 Maintainability. The compressor shall operate as specified herein without repair or maintenance other than the contractor's recommended normal scheduled adjustments and servicing, as established by a maintenance schedule prepared and submitted by the contractor prior to test. All major assemblies and installed attachments shall be accessible for maintenance repair and replacement without removal of other major assemblies and installed attachments not normally removed. Cover plates which must be removed for component adjustment shall be equipped with quick-disconnect fastenings. All fasteners shall be of corrosion-resistant material or shall be treated to be corrosion resistant. All screw threads shall be in accordance with FED-STD-H28. Maximum use shall be made of interchangeable hardware and fastening devices. Use of self-tapping screws shall not be permitted. Means for drainage of lubricants, and condensate traps shall be in an accessible location and shall drain to a container without splashing on any component or on operating personnel. The drain outlets shall be so located to facilitate complete drainage. All drain outlets shall be labeled to indicate the reservoir being drained (i.e. , "AIR TANK DRAIN" "OIL DRAIN" etc.) in accordance with 3.24. Each maintenance, assembly or disassembly operation performed as a result of testing shall be accomplished by not more than two soldiers using common tools and special tools furnished with the compressor.

3.8 Airhose The airhose shall be the commercial heavy duty type 5/16 inch ID, minimum working pressure shall be not less than 200 pounds per square inch (psi) and unless otherwise specified (see 6.2) shall be not less than 50 feet long. Air hose couplings shall be internal swivel fitted, having a l/4-inch, standard, straight-pipe thread and a 30-degree tapered seat and shall be fitted at one end with an inflator gage conforming to GG-G-91, type III, style 3.

3 9 Intake air filter and silencer. The compressor shall be provided with a dry-type combination intake air filter and silencer.

3.10 Lubrication All surfaces requiring lubrication shall be provided with a means for lubricating. A lubrication chart shall be provided in a clearly visible location. The chart shall indicate the lubrication points, the type of lubricant, the frequency of lubrication, and for oil reservoirs, the quantity of lubricant in accordance with 3.24.

3.10.1 Lubricants The compressor shall operate as specified herein when lubricated with military lubricants (see 6.4).

3.10.2 Lubrication fittings. Lubrication fittings shall conform to MIL-F-3541, type I, II, or III, Fittings shall be located in protected positions. Fittings shall be accessible to a grease gun conforming to KIL-G-3859, type II. Accessibility to fittings shall be provided without the removal or adjustment of accessories or parts. Panels and plates equipped with hand-operable, quick-disconnect fasteners may be removed to provide accessibility to lubrication fittings.

3.10.3 Pressure-release device. A pressure-release device shall be provided where the use of pressure lubricating equipment will damage grease seals or other parts .

3.10.4 Enclosureswith integral reservoir of lubricant. Enclosures, such as gear chase and transmission housings which contain a reservoir of lubricants for the lubrication of the parts enclosed, shall be equipped with dipsticks, check plugs not less than l\2-inch pipe size, or sight gages to determine the level of the lubricant. Each enclosure shall be equipped with a drainplug. Each enclosure shall be equipped with a means for filling the enclosure with lubricant. The drainplug shall be located so that removal of the drainplug will result in complete drainage of the lubricant from the enclosure. Drainage shall be to a container when the compressor is in its normal position. Tubes may be used to convey the lubricant from the drain to a container. Accessibility to the drain plug, the filling means, and the lubricant-level checking device shall be obtained without the removal or adjustment of accessories or parts.

3.10.5 Delivery lubrication service. When delivered, all components, except those for which preservatives are specified in 5.1, shall be lubricated. Grease lubrication, excluding lubrication of sealed bearings, shall be with greases conforming to MIL-G-10924 or MIL-G-23827. Unless otherwise specified herein, all components shall be filled to the operating level with military oils designated for use in the temperature range as specified herein. Each lubricated component shall be tagged in a conspicuous place to indicate the temperature range and grades of oils and greases used.

3.11 Fungus- and moisture-resistance. The electrical circuity, including all components and connections except as specified below, shall be protected from the effects of moisture and fungus growth by an overall treatment with a varnish conforming to MIL-V-173, composition I or II as applicable, 7 percent salicylanilide (by weight) based on the nonvolatile content of the varnish.

a. Components or circuit elements that are inherently fungus and moisture resistant or which are hermetically sealed need not be treated.
b. Components or circuit elements whose functions will be adversely affected by the varnish coating shall not be treated.

When used, the varnish shall be applied by spray, brush, or a combination of both to give a minimum dry-film thickness of 1 mil to component or element surfaces previously cleaned and prepared so that the surfaces are free from all foreign matter which would interfere with the adherence or function of the varnish.

3.11.1 Composition Composition II shall be used only in the case when local air pollution regulations in the application of varnish precludes the use of composition I. When composition II Is used, the contractor shall provide evidence to the Government that the use of composition II is required, and shall certify that composition II material complies with Rule 422 - Usage of Solvents.

3.12 Identication marking. The compressor shall be identified in accordance with MIL-STD-130. The marking shall be applied to the compressor on identification plates conforming to MIL-P-514, type I, style 1, composition C, of type I, grade A, class 1 material. Plates shall be attached by screws, bolts, or rivets In a conspicuous, protected location.

