INCH-POUND
MIL-DTL-62483A(AT)
25 September 1998
SUPERSEDING
MIL-E-62483(AT)
14 December 1983

DETAIL SPECIFICATION

ENGINE, DIESEL, 6 CYLINDER, IN-LINE, LIQUID COOLED, 210 HP

This specification is approved for use by the U.S. Army Tank-automotive and Armaments Command, Department of the Army, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers a 6 cylinder, in-line, liquid cooled, internal combustion diesel engine.

1.2 Classification. Engines will be for the following truck models as specified (see 6.2):

M809	- Chassis, Truck, 5 Ton, 6x6.
M939	- Chassis, Truck, 5 Ton, 6x6.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirement documents cited in sections 3 and 4 of this specification, whether or not they are listed.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: U.S. Army Tank-automotive and Armaments Command, ATTN: AMSTA-TR-E/BLUE, Warren, MI 48397-5000, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document, or by letter.

AMSC N/A FSC 2815

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise 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).

SPECIFICATIONS

FEDERAL

A-A-50271	- Plates, Identification.
A-A-52557	- Fuel Oil, Diesel.

DEPARTMENT OF DEFENSE

MIL-PRF-2104	- Lubricating Oil, Internal-Combustion Engine, Combat/ Tactical Service.
MIL-L-46167	- Lubricating Oil, Internal-Combustion Engine, Arctic.
MIL-PRF-46795	- Generating System: Alternator, Rectifier, 60 Amperes, 28 Volts.

STANDARDS

DEPARTMENT OF DEFENSE

MS53011	- Starter, Engine, Electrical, 24-Volt, DC, 5-1/8 Inch, Frame Diameter, Actuated Heavy-Duty, Long Frame.

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

2.2.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

ENVIRONMENTAL PROTECTION AGENCY (EPA)

Control of Air Pollution from New Motor Vehicles and New Motor Vehicle Engines.

(Application for copies of EPA publications should reference the Code of Federal Regulations, 40 CFR, and the Federal Register and should be addressed to the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.)

DRAWINGS

10929868	- Rectified AC Generating System.
11604557	- Air Cleaner Assembly, Engine - 550 cfm.
11604558	- Air Cleaner Assembly, Engine - 800 cfm.
11604610	- Air Cleaner Assembly, Engine - 675 cfm.
11664247	- Pump and Pulley Assembly, Steering.
11664451	- Engine Assembly, M809.
11664481	- Steering Pump Assembly.
11669328	- Engine Assembly, M939.

(Copies of these drawings are available from the U.S. Army Tank-automotive and Armaments Command, ATTN: AMSTA-TR-E/BLUE, Warren, MI 48397-5000.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of 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 SOCIETY OF MECHANICAL ENGINEERS (ASME)

PTC-9	- Displacement Compressors, Vacuum Pumps and Blowers.

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

NATO INTERNATIONAL STAFF - DEFENSE SUPPORT DIVISION

AC/225 (Panel II) D131 (Part II)	- NATO Standard Engine Laboratory Test for Diesel and Gasoline Engines.

(Application for copies may be obtained from NATO, Military Agency for Standardization (MAS), 35 Chesham Place, London SWI, England.)

2.4 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 First article. When specified (see 6.2), a sample shall be subjected to first article inspection (see 4.1.1).

3.2 Design, materials, and manufacturing processes. Unless otherwise specified herein, the design, materials, and manufacturing process selection is the prerogative of the contractor as long as all articles submitted to the Government fully meet the operating, interface, support and ownership, and operating environment requirements specified (see 4.2.2.1).

3.2.1 Construction. The engine shall be constructed in accordance with Drawing 11664451 for M809 vehicles, and Drawing 11669328 for M939 vehicles (see 6.2).

3.2.2 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

3.3 Operating requirements. Each engine shall provide the following functional, operational, and performance capabilities.

3.3.1 Production engine break-in run. A production break-in run is required. The break-in run schedule shall be established by the contractor to assure that each engine, as offered for delivery, is suitable for immediate vehicle drive-away operations. The manufacturer may use oil of his own selection for the engine build up and production break-in run (see 4.2.3.1).

3.3.2 NATO standard engine test. The engine shall show no evidence of performance degradation when tested in accordance with NATO standard AC/225 (Panel II) D/131 (Part II), section 2-3 (see 4.2.3.2). During the tests, the engine shall require only specified maintenance.

3.3.3 Exhaust smoke density. The engine exhaust smoke number at the engine outlet during operation at elevation up to 500 feet (ft) [152 meters (m)] and using specified fuels shall not exceed EPA requirements throughout speed range when using Robert Bosch model ETD 020.50 smoke meter, and sampling pump model ETD 020.00 (see 4.2.3.3).

3.3.4 Air pollution. The engine shall comply with the EPA regulations governing control of air pollution from new motor vehicles and new motor vehicle engines in effect on the date of award of contract (see 4.2.3.3 1).

3.3.5 Submersion requirements. The engine and all accessories with intake and exhaust ducted to the atmosphere, shall start and operate while submerged in fresh and salt water (see 4.2.3.4).

3.3.6 Grades and slopes. The engine shall perform as specified with the oil at "full" and "add" levels when inclined in either direction, 60 percent (%) longitudinally or 30% laterally, or any combination thereof. During an operating period of 30 minutes there shall be no evidence of faulty lubrication, cooling, fuel supply, leakage, or other malfunction (see 4.2.3.5).

