

INCH-POUND

MIL-DTL-13791H
18 February 2015
SUPERSEDING
MIL-DTL-13791G
25 February 2009

DETAIL SPECIFICATION

DISTRIBUTOR, IGNITION SYSTEM: INTEGRAL COIL, WATERPROOF 24 VOLT

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

1. SCOPE

1.1 Scope. This specification covers waterproof ignition distributor assemblies with integral ignition coil and authorized repair parts. These ignition distributor assemblies are designed to operate in 24 volt (V) direct current (dc) electrical systems and are of breaker point or breakerless design. Ignition distributor assemblies should be referred to herein as "distributors".

1.2 Classification Distributors should be classified by type and class as follows (see 3.3.1, 6.2 and 6.3).

Classification	Description	Drawing No.
Type I	Left hand (counterclockwise) rotation viewing Drive-end	7355734, 7762671, 7762685, 12259526
Type II	Right hand (clockwise) rotation viewing Drive-end	7353276, 7355596, 7358569, 7374377, 10863489
Class 1 1/	Breaker point design	
Class 2 1/	Breakerless design	

1/ See 3.3.1, 6.3.3 and 6.3.4.

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 requirements of documents cited in sections 3 and 4 of this specification, whether or not they are listed.

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 cited in the solicitation or contract.

Comments, suggestions, or questions on this document should be addressed to: DLA Land and Maritime, Attn: VAI, P.O. Box 3990, Columbus, OH 43218-3990, or emailed to FluidFlow@dla.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <https://assist.dla.mil>.



MIL-DTL-13791H

FEDERAL STANDARDS

- FED-STD-H28/2 - Screw -Thread Standards for Federal Services, Section 2, Unified Inch-Screw Threads – UN and UNR Thread Forms

COMMERCIAL ITEM DESCRIPTION

- A-A-50271 - Plate, Identification, Instruction and Marking, Blank.

DEPARTMENT OF DEFENSE STANDARDS

- MIL-STD-130 - Identification Marking of US Military Property.
- MIL-STD-202 - Test methods for Electronic and Electrical Component Parts.
- MIL-STD-461 - Electromagnetic Emission and Susceptibility Requirements for the Control of Electromagnetic Interference.

(See supplement 1 for list of specification sheets.)

(Copies of these documents are available online at <https://assist.dla.mil/>.)

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 of these documents are those cited in the solicitation or contract (see 3.3.1).

ARMY DRAWINGS:

- 5701239 - Ignition Distributor Contract Set.
- 7348578 - Ignition Distributor Rotor.
- 7353276 - Ignition Distributor Assembly.
- 7355596 - Ignition Distributor Assembly.
- 7355734 - Ignition Distributor Assembly.
- 7358569 - Ignition Distributor Assembly.
- 7374377 - Ignition Distributor Cap Assembly.
- 7374880 - Ignition Distributor Cap.
- 7374883 - Ignition Distributor Cap Cover.
- 7375373 - Ignition Distributor Cap Cover.
- 7539588 - Ignition Distributor Rotor.
- 7727531 - Gap, Sparking.
- 7762671 - Ignition Distributor Assembly.
- 7762685 - Ignition Distributor Assembly.
- 8722526 - Ignition Distributor Cap.
- 10863489 - Retainer bearing.
- 11640924 - Ignition Distributor Contact Set.
- 11663066 - Ignition Distributor Coil.
- 12259526 - Ignition Distributor Assembly.

(Copies of these documents are available online at <http://www.dsccl.dla.mil/programs/milspec/> or from the Defense Supply Center Columbus, ATTN: VAI, P.O. Box 3990, Columbus, Ohio 43218-3990.)

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 these documents are those cited in the solicitation or contract.

AEROSPACE INDUSTRIES ASSOCIATION (AIA)

NASM35206 - Screw, Machine – Pan Head, Cross-Recessed Carbon Steel, Cadmium Plated, UNC-2A.

(Copies of these documents are available online at <http://www.aia-aerospace.com>.)

ASTM INTERNATIONAL (ASTM)

ASTM-B117 - Salt-Spray (Fog) Testing
ASTM-B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel
ASTM-B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel
ASTM-G21 - Materials To fungi, Synthetic Polymeric, Determining Resistance Of

(Copies of these documents are available from <http://www.astm.org>.)

SAE INTERNATIONAL

SAE-AMS-C-81562 - Coatings, Cadmium, Tin-Cadmium and Zinc (Mechanically Deposited)
SAE-AMS-QQ-P-416 - Plating, Cadmium (Electrodeposited)
SAE-AMS2700 - Steels, Passivation of Corrosion Resistant

(Copies of these documents are available online at <http://www.sae.org>.)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein (except for related specification sheets), 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 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheet. In the event of any conflict between the requirements of this specification and the specification sheet, the latter shall govern.

3.2 First article. When specified (see 6.2), a sample shall be subjected to first article inspection in accordance with 4.4.

3.2.1 Distributors. Unless otherwise specified (see 6.2), the contractor shall furnish distributors which shall be subjected to first article inspection (see 4.4). First article inspection samples, properly marked with identifying information will be representative of the distributors to be furnished to the Government. All subsequent units delivered to the Government must conform to these samples in all of their pertinent physical and performance attributes.

3.2.3 Authorized repair parts. Unless otherwise specified (see 6.2), the contractor will furnish authorized repair parts (see table I) which shall be subjected to first article inspection (see 4.4). First article inspection samples, properly marked with identifying information will be representative of the

MIL-DTL-13791H

distributors to be furnished to the Government. All subsequent units delivered to the Government must conform to these samples in all of their pertinent physical and performance attributes.

3.2.3.1 Separate repair parts. Repair parts submitted separately for first article inspection shall be individually assembled necessary to form a assembly. with all other parts complete distributor

TABLE I. Authorized

Drawing	Title
5701239	Ignition distributor contact set
7348578	Ignition distributor rotor
7374880	Ignition distributor cap
7374377	Ignition distributor cap
7374883	Ignition distributor cap cover
7375373	Ignition distributor cap cover
7539588	Ignition distributor rotor
7762685	Ignition distributor assembly
7727531	Gap, sparking
8722526	Ignition distributor cap
8722527	Ignition distributor rotor
11640924	Ignition distributor contact set
116623066	Ignition distributor coil
NASM35206	Screw, machine-pan head, cross-recessed, carbon steel, cadmium plated, UNC-2A
MS51114	Coil, Ignition - 24 Volt, DC (with Internal Ballast)
MS51115	Coil, Ignition - 24 Volt DC (Without Internal Ballast)

repair parts.

3.2.3.2 Assembled repair parts. Repair parts contained within distributor assemblies, which have successfully met first article requirements, must also have successfully completed first article inspection