3.13 _____ Each compressor shall be equipped with instruction plates or diagrams, including warnings and cautions, describing any special or important procedures to be followed in assembling, operating or servicing the compressor . Instruction plates shall conform to MIL-P-514, type III, composition c, of type I, grade A, class 1 material. Plates shall be attached by screws, bolts, or rivets in a conspicuous, protected location,

3.14 Treatment and painting. The compressor, components, and parts painted in commercial practice shall be cleaned, created, and painted in accordance with MIL-T-704, type F or G, as applicable. Unless otherwise specified (see 6.2), top coat color shall be camouflage green 383 conforming to MIL-C-46168 or MIL-C-53039.

3.15 Type I reciprocating.

3,15.1 Compressor. The type I compressor shall deliver the capacities of free air (see 6.5) specified in table I at a pressure of 175 pounds per square inch gage (psig), as determined by the ASME Performance Test Code 9. The components of the compressor shall be balanced so that when the compressor is operated in conjunction with the electric motor, vibration shall be minimized. The compressor shall produce rated capacity at rated pressure for 500 hours in operating periods of not less than 4 hours. Operating periods of not less than 4 hours (see 4.6.2.4), during high and low temperature tests may be counted (see 4.6.2.5 and 4.6.2.6). The compressor shall nor exceed the contractor's recommended continuous operating speed. The compressor shall be air cooled. The cylinder heads or cylinder assembly (if cast integrally) shall be removable. The intake and exhaust valves shall be removable. A fan shall be provided for cooling.

TABLE X. Compressor characteristics.

Size	Minimum capacity (free air)	Maximum operating pressure	Rated discharge pressure
(cfm)*	(cfm)	(psig)	(psig)
5	5	200	175
15	15	200	175
25	25	200	175

* cfm - cubic feet per minute.

3.15 2 Intercooler and aftercooler. When a multiple-stage compressor is furnished, an intercooler shall cool the air between the pressure stages and shall be located so as to be cooled by the airblast from the fan. A spring-loaded-type, pressure-relief valve shall be installed between the pressure stages to protect the low-pressure cylinder in case of failure of the high-pressure cylinder valves. The temperature measured at the discharge of the air receiver shall not exceed ambient plus 100 ^{0}F at a pressure of 200 psig. If necessary to meet the temperature requirements specified herein, an aftercooler may be provided between the last stage of the compressor and the air receiver tank. Aftercooler shall be air cooled.

3.15.3 Pressure tubing and fitting. All pressure tubing and fittings shall be rated to withstand 1-1/2 times their normal working pressure.

3.15.4 Drive. The drive shall consist of matched multiple V-belts and grooved pulleys on the power unit and compressor unit. All drive belts shall conform to MIL-B-1104O A means for belt removal and adjustment shall be provided.

3.16 Type II rotary

3.16.1 Compressor The type II compressor shall deliver the capacities of free air specified in table I at a pressure of 175 psig as determined by the ASME Performance Test Code 9. The components of the compressor shall be balanced so that when the compressor is operating in conjunction with the electric motor, vibration shall be minimized. The compressor shall produce rated capacity at rated pressure for 500 hours in operating periods of not less than 4 hours (see 4.6.2.4). Operating periods of not less than 4 hours during high and low temperature tests may be counted (see 4.6.2.5 and 4.6.2.6). The compressor shall not exceed the contractor's recommended continuous operating speed The compressor unit shall be positive displacement and air cooled. A means shall be provided to remove and recover the oil from the discharge air. When a filter-type separator is used, it shall be accessible for examination, cleaning and replacement without removal of other parts or components. To prevent hydraulic lock upon starting, a means shall be provided in the stator assembly to allow accumulated oil to pass into the sump. The rotors, stators, and blades for any one size compressor shall be interchangeable among all compressors of that type, class, and size furnished by that manufacturer. A pressure gage shall be provided between the compressor unit and the separator discharge to indicate the pressure in the compressor. A nonreturn valve shall be provided either in the oil separator or in the discharge from the separator to prevent reverse flow of air from the receiver.

3.16.2 Pressure tubing and fittings. All pressure tubing and fittings shall be rated to withstand 1-1/2 times their normal working pressure.

3.16.3 Drive. The type II compressor shall be either direct drive or multiple V-belt drive. The multiple V-belt drive shall conform to 3.15.4. When a direct drive is used, a flexible coupling shall be installed between the power unit and compressor unit. The mounting base for the power unit shall have a means for belt removal and adjustment when V-belt drive is used.

3.17 Class 1. tank-mounted The compressor unit and power unit shall be mounted on a base attached to the air-receiver tank.