3.3.7 Thermostat. The engine shall be equipped with a thermostat which shall function to provide rapid warm-up of the engine. The thermostat characteristics shall be based on the use of solutions conforming to coolants specified herein (see 4.2.3.6).

3.3.8. Engine lubrication system. The engine lubrication system, equipped with suitable oil filters, shall be capable of satisfactory operation under intended service, operating, and performance requirements specified herein when serviced with seasonal grades of oil (see 4.2.3.7). Typically, the engine shall be serviced with the following products listed in table I.

TABLE I. Service products specifications.

Ambient air temperature °F	(°C) 1/	Viscosity	Specification
-65 to 0	(-54 to -17)	Arctic	MIL-L-46167
-10 to +40	(-23 to 4)	10W	MIL-PRF-2104
0 to 120	(-17 to 49)	15/40W	MIL-PRF-2104
+15 to 120	(-9 to 49)	30W	MIL-PRF-2104

1/ °F (°C) = Fahrenheit (Celsius)

3.3.9 Air cleaner. The air cleaner shall have an efficiency equal to the manufacturer's best commercial system and adequate capacity to hold and remove contaminants under all environmental conditions. Based on the rated engine airflow, the contractor shall select one of the air cleaner assemblies in accordance with Drawing 11604557 [550 cubic feet per minute (ft^3/min)(15.6 cubic meters per minute (m^3/min))], or Drawing 11604558 [800 ft^3/min (22.7 m^3/min)] or Drawing 11604610 [675 ft^3/min (19.1 m^3/min)] (see 4.2.3.8).

3.3.10 Accessories and equipment. All electrical accessories and equipment, wiring, and electrical connections shall evidence no leakage and shall be mechanically operable during and subsequent to submersion. All accessories and equipment shall be installed on the engine and properly adjusted (see 4.2.3.9).

3.3.10.1 Alternator system. The engine alternator system shall deliver 28 volt (V) direct current (dc), providing not less than 60 amperes (A) for charging and operating loads. The drive ratio shall be such that at a normal engine idle, the electrical output shall be not less than 18 A. The alternator shall conform to Drawing 10929868 and MIL-PRF-46795 (see 4.2.3.9.1).

3.3.10.2 Starting system. The engine starter shall be a 24 V electric solenoid actuated, waterproofed, corrosion, and fungus resistant unit and shall conform to MS53011-1 (see 4.2.3.9.2).

3.3.10.3 Air compressor. The air compressor on the engine with applicable governor shall deliver the following minimum air flows at a pressure of 125 pounds per square inch gage (psig) [862 kilopascals (kPa)] at the specified engine speeds (see 4.2.3.9.3).

a. 5.4 ft^3/min (153L/min) at an air density of 0.073 lb/ft^3 (1.17 kg/m^3) at engine full load governed speed (2100 rpm).
b. 4.2 ft^3/min (119L/min) at an air density of 0.073 lb/ft^3 (1.17 kg/m^3) at 1500 rpm. In addition, the unloading valve shall function properly in conjunction with air compressor governor at normal governing pressure. Air flow performance shall be conducted at (or corrected to) an ambient intake air temperature of 77 $\pm$5°F (25±3°C) and dry barometer pressure of 29.42 $\pm$0.5 in. of Hg.(2981 ±51 kPa).

3.3.10.4 Engine governor. The engine speed shall be limited to speeds of not more than 2450 rpm, no load, by means of a tamper-proof governor. The governor shall be set as specified herein and sealed during the break-in run (see 4.2.3.9.4).

3.3.10.5 Power steering pump. The engine shall be equipped with a power steering pump conforming to Drawing 11664247. The power steering pump shall be filled with 10W oil in ambient temperatures between -10 and +120 degrees Fahrenheit (°F) [(-23 and 49 degrees Celsius (°C)] and arctic oil in temperatures between -65 and 0°F (-54 and -17°C). The pump assembly shall conform to Drawing 11664481 (see 4.2.3.9.5).

3.3.10.6 Electromagnetic interface. Unless otherwise specified (see 6.2), the engine and its components shall meet the conducted and emission requirements specified in figures 2 and 3 (see 4.2.3.9.6).

3.4 Interface requirements.

3.4.1 Overall envelope and interface. The engine envelope dimensions and the mounting, electrical, and mechanical interfaces shall conform to Drawings 11664451 for M809 vehicle or 11669328 for M939 vehicle, as applicable (see 4.2.4.1).

3.4.2 Engine weight with accessories. The engine with accessories shall weigh not more than 2625 lbs (1191 kg) (see 4.2.4.2).

3.5 Support and ownership requirements.

3.5.1 Reliability. During Government specified vehicle tests, the engine assembly installed in a 5 ton M809 or M939 series cargo truck with specified payload and towed load shall operate in conformance with specified test cycles for 20 000 miles [32 186 kilometers (km)], and shall not exceed the maintenance ratio criteria specified in 3.5.1.1 (see 4.2.5.1).

3.5.1.1 Maintenance ratio. During Government specified vehicle test cycles, the time required to perform scheduled (not to include organizational operator daily maintenance) and unscheduled engine maintenance shall not exceed 4% of the operating hours, based upon 20 miles (32 km) equal one hour of operation. The unscheduled engine maintenance shall not exceed 2% of the operating hours (see 4.2.5.1.1).