3.17.1 Air-receiver tank The air-receiver tank for the class 1 compressor shall be of the horizontal type and shall be constructed in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII. The receiver shall bear the ASKE stamp and no welding or other actions shall be permitted after the receiver has been certified. Unless otherwise specified (see 6.2), the capacity of the air-receiver tanks for the 5-cfm shall be not less than 20 gallons and for the 15-cfm and 25-cfm compressors shall be not less than 80 gallons. Unless otherwise specified (see 6.2), the air-receiver tank fittings shall include a globe discharge valve, a drain cock and a 0-psig to not less than 250-psig pressure gage having 10 psig or smaller increments. The air-receiver tanks shall include a pressure relief valve conforming to ASME Boiler and Pressure Vessel Code. The receiver shall be provided with a steel base of not less than four q ounting feet for horizontal mounting. When equipped with a steel base, openings shall be provided to permit insertion of forklift tines. Each opening shall be not less

than 11 inches by 3 inches in size; openings shall be located such that the center of gravity of the compressor falls between the centers of forklift openings. A means shall be provided on the receiver for securing the airhose.

3.18 Class 3. caster-mounted. The compressor unit and power unit shall be mounted on a steel base attached to a horizontal-type, air-receiver tank. The air-receiver shall be constructed as specified in 3.17, except the tank shall be mounted on four casters conforming to FF-C-88. Two type II (swivel) casters shall be mounted on the compressor end, and two type I (nonswivel) casters shall be mounted on the motor end.

3.18.1 Caster installation. The casters shall be mounted so that the compressor will not overturn when pushed or pulled about on a horizontal surface or when tilted 15 degrees from the horizontal in any direction. The casters shall be attached to steel mounts on the bottom side of the receiver tank and located near each end of the tank. The distance between the centerline of the casters (measured side to side) shall be not less than 6 inches greater than the maximum diameter of the air-receiver tank.

3.18.2 Handle and storage rack. The class 3 compressor shall be equipped with a combination handle and storage rack The handle and storage rack shall be removable , and similar to that shown on figure 1 (see 6.6) . The handle shall be positioned not less than 30 inches and not more than 40 inches from the floor. The storage rack shall hold the airhose specified in 3.8 and 50 feet of No. 10 AWG, type SO, 3-conductor cable. The storage rack shall be located so that neither hose nor cable, when stored on the rack, will contact any component of the compressor subject to high temperature.

3.18.3 Tilt requirement. The compressor shall deliver rated capacity when operated at rated speed and pressure, tilted 15 degrees from the horizontal in any plane ,

3.19 Class 4. base mounted. The compressor unit and power unit shall be mounted on a base attached to a horizontal-type air-receiver tank. The air-receiver tank shall be constructed as specified in 3.17.

3.19.1 Toolbox. A toolbox made of No. 14 gage sheet steel shall be furnished with the lid edges formed to overlap the top edges of the box to prevent the entry of dirt, snow, and rain. The toolbox shall be of sufficient size to hold the canvas cover, all maintenance tools, inflator gage and publications.

3.19.2 Transportability. The base-mounted 15-cfm compressor shall be equipped with tiedown or slinging provisions.

3.19.2.1 Tiedown provisions The tiedown provisions shall conform to MIL-STD-209, class 2 or 3, type 2 or 5 equipment. The tiedown provisions shall satisfactorily complete the pull testing as specified in 4.6.2.11.1 without weld failure, permanent deformation, cracking, loosening, or breaking of the provision or its connecting structural component. Tiedown points shall be labelled “TIEDOWN HERE" and combination lift/tiedown points shall be labelled “LIFT’/TIEDOWN HERE”. The labels shall conform to MIL-STD-1472.

3.19.2.2 Slinging provisions. The slinging provisions shall conform to MIL-STD-209, class 1 or 3, type 2 or 5. The provisions shall enable the complete

compressor to be lifted in the normal operating position. The provisions shall be located so that not less than l-inch clearance is maintained between slings and all exterior parts and shall be fastened to members which will withstand stresses in the amount and direction of pull specified for the provisions without weld failure, permanent deformation, cracking, loosening, or breaking of the provision or its connecting structural components. Slinging provisions may also be used as tiedown provisions when such provisions meet the requirements specified in 3.19.2.1. Lift points shall be labelled "LIFT HERE". The labels shall conform to the requirements of MIL-STD-1472.

3.20 Electric-motors. Motor wiring and control systems shall conform to the provisions of ANSI B15.1.

3.20.1 Electric motor. Unless otherwise specified (see 6.2), each compressor shall be driven by a single phase, induction, squirrel cage, electric motor, capacitor (drip proof) conforming to NEMA MG-1. The electric motor shall have the continuous horsepower rating as specified in table II The horsepower required by the compressor when performing at 200 psig shall be not more than the continuous horsepower rating, including the service factor, of the motor. The motor shall have all electrical equipment connected for operating on a power supply having the characteristics as specified (see 6.2) .

TABLE II Electric motor ratings.

Compressor size (cfm)	Minimum horsepower rating (hp)
5	2.0
15	5.0
25	10.0

3.20.2 Starter. A starter shall be furnished conforming to MIL-S-12514, type I, class 2, and shall be provided with a NEMA type 12 (dripproof) and dust tight enclosure . The class 2 starter shall be magnetically operated by a pressure switch tch The starter shall be reset by an externally operable switch mounted in motor starter enclosure. The maintained contact stop-start switch and reset shall be located in an accessible location.

3.20.2.1 Low-voltage protection. A low-voltage protective device shall be provided to open all ungrounded line conductors whenever voltage falls or drops below a predetermined level or after the operation of the overload protective device. After the operation of the overload protective device, the reset switch shall require actuation before the motor can be restarted. The overload protective device shall be removable and replaceable. The holding coil may be regarded as the low-voltage protective device.

3.20.3 Conduit Wiring shall be installed in conduit conforming to WW-C-566, UL 6, UL 514, or UL 1242, as applicable. Conduit outlets shall conform to W-C-586.

3.20.4 Pressure regulation. Each compressor shall have an adjustable, pressure-actuated electric control. The control shall be adjusted to stop the motor when the pressure has risen to 200 +0, -10 psig, and to start the motor when

the pressure has dropped to 175 ±I0 psig. A device shall be provided to protect the motor from starting against tank pressure.

3.20.5 Electrical conductive casters. Class 3, compressor shall be provided with electrical conductive casters.

3.20.6 Wiring The cable for wiring the electrical system shall be in accordance with MIL-C-13486, low-temperature (-25 ^{0}F), type and size as applicable. The wires shall be enclosed in a loom and clamped neatly to the structural members.

3.21 Pulley. 5-cfm compressors. When a V-belt drive is used, the drive pulley shall be provided with an inner hub which clamps to the shaft by moving axially along a taper in the outer hub. The mechanical clamping shall be accomplished by the use of a screw member or members for mounting and removal of the pulley.

3.22 Interchangeability. All parts having the same part number shall be functionally and dimensionally interchangeable Interchangeable parts are defined as two or more parts possessing such functional and physical characteristics as to be equivalent in performance and durability and capable of being exchanged one for the other without alteration of the parts themselves or of adjoining parts, except for adjustment, and without selection for fit or performance.

3.23 Workmanship. All parts, components and assemblies of the compressor including castings, forgings, molded parts, stampings, bearings, seals, machined surfaces , and welded parts shall be clean and free from sand, dirt, fins, pits, sprues, scales, or any damaging extraneous material. The compressor shall be free of any defect that could impair its operation and serviceability

3.23.1 Fabrication. Steel and aluminum used in the fabrication of the compressors shall provide original quality surface finish and shall be free from kinks and sharp bends. The forming of the material shall be done by methods that will not cause damage to the metal. Shearing and chipping shall be done neatly and accurately, Corners shall be square and true, and sharp edges and burrs shall be removed. Flame-cutting may be employed instead of shearing and sawing. Burned surfaces of flame-cut material shall be ground or machined sufficiently to remove ash and cooling checks. Precautions shall be taken to avoid overheating, and heated metals should be allowed to cool slowly, All bends of a major character shall be made with metal dies or fixtures to insure uniformity of size and shape.

3.23.2 Welding The surfaces of parts being welded shall be free of scale, paint, grease, and other foreign matter. Welds shall transmit stress without permanent deformation or failure when the parts connected by the welds are subjected to proof and service loading. Welding shall be in compliance with ASNE Boiler and Pressure Vessel Code, Section IX.

3.23.3 Bolted connection. All boltholes still be accurately punched or drilled and shall have the burrs removed. Washers or lockwashers shall be provided where necessary. All bolts, nuts, and screws shall be correctly torqued and shall have full thread engagement. Matching thread areas securing bolts or capscrews shall be of sufficient strength to withstand the tensile strength of the bolt.

3.23.4 Riveted connections. Rivets shall fill the holes completely. The upset rivet heads shall be full, neatly made, concentric with the rivet holes, and in full contact with the surface of the member and shall be in accordance with SAE J492.

3.23.5 Machine work. Tolerances and gages for metal fits shall conform to the limitations specified herein.

3.24 Human factors engineering. The air compressor shall comply with the design criteria of MIL-STD-1472 Special design emphasis shall be given to MIL-STD-1472, general requirements (4), visual displays (5.2), controls (5.4), labeling (5.5), anthropometry (5.6) , design for maintainer (5.9), and hazards and safety (5.13), as applicable.

3.25 Noise limits The noise produced by the air compressor shall conform to MIL-STD-1474 requirements, with the exception of MIL-STD-1474, 5.2, 5.3, and 5.4, when tested in accordance with 4.6,2.13. The provisions of MIL-STD-1474, 4.3 and 4.4 shall be provided if and only if MIL-STD-1474, 5.1.1.2 procedures have been pursued and documented to the satisfaction of the procuring activity and written permission to exceed the 85 dB(A) limit is obtained from the contracting officer. In accordance with MIL-STD-1474, 5.1.2.1.2, the operator position shall be defined as that point which is a horizontal distance of 18 inches from the pressure gauge. Occasionally occupied positions are defined as those points that are 60 inches above the ground and a horizontal distance of 39 inches from the unit Noise hazard signs shall conform to MIL-STD-1474, 4.2 and 5.1.2.1.4.

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 (examinations and tests) 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 ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance All items shall 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 ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this 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. The contractor is responsible for insuring that components and materials are manufactured, examined, and tested in accordance with referenced specifications and standards, as applicable.

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).
c. Inspection of packaging (see 4.7).

4.3 First article inspection.

4.3.1 Examination. The first article compressor shall be examined as specified in 4.6.1. Presence of one or more defects shall be cause for rejection.