3.5.1.2 Maintainability. The engine and its installations shall permit accomplishment of maintenance in the field with minimum time. Engine and installation features shall require minimum quantity of special tools, minimum variety and quantity of maintenance tasks, maximum practicable use of sealed assemblies and modules, and maximum accessibility for service and repair. Engine mounted accessories shall be installed or mounted so that they may individually be removed, replaced and the installation tested within one hour using normal hand tools and maintenance procedures (see 4.2.5.1.2).

3.5.2 Oil filters. The engine oil filters shall be readily accessible and the design shall facilitate hot oil draining and filter changes (see 4.2.5.2).

3.5.3 Oil filler and gage. The crankcase oil filler shall be arranged so that oil can be readily poured into the filler opening without requiring the use of a funnel from a 5-quart (qt) (4.7 liter (L)) round can or a 5-gallon (gal) (18.9 L) lug cover pail. The engine shall be provided with a properly accessible waterproofed bayonet gage that ensures ready and accurate determination of crankcase oil level with engine stopped (see 4.2.5.3).

3.5.4 Fuel-water separator and fuel filters. The fuel separator shall include provisions for drainage of separated water. Provisions for daily drainage of all filters shall be furnished. The drainage provisions shall be within easy reach of an operator or mechanic during normal preoperational vehicle checks and shall not require the use of tools to operate or the disassembly of any components to gain access. The operation of the drains shall be simple, and the location such that the operators will not avoid following prescribed maintenance checks (see 4.2.5.4).

3.5.5 Engine data plate. Engine data plates shall be installed on the engine block in a location readily visible to personnel performing maintenance on the engine in a vehicle. The data plates shall conform to A-A-50271 (see 4.2.5.5).

3.5.6 Leakage. During dynamometer operation, or when installed in a vehicle, the engine shall show no evidence of leakage greater than class III as defined in 6.6 (see 4.2.5.6).

3.6 Operating environment requirements. Each shall operate under the following environmental conditions without damage or loss of performance.

3.6.1 Environmental performance. The engine shall start within one minute after cranking, following 15 minutes of warm-up under the following performance conditions:

a. Temperature conditions. With integral starting aids only after being cold-soaked for 24-hour period without benefit of solar-radiation, to an ambient temperature of -25°F (-32°C).
b. Elevation conditions. At any elevation from sea level to 8000 ft (2438 m) as specified in table II, the engine shall have adequate torque and power characteristics to meet the performance requirements specified herein.
c. Humidity conditions. Under relative humidity conditions as low as 5% at temperature of 120°F (49 °C) and as high as 100% at all temperatures from -25° to 85°F (-32° to 29°C).

TABLE II. Elevation conditions.

Elevation		Ambient temperature, °F (°C) 4 to 6 ft (1.22 to 1.83 m) above ground		Solar radiation	
feet	(meters)			Btu/ft^{2}hr	Watt per square meter Kelvin (W/m^2·K)
Sea level to					
3000	(914)	120	(49)	360	(51.9)
4000	(1219)	115	(46)	364	(52.5)
6000	(1829)	105	(41)	372	(53.7)
8000	(2438)	95	(35)	380	(54.8)

3.6.2 Limiting operating temperatures. The engine shall not exceed the following temperatures when operating at full load throughout the speed range of engine under any conditions specified herein (see 4.2.6.2):

a. Oil sump 260°F (127°C) (measured at the drain plug).
b. Coolant 210°F (99°C) (measured at engine coolant outlet) without pressurized coolant system.

3.6.3 Steam and water jet cleaning. The engine and all its components shall withstand cleaning with high-pressure steam and alkaline steam cleaning compounds and water jet, without deterioration of seals or hoses, water leakage past seals or gaskets, or other defects. Paint removal shall not be a basis for rejection under this requirement (see 4.2.6.3).

4. VERIFICATION

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

a. First article inspection (see 4.1.1).
   (1) Preproduction inspection.
   (2) Initial production inspection.
b. Conformance inspections (see 4.1.2).

4.1.1 First article inspection. Unless otherwise specified (see 6.2), first article inspection shall be performed on preproduction or initial production when required by the contract. When a first article inspection is required (see 3.1 and 6.2), it includes the verifications listed in table III.

4.1.1.1 Preproduction inspection. The preproduction sample shall consist of two diesel engine assemblies. Preproduction inspection shall consist of examination as specified in table III.

4.1.1.2 Initial production inspection. The Government shall select two units, from the first ten engines produced under the production contract for initial production. Initial production units shall be examined as specified in table III.

4.1.2 Conformance inspection. Conformance inspection shall include the verifications listed in table III.

TABLE III. Verification methods.

Title	Requirement	Verification	First article	Conformance inspection 100%
Design, materials, and manufacturing processes	3.2	4.2		
Operating requirements	3.3			
Break-in run	3.3.1	4.2.3.1	X	X
NATO standard engine test	3.3.2	4.2.3.2	X	
Exhaust smoke density	3.3.3	4.2.3.3	X	
Air pollution control	3.3.4	4.2.3.3.1	X	
Submersion requirements	3.3.5	4.2.3.4	X	
Grades and slopes	3.3.6	4.2.3.5	X	
Thermostat	3.3.7	4.2.3.6	X	
Engine lubrication system	3.3.8	4.2.3.7	X	
Air cleaner	3.3.9	4.2.3.8	X	
Accessories and equipment	3.3.10	4.2.3.9	X	
Alternator system	3.3.10.1	4.2.3.9.1	X	
Starting system	3.3.10.2	4.2.3.9.2	X	
Air compressor	3.3.10.3	4.2.3.9.3	X	
Engine governor	3.3.10.4	4.2.39.4	X	X
Power steering pump	3.3.10.5	4.2.3.9.5	X	
Electromagnetic interface	3.3.10.6	4.2.3.9.6	X	
Interface requirements	3.4	4.2.4		
Overall envelope and interface	3.4.1	4.2.4.1	X	
Engine weight with accessories	3.4.2	4.2.4.2	X	
Support and ownership requirements	3.5	4.2.5		
Reliability	3.5.1	4.2.5.1	X	
Maintenance ratio	3.5.1.1	4.2.5.1.1	X	
Maintainability	3.5.1.2	4.2.5.1.2	X	
Oil filters	3.5.2	4.2.5.2	X	
Oil filler and gage	3.5.3	4.2.5.3	X	
Fuel-water separator and fuel filters	3.5.4	4.2.5.4	X	
Engine data plate	3.5.5	4.2.5.5	X	
Leakage	3.5.6	4.2.5.6	X	X
Operating environment requirements	3.6	4.2.6		
Environmental performance	3.6.1	4.2.6.1	X	
Limiting operating temperatures	3.6.2	4.2.6.2	X	
Steam and water jet cleaning	3.6.3	4.2.6.3	X	

4.2 Verification methods. The types of verification methods included in this section are visual inspection, measurement, sample tests, full-scale demonstration tests, simulation, modeling, engineering evaluation, component properties analysis, and similarity to previously-approved or previously-qualified designs.

4.2.1 Verification alternatives. The manufacturer may propose alternative test methods, techniques, or equipment, including the application of statistical process control, tool control, or cost-effective sampling procedures, to verify performance. See the contract for alternatives that replace verifications required by this inspection.

4.2.2 Inspection conditions. Unless otherwise specified, (see 6.2) all inspections shall be conducted under the following conditions:

a. Air temperature: 73 ±18°F (23 ±10°C).
b. Barometric pressure: 21.4 (+6.8, -22.25) inches (in.) Hg of mercury [725 (+50, -75) kilopascals (kPa)].
c. Relative humidity: 50 ±30 percent.

4.2.2.1 Materials, design and construction. Conformance to 3.2 through 3.2.1 shall be determined by inspection of contractor records providing proof or certification that design, construction, processing, and materials conform to requirements. Applicable records shall include drawing, specification, design data, receiving inspection records, processing and quality control standards, vendor catalogs and certifications, industry standards, test reports, and data rating.

4.2.3 Operating requirements verification.

4.2.3.1 Production engine break-in run. Each engine shall be hooked to an engine dynamometer and operated through the break-in run schedule developed by the manufacturer. During the break-in run, the engine shall be observed for oil pressure, overheating, oil or coolant leaks, and unusual noises (see 3.3.1). During the break-in run, the governor shall be adjusted and set to limit the engine speed to 2100 rpm full load and 2450 rpm no load. When the governor is set to the engine speed specified, it shall be sealed in such a manner that if tampered with, it will be readily apparent (see 3.3.10.4). The break-in run shall be conducted on all engines prior to further testing.

4.2.3.2 NATO performance test. With the engine mounted on an engine dynamometer, and under the environmental conditions specified herein, the tests specified herein, shall be performed in accordance with NATO standard AC/225 (Panel II), D/131 (part II), section 2-3 (see 3.3.2). The performance test is to include curves of power, torque, and specific fuel consumption versus rpm at 100%, 85%, 70%, 50%, and 25% load, which will be measured and calculated at a minimum of five speed settings in both ascending and descending order. The highest speed setting is to be the rated speed. For each setting, the engine should run for

15 minutes to allow the operating parameters to stabilize. The endurance test specified herein shall be conducted using fuel conforming to DF-2 of A-A-52557 of minimum quality.

4.2.3.3 Exhaust smoke density. Exhaust smoke conditions for diesel engines during performance and altitude testing shall be measured by the use of a Robert Bosch model ETD 020.00 sampling pump, and analyzed on an ETD 020.50 smoke meter analyzing instrument. Testing shall be conducted at room temperature 65° to 80°F (18° to 27°C) and in accordance with the manufacturer's instructions. Failure to meet the EPA requirements shall constitute failure of the test.

4.2.3.3.1 Air pollution standards. Testing for compliance shall include any of the following: measurement, full-scale demonstration tests, similarity to previously-approved on previously-qualified designs on the manufacturer may propose alternative test methods. Failure to meet the EPA requirements shall be course for failure of the test.

4.2.3.4 Submersion requirements. The engine with accessories shall be under load, and with the intake and exhaust ducted to the atmosphere, shall be operated while submerged to a depth of 18 in. (457 mm) above the valve cover housings in fresh and salt water. While still submerged, engine shall be restarted after being stopped for three minutes, then operated for an additional 15 minutes. At conclusion of operation, a maximum of one percent water contamination by volume in the lubricating oil is permissible. Failure of the engine to operate or leakage in excess of that allowed shall constitute failure of the test.