4.3.2 Tests. The first article compressor shall be tested as specified in 4.6.2.1 through 4.6.2.12 as applicable for the class compressor to be furnished. Failure of any test shall be cause for rejection. A first article test log (see figure 2) shall be furnished.

4.4 Quality conformance inspection.

4.4.1 Examination Each compressor shall be examined in accordance with 4 6.1. Presence of one or more defects shall be cause for rejection.

4.5 Tests.

4.5.1 Individual. Each compressor shall be tested as specified in 4.6.2.12 Failure of a test shall be cause for rejection.

4.6 Inspection procedure.

4.6.1 Examination. The compressor shall be examined for the following defects.

101. Material not as specified (see 3.3).
102. Materials not resistant to corrosion and deterioration, or treated to be resistant to corrosion and deterioration of the applicable storage and operating environments (see 3.4).
103. Dissimilar metals as defined in MIL-STD-889 are not effectively insulated from each other (see 3.4.1).
104. Cadmium plated parts used (see 3.4.2).
105. Contractor does not have documentation available for identification of materials, material finishes, or treatment (see 3.4.3).
106. Used, rebuilt or remanufactured components, pieces, or parts incorporated in the compressor (see 3.4.4).
107. Safety devices or guards missing or not as specified (see 3.6).
108. Human factors not as specified (see 3.24).
109. Maintainability not as specified (see 3.7).
110. Airhose not as specified (see 3.8).
111. Intake air filter and silencer not as specified (see 3.9).
112. Lubrication not as specified (see 3.10).
113. Lubricants not as specified (see 3.10.1).
114. Lubrication fittings not as specified (see 3.10.2).
115. Pressure-release device not as specified (see 3.10.3).
116. Enclosures with integral reservoir of lubricant not as specified (see 3.10.4).
117. Delivery lubrication service not as specified (see 3.10.5).

118. Fungus - and moisture-resistance not as specified (see 3.11).
119. Composition not as specified (see 3.11.1).
120. Identification marking not as specified (see 3.12).
121. Instruction plates not as specified (see 3.13).
122. Treatment and painting not as specified (see 3.14).
123. Color not as specified (see 3.14),
124. Pressure tubing and fittings not as specified (see 3.15.3 and 3.16.2).
125. V-belts and pulleys not as specified (see 3.15.4 and 3.16.3).
126. Castors not mounted as specified (see 3.18).
127. Handle and storage rack not as specified (see 3.18.2)
128. Base-mounted compressor not as specified (see 3.19).
129. Toolbox not as specified (see 3.19.1)
130. Tiedown and slinging provisions not as specified (see 3.19.2.1 and 3.19.2.2).
131. Electric motors wiring and controls not as specified (see 3.20).
132. Electric motor not as specified (see 3.20.1).
133. Starter not as specified (see 3 20.2)
134. Low-voltage protection not as specified (see 3.20.2.1).
135. Conduit not as specified (see 3.20.3)
136. Wiring not as specified (see 3.20.6).
137. Pulley, 5-cfm compressors not as specified (see 3.21).
138. Interchangeability not as specified (see 3.22).
139. Workmanship not as specified (see 3.23) .
140. Fabrication not as specified (see 3.23.1)
141. Welding not as specified (see 3.23.2).
142. Bolted connections not as specified (see 3.23.3).
143. Riveted connections not as specified (see 3.23.4).
144. Machine work not as specified (see 3.23.5).
145. Electrical conductive casters not as specified (see 3.20.5).

4.6.2 Tests

4.6.2.1 Test conditions. The compressor shall operate as specified herein without maintenance other than the contractor's recommended normal scheduled maintenance as established by a maintenance schedule prepared and submitted by the contractor prior to test. The compressor shall be lubricated with military oils and greases. A first article test log similar to figure 2 shall be furnished tabulating all appropriate test data and observations. Safety and human factor considerations shall be evaluated throughout testing.

4.6.2.2 Air-receiver tank. The air-receiver tank for the compressor shall be tested in accordance with the ASME Boiler and Pressure Vessel Code, section VIII. Failure of any ASME tests shall constitute failure of this test. Presence of the AWE official code U-symbol stamped or marked on the receiver and the furnishing of a copy of the ASME data sheet (Form U-1) may be accepted as evidence that the receiver conforms to the ASME Boiler and Pressure Vessel Code.

4.6.2.3 Capacity and performance. The compressor capacity shall be determined in accordance with the method specified in the ASHE Performance Test Code 9. This test shall be performed in conjunction with and simultaneously with the endurance test (see 4.6.2.4). The air-discharge temperature shall be determined when the compressor is operating at minimum capacity at maximum discharge pressure. Any one of the following conditions shall constitute failure of this test:

a. Discharge air pressure less than 175 psig.
b. Discharge air temperature in excess of ambient +100 °F.
c. Free-air capacity less than that specified in table II

4.6.2.3.1 Power consumption. Test unit at rated speed and whole delivering its rated capacity for power consumption, using a calibrated motor or dynamometer. Horsepower in excess of the continuous horsepower rating of the motor shall constitute failure of this test.