4.2.3.5 Grades and slopes. With the engine under load, the engine shall meet the performance characteristics specified for not less than 30 minutes in each direction. With the oil level at the full level and at add oil level condition in the sump, and measured while in a level condition, the engine shall perform as specified when raised and lowered to a 60 percent longitudinal grade, when tipped sideways to a 30 percent grade, or in any combination of longitudinal or lateral grades. During operation as specified herein, any evidence of stalling, overheating, or degradation of performance will be cause for rejection. During the specified test, the engine shall be shut off and restarted a minimum of 2 times in each direction, with a minimum of 2 minutes during shutdown. Oil pressure shall be carefully monitored during tests, and if the pressure falls below the minimum pressure indicated for safe operation, the test shall be aborted. Any evidence of faulty lubrication, cooling, fuel supply, leakage, or other malfunction during or following tests shall be cause for rejection. The engine shall meet the following requirements while under test:

a. Net horsepower: 210-225 observed hp [157-168 kW] at 2100 rpm (see figure 1).
b. Peak torque: 590-650 lb-ft [800-881 N·m] at 1500 rpm (see figure 1).
c. Fuel consumption: shall not exceed 0.395 lb [0.18 kg] per observed bhp hour with engine operating at full load and speed and without fan (see figure 1).

d. Oil consumption: 0.007 lb (0.003 kg) per observed bhp hour maximum at full load throughout the speed range of the engine.

4.2.3.6 Thermostat. During engine tests, verify that the thermostat provided remains closed, restricting coolant flow until minimum operating temperature of the engine as specified by the manufacturer has been reached and that the thermostat is fully open at 210°F (99°C) measured at the coolant outlet. Failure to maintain the specified flow rate shall constitute failure of the test.

4.2.3.7 Engine lubrication system. The engine shall operate without damage during all testing at the specified temperature ranges. During tests specified with each of the specified oils, the oil pressure shall not fall below the minimum specified by the manufacturer. During tests specified with each of the oils specified, with oil level at the lowest marked safe operating level on the dipstick and with engine running at 600 +10 rpm, the oil pressure shall not fall below the minimum specified by the manufacturer. Verification of a satisfactory lubrication system shall be determined during tear down inspections following engine tests, and will be evidenced by a lack of excessive wear or damaged wear surfaces.

4.2.3.8 Air cleaner. Verify that the air cleaner is of a size and type proper for the engine requirements and that the air cleaner shall have an efficiency equal to the engine manufacturer's best commercial system and adequate capacity to hold and remove contaminants.

4.2.3.9 Accessories and equipment. Verify that the electrical accessories and equipment are mechanically operable during and subsequent to submersion and that the manufacturer has a certification of file attesting to waterproofness.

4.2.3.9.1 Alternator system. Verify that the alternator system delivers 28 Vdc at 60 A. With the engine mounted on a dynamometer and operating at 600 rpm, the alternator output shall not be less than 18A. Output below the specified values shall constitute failure of the test.

4.2.3.9.2 Starter system. Verify that the manufacturer has a certificate on file attesting that the starter system is in accordance with MS53011-1 or equivalent (see 4.2.1) and conforms to the performance requirements.

4.2.3.9.3 Air compressor. With the engine mounted on an engine dynamometer and operating at the following specified engine speeds, the air compressor shall deliver the following minimum air flows at a pressure of 125 pounds per square inch gage (psig). Air flow performance shall be measured as specified in the ASME PTC-9. Failure to maintain the specified air flow rate shall constitute failure of the test.

4.2.3.9.4 Engine governor. During the manufacturer's break-in run, it shall be verified that the engine governor is set and sealed to govern the engine speed. The governor shall be sealed in such a manner that any tampering with the setting will be readily observed.

4.2.3.9.5 Power steering pump. Verify that the manufacturer has a certificate on file attesting that the power steering pump conforms to performance requirements specified in Drawing 11664481 (see 3.3.10.5).

4.2.3.9.6 Electromagnetic compatibility. The engine and components shall be tested to verify that the conducted and radiated emissions do not exceed the levels shown in figures 2 and 3.

4.2.4 Interface requirements verification.

4.2.4.1 Overall envelope and interface inspection. Verify that the engine envelope dimensions and the mounting, electrical, and mechanical interface dimensions conform to the applicable drawing.

4.2.4.2 Engine weight with accessories. The engine complete with accessories shall be weighed on a certified scale and shall not weigh more than 2625 lbs (1191 kg).

4.2.5 Support and ownership requirements.

4.2.5.1 Reliability. To determine reliability, the engine and its components shall be inspected for failures following the reliability test. There shall be no failures which require engine replacement. Identical failures of the engine, engine components, or engine accessories which occur twice during the 20 000 mile (32 186 km) test whether on one engine or on another engine in a different vehicle which is being concurrently tested shall be considered a failure and the Government shall refuse acceptance of the engines. Successful completion of complete retesting must be accomplished prior to approval by the Government.

4.2.5.1.1 Maintenance ratio. To determine maintenance ratio, the data accumulated during vehicle test cycles shall be evaluated. Maintenance data so accumulated will be based on active maintenance time; i.e., time for diagnosis, repair, and test of repair, but will not include time for recovering the vehicle, cleaning, securing parts, performing administrative shop functions, obtaining mechanics, etc. Maintenance time in excess of that allowed shall constitute failure to achieve the maintenance ratio.