4.6.2.4 Endurance . Operate the compressor for not less than 500 hours continually in periods of not less than 4 hours of running time. Oil changes and other preventive maintenance shall be performed during downtime. There shall be no replacement of parts. Adjustments provided by integral devices and repairs which require 1 manhour or less may be made. The 500 hours of operation shall be accomplished at rated capacity and pressure. Record appropriate remarks, including a record of all stops and adjustments, Record the following data at least once during each 24 hour period. Readings shall be taken only after at least 1 hour of continuous operation:

a. Air temperature, ambient.
b. Air temperature at receiver discharge.
c. Air receiver pressure.
d. Barometric pressure.
e. Air temperature at compressor intake.
f. Air temperature upstream of nozzle.
g. Air pressure at compressor intake.
h Nozzle throat diameter.
i. Nozzle coefficient of discharge.
j Differential pressure across the nozzle.
k. Compressor unit speed (rpm).
1. Compressor capacity (cfm) computed.

Completion of less than 500 hours of operation at rated capacity and pressure, discharge air temperature in excess of ambient +100 °F, requirement for replacement of parts, requirement for repairs requiring more than 1 manhour to complete, or necessity for adjustment not provided for by integral devices shall constitute failure of this test. Computed cfm capacity less than specified shall constitute failure of the test (see 3.15.1 and 3.16.1).

4.6.2.5 High temperature Unless otherwise specified, subject the compressor to an ambient temperature of 120 ±5 °F until all components have stabilized at this temperature in the test chamber. Then start and operate the compressor at rated capacity and pressure for not less than 4 hours while maintaining 120 ±5 °F ambient temperature. The operating time for this test may be counted toward the accomplishment of the endurance test. Record the data as specified in 4.6.2.4 at 30-minute intervals. Failure to start and operate at rated capacity, pressure and speed, discharge air temperature in excess of ambient +100 °F or requirement for replacement of parts shall constitute failure of this test.

4.6.2.6 Low temperature. Unless otherwise specified, subject the compressor to an ambient temperature of -25 °F until all components have stabilized at this temperature in the test chamber. Then start and operate the compressor at rated capacity, pressure and speed for not less than 4 hours while maintaining -25 ±5 °F ambient temperature. The operating time for this test may be counted toward the

accomplishment of the endurance test. Record the data as specified in 4.6.2.4 at 30-minute intenals. Failure to start and operate at rated capacity, pressure and speed, or requirement for replacement of parts shall constitute failure of this test.

4.6.2.7 Cycling. Start the compressor and allow the receiver pressure to build up until the pressure-regulation control operates. Then reduce the receiver pressure until the pressure-regulation control activates to increase the pressure Vary the pressure as above until a total of 20 high-pressure actuations and 20 low-pressure actuations have been reached. Inability of the pressure-regulation control to control the pressure as specified shall constitute failure of this test .

4.6.2.8 Pressure regulation. When an adjustable pressure-regulating valve of the pressure-relief type actuated by receiver pressure is used at the beginning and after completion of the endurance test, start the compressor and allow the receiver pressure to build up to determine pressure required to discharge full capacity through the pressure-regulating valve. Then reduce the receiver pressure to determine the pressure at which the pressure-regulating valve reseats Inability to meet the requirements specified in 3.20.4 shall constitute failure of this test.

4.6.2.9 Class 3.

4.6.2.9.1 Casters. Push and pull the compressor horizontally in all directions, turn the compressor 360 degrees, and tilt the compressor 15 degrees from the horizontal in all directions. Overturning or any condition that interferes with the maneuverability of the compressor or physical damage to the compressor shall constitute failure of this test.

4.6.2.10 Tilted operation Tilt the compressor 15 degrees from the horizontal about the longitudinal axis and operate in this position for 30 minutes. This test shall be performed in each of the four directions (compressor tilted with respect to longitudinal and transverse axes). Allow the compressor to stand for 4 hours in the tilted position most likely to adversely affect the lubrication then start and operate the compressor for 30 minutes in that position. Any malfunction due to tilted operation such as lack of lubrication, rough or erratic operation, or permanent deformation of any part or component shall constitute failure of this test.

4.6.2.11 Class 4

4.6.2.11.1 Tiedown porvisions test The tiedown provisions shall be tested in accordance with MIL-STD-209 to prove rmance to 3.19.2.1. Inability to meet the requirements of 3.19.2.1 shall constitute failure of this test.

46.2.11.2 Slinging provisions test The slinging provisions shall be tested in accordance with MIL-STD-209 to prove conformance to 3.19.2.2. Inability to meet the requirements of 3.19.2.2 shall constitute failure of this test.

4.6.2.12 Capacity Test each compressor for capacity in accordance with 4.6.2.3 except that each compressor shall be tested as a unit driven by its electric motor. Prior to testing, run-in each compressor as prescribed by the

contractor. Occurrence of one or more of the following conditions shall constitute failure of this test.

a. Discharge air pressure less than 200 psig.
b. Discharge air temperature in excess of ambient temperature +100 °F.
c. Free-air capacity less than that specified in table I

4.6.2.13 Noise level test. Noise levels shall be measured in accordance with MIL-STD-1474 requirements and reported in the format indicated by MIL-STD-1474, figure 11. As a minimum: noise levels shall be measured when equipment is operating under full load. MIL-STD-1474, 5.1.2.1.4 contours shall be taken at not fewer than 12 equal horizontal arc increments, one increment shall include data from the noisiest position. Additionally, the noise level at the typical operating position shall be provided as dB(A) level. Failure to comply with MIL-STD-1474 provisions shall constitute failure of this test.