4.2.5.1.2 Maintainability. The engine and its installation shall be evaluated for maintainability. The engine mounted accessories shall be removed, reinstalled, and tested to determine that the time conforms to the one hour maximum specified.

4.2.5.2 Oil filters. Verify that oil filters are part of the engine configuration and that they are readily accessible for hot oil draining, and filters can be easily removed and replaced.

4.2.5.3 Oil filler and gage. Verify that the oil filler opening is in such a position that oil can be poured into the filler without the use of a funnel. Remove the waterproof type bayonet gage oil dipstick and verify that the oil level is in the safe operating zone as identified on the dipstick.

4.2.5.4 Fuel-water separator and fuel filters. Verify by visual inspection that the fuel-water separator and the fuel filters operate and there is no evidence of leakage.

4.2.5.5 Engine data plate. Verify that the engine data plate is installed on the engine block in a location that will be readily visible to personnel performing maintenance when the engine is installed in a vehicle.

4.2.5.6 Leakage. During all testing the engine assembly shall be closely monitored for evidence of leakage. Any leakage great enough to form drops (class III) as defined in 6.6 shall be cause for rejection.

4.2.6 Operating environment requirements verification.

4.2.6.1 Environmental requirements. With the engine mounted on a dynamometer as specified in 4.2.3.2, the engine shall be started and operated for 15 minutes under the following conditions:

a. Temperature conditions. With integral cold starting aids only after being cold-soaked for 24-hour period without benefit of solar-radiation, to an ambient temperature of -25°F (-32°C).
b. Elevation conditions. At any elevation from sea level to 8000 ft (2438 m) as specified in table III, the engine shall have adequate torque and power characteristics to meet the performance requirements specified herein.
c. Humidity conditions. Under relative humidity conditions as low as 5% at temperature of 120°F (49 °C) and as high as 100% at all temperatures from -25° to 85°F (-32° to 29°C).

4.2.6.2 Limiting operating temperatures. Monitor the engine oil and coolant temperatures to verify that they do not exceed the operational limits.

4.2.6.3 Steam and water jet cleaning. The engine assembly shall be steam and water jet cleaned as follows: The jet is applied perpendicular to the surface being cleaned at a distance of not more than 1 ft (0.305 m) from the surface for steam cleaning, and not more than 5 ft (1.53 m) from the surface for water jet cleaning, and cleaned at a rate of one square foot per minute

(ft^2/min) [0.09 meter squared/ minute (m^2/min.)]. The jet pressure shall be not less than 100 psi (689 kPa) and not more than 110 psi (758 kPa). Subsequent to the cleaning operation, the engine and components shall be disassembled to the extent necessary to determine if any deterioration to seals, hose, gaskets, or driving belts exists, and to determine if any entry of water has occurred into the engine or any component. Any evidence of seals, hose, gasket, or driving belt deterioration, or any sign of water entry resulting from above testing, shall be cause for rejection.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

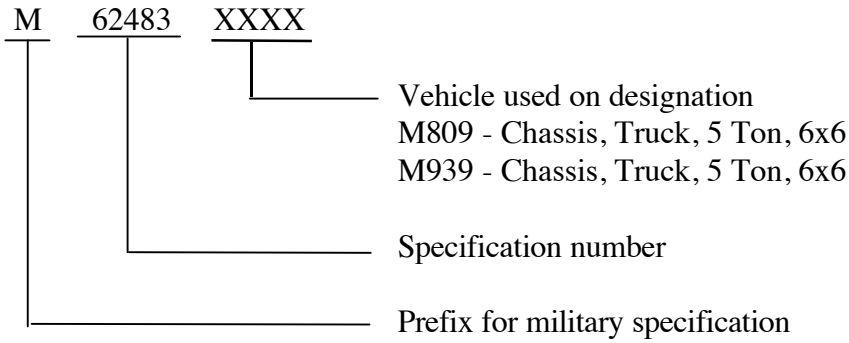
(This section contains information of a general or explanatory nature which may be helpful, but is not mandatory.)

6.1 Intended use. The engines covered by this specification are intended for the M809 and M939 series 5 ton trucks used by the United States Military Service in transporting personnel or cargo, towing trailers or semitrailers, and recovering disabled equipment during military operations. The engines are military unique because they are specially designed to interface with the M809 and M939 trucks where no known commercial equipment can be substituted.

6.2 Acquisition requirements. Acquisition documents must specify the following:

a. Title, number, and date of this specification.
b. Engine classification (see 1.2 and 3.2.1).
c. Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.2.1 and 2.3).
d. When first article is required (see 3.1, 4.1.1 and 6.4).
e. Electromagnetic compatibility, if other than as specified (see 3.3.10.6).
f. Inspection conditions if other than as specified (see 4.2.2).
g. Packaging requirements (see 5.1).

6.3 Part or identifying number (PIN). The PIN to be used for engines acquired to this specification are created as follows:



6.4 First article. When requiring a first article inspection, contracting documents should provide specific guidance to offerors. This guidance should cover whether the first article is a first article sample, a first production item, or the number of test items. These documents should also include specific instructions regarding arrangements for examinations, approval of first article test results, and disposition of first articles. Pre-solicitation documents should provide Government waiver rights for samples for first article inspection to bidders offering a previously acquired or tested product. Bidders offering such products who wish to rely on such production testing must furnish evidence with the bid that prior Government approval is appropriate for the pending contract.

6.5 Conformance inspection. Affordable conformance inspection with confidence varies depending upon a number of procurement risk factors. Some of these factors include: Contractor past performance, Government schedules and budget, product material and design maturity, manufacturing capital equipment and processes applied, the controlled uniformity of those processes, labor skill and training, and the uniformity of measuring processes and techniques. During the solicitation, contracting documents should indicate those tests desired from table II and their designated frequency based on a risk assessment for the procurement.

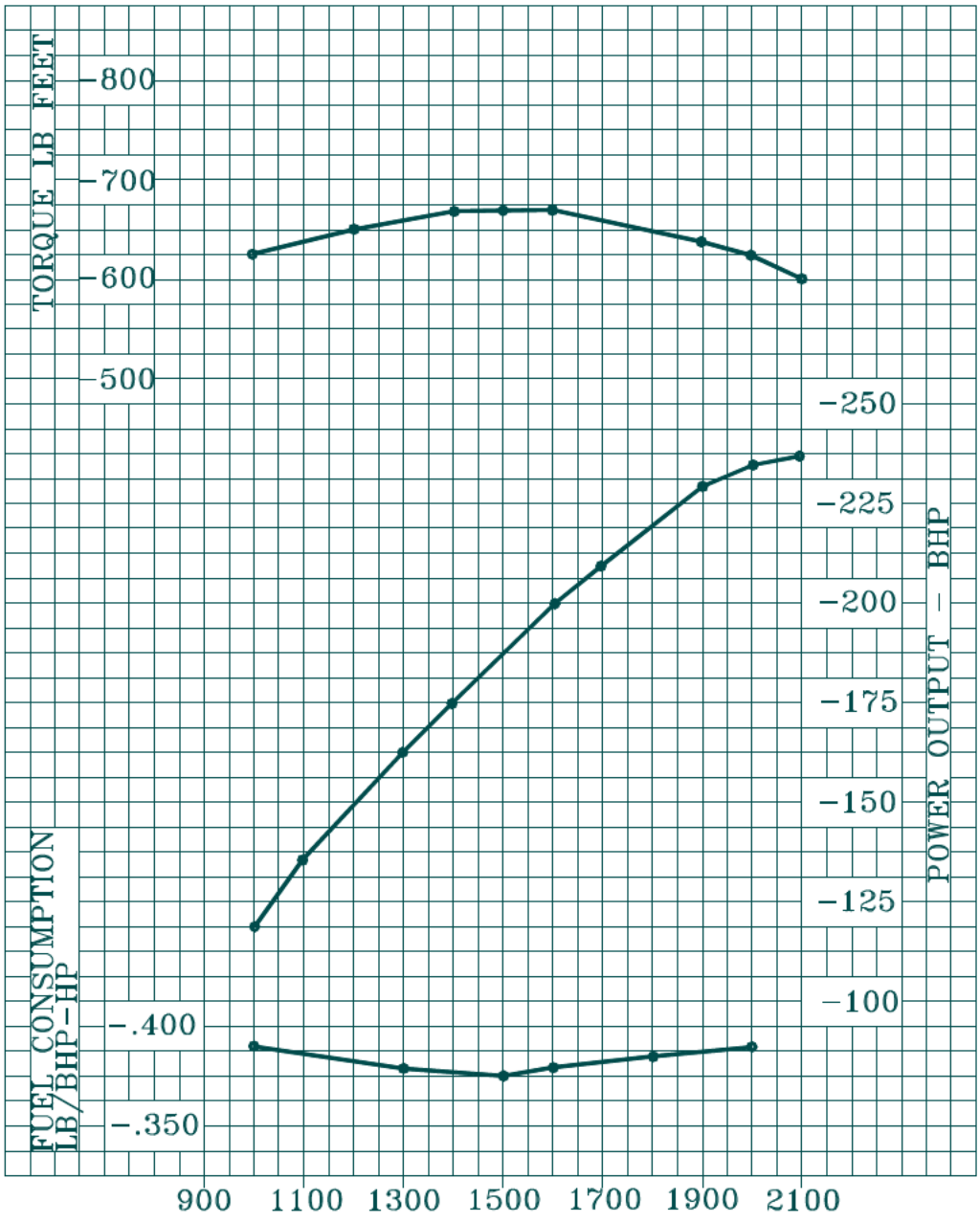
6.6 Definitions. The following definitions shall be used for the classification of defects for leaks:

a. Class I. Leakage indicated by wetness or discoloration not great enough to form drops.
b. Class II. Leakage great enough to form drops but not enough to cause drops to drip from item being checked/inspected.
c. Class III. Leakage great enough to form drops that fall from the item being checked/inspected.

6.7 Subject term (key word) listing.

Air compressor
Alternator system
Oil filters
Lubrication system
Starter system
Power steering pump
Thermostat

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



NOTE: Horsepower, torque, and fuel consumption curves shown represent performance at Standard SAE J1349 conditions at 500 feet altitude (29.00 Hg (736 mm Hg) dry barometer), 85°F (29°C) air intake temperature, and 0.38 Hg (9.6 mm Hg) water vapor pressure.