4.7 Inspection of packaging. The preservation, packing, and marking shall be examined and tested to determine compliance with the quality assurance provisions of MIL-C-3600.

5. PACKAGING

5.1 Preservation. packing. and marking. The air compressors, accessories, repair parts, tools, and publications shall be preseved, packed, and marked in accordance with MIL-C-3600. The level of preservation arid packing shall be level A, B, or C as specified (see 6.2).

6. NOTES

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

6.1 .Jntended use. The compressors are intended for use as a source of compressed air in the normal operations conducted at filling stations and vehicle maintenance shops.

6.2 Aquisition requirements Acquisition documents should specify the following:

a. Title, number, and date of the specification.
b. Type, class, and size 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 and 2.2).
d. Time frame required for submission of first article model and number of compressors to be furnished (see 3.2).
e. When the Government will conduct any or all of the first article examination and tests. When the Government will conduct some but not all of the first article examination and tests, the contracting officer should specify which examination and tests will be conducted by the Government and which examination and tests shall be conducted by the contractor (see 3.2).
f. Length of airhose to be. furnished if other than as specified (see 3.8).
g. Color required (see 3.14).
h. Capacity of air-receiver tank if.other than as specified (see 3.17.1).

i. Air-receiver tank fittings required if other that as specified (see 3.17.1).
j. Style of motor if other than that specified in 3.20.1.
k. Power supply on which electric motors will operate (see 3.20.1). (Dual-voltage motors may be furnished buy only one of the voltages shall be specified for the motor on the compressor.)
1. Level of preservation and packing required (see 5.1).

6.3 First article. When a first article inspection is required, the item(s) should be a preproduction model. The first article should consist of one or more units . The contracting officer should include specific instructions in acquisition documents regarding arrangements for examinations, approval of the first article test results and disposition of the first articles. Invitation for bids should provide that the Government reserves the right to waive the requirement for samples for first article inspection to those bidders offering a product which has been previously acquired or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending contract. Bidders should not submit alternate bids unless specifically requested to do so in the solicitation.

6.4 Lubricants. MIL-STD-838 prescribes the policy for using specification-type products wherever possible and provides specific requirements for potential use of non-standard proprietary products. MIL-STD-838 is implemented by MIL-HDBK-113. The contracting officer should note that unless otherwise authorized by the US Army Belvoir Research, Development, and Engineering Center (ATTN: STRBE-FL), Fort Belvoir, VA 22026-5606, lubricants, fluids, and greases for ground equipment systems must be restricted to those listed under MIL-HDBK-113, chapter 2.

6.5 Free air Free air is defined as air at atmospheric conditions surrounding the compressor, at the point where the compressor is installed, but not in the immediate vicinity where it may be affected by the heat of the compressor.

6.6 Information figures Figure 1 shows a caster-mounted compressor which has been found acceptable; however, the figure is included for illustration only and is not intended to preclude the furnishing of other designs which conform to this specification.

6.7 Technical manuals. The requirement for technical manuals should be considered when this specification is applied on a contract. If technical manuals are required, military specifications and standards that have been cleared and listed in DOD 501O.I2-L, Acquisition Management Systems and Data Requirements Control List (AMSDL) must be listed on a separate Contract Data Requirements List (DD) Form 1423), which is included as an exhibit to the contract. The technical manuals must be acquired under separate contract line item in the contract.

6.8 Provisioning. The contracting officer should include provisioning requirements for repair parts and maintenance tools as necessary (including any special tools), and instructions on shipment of compressors. A suggested paragraph is as follows:

> "Shipment of compressors shall include repair parts, maintenance tools, operational instructions, and accessories, unless exceptions are provided elsewhere in the contract."

6.9 Subject term (key word) listing.

5 cfm at 175 psig
15 cfm at 175 psig
25 cfm at 175 psig
Base mounted
Caster mounted
Garage type
Tank mounted