FIGURE 1. Engine speed - rpm.

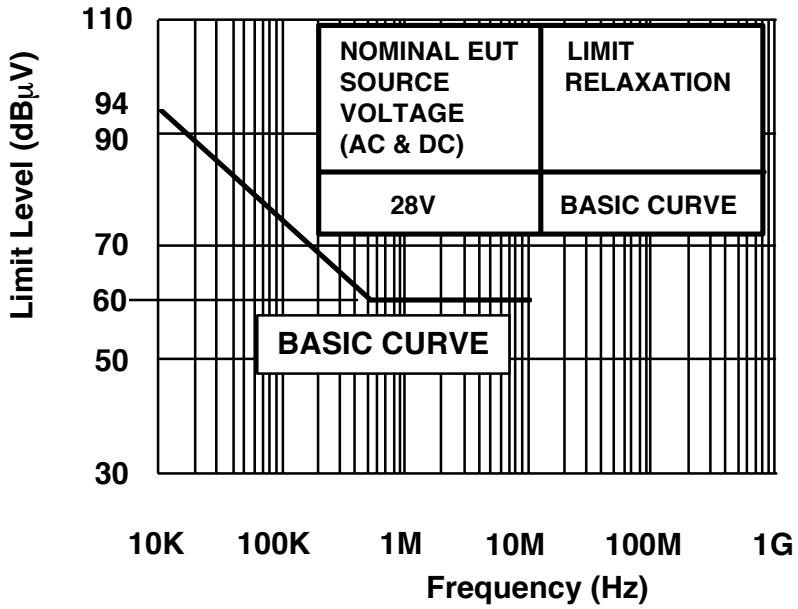


FIGURE 2. Conducted emission limit (equipment under test (EUT) power leads, ac and dc).

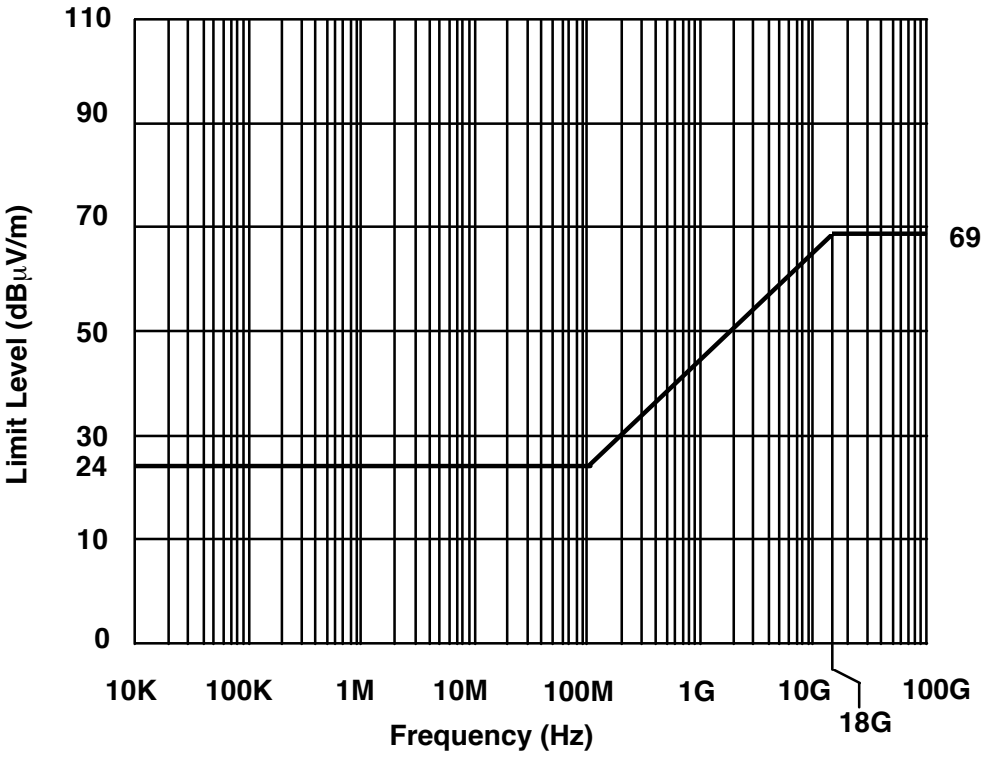


FIGURE 3. Radiated emission limit for ground applications.

Custodian:
Army - AT

Preparing Activity:
Army - AT

(Project 2815-0179)

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, 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.

I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER	2. DOCUMENT DATE *(YYMMDD)*
	MIL-DTL-62483A(AT)	980925

3. DOCUMENT TITLE

ENGINE, DIESEL, 6 CYLINDER, INLINE, LIQUID COOLED, 210 HP

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 (2) AUTOVON *(If applicable)*	7. DATE SUBMITTED *(YYMMDD)*

8. PREPARING ACTIVITY

a. NAME	b. TELEPHONE *(Include Area Code)* (1) Commercial (810) 574-8745 (2) AUTOVON 786-8745
c. ADDRESS *(Include Zip Code)* Commander U.S. Army Tank-automotive and Armaments Command ATTN: AMSTA-TR-E/BLUE Warren, MI 48397-5000	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