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

Custodians :
Army -ME
Navy - YD

Review activity:
DLA - CS

User activity:
Navy - MC

Preparing activity:
Army - ME

Project 4310-0190

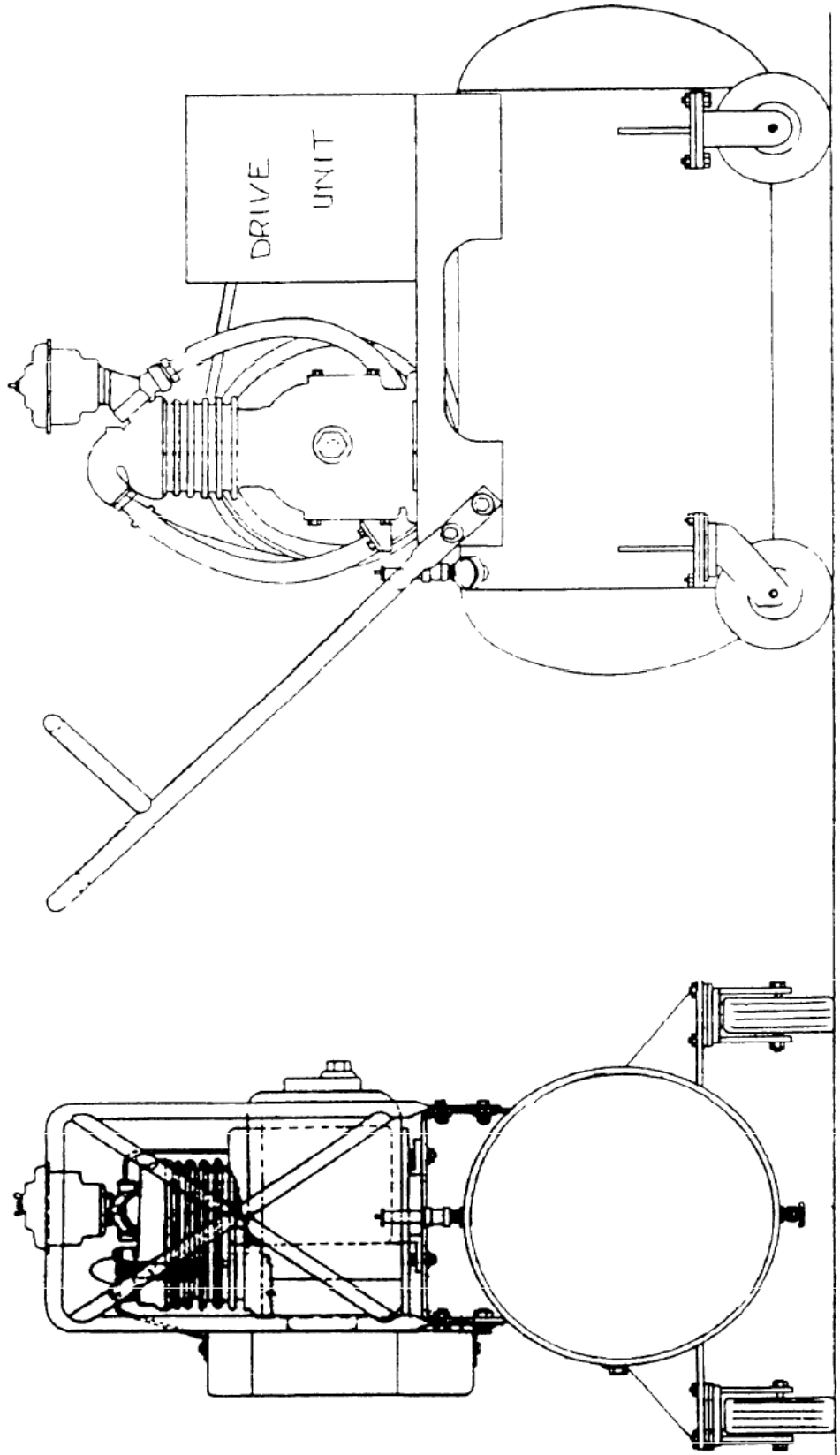

FIGURE 1. Compressor, air, caster mounted (general configuration).

X-3726

DATA SHEET
MFG NAME_____ P/N_____ Record Time & Amount of Compressor Oil Added Sheet___of___

Test Title: _____ Run No._____ Date_____

Item	SYM	UNITS	Readings 1	2	3	4	5	6	7	8	9	10	...	...
1. Time Start, Readings, Stop	R_t	HRS. MIN.	(IF STOP IS UNSCHEDULED, GIVE REASON FOR STOP AND DOWN TIME)											
2. Temp. (Ambient) Dry Bulb	T_a	°F												
3 Temp. (Ambient) Wet Bulb	T_{wb}	°F												
4. Pressure (Ambient)	P_b	°F												
5. Temp., Engine Coolant	T_{e1}	°F												
6. Temp., Engine Lubricant	T_{e2}	°F												
7. Temp., Compressor Lubricant	T_L	°F												
8. Temp., Receiver Discharge	T_r	°F												
9. Pressure, Rec.	T_r	°F												
10. Pressure, Compressor Intake	P_s	°F												
11. Temp., Compressor Intake	T_1	°F												
12. Temp., Upstream of Nozzle	T_2	°F												
13. Pressure Differential Across Nozzle	dP	In.H_2O												
14. Compressor Speed	N	RPM												

FIGURE 2. Test log.

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-C-13874K	2. DOCUMENT DATE (YYMMDD) 920716

3. DOCUMENT TITLE Compressors, Reciprocating and Rotary, Air, Electric Motor Driven

4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (Last, First, Middle Initial)	b. ORGANIZATION	
c. ADDRESS (Include Zip Code)	d. TELEPHONE (Include Area Code) (1) Commercial (if applicable) (2) AUTOVON	7. DATE SUBMITTED

8. PREPARING ACTIVITY

a. NAME Betty Taylor	b. TELEPHONE (Include Area Code) (1) Commercial (703) 704-3466	(2) AUTOVON 654-3466
c. ADDRESS (Include Zip Code S Army Belvoir RDE Center ATTN: STRBE-TSE Fort Belvoir, VA 22060-5606	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340 AUTOVON 289-2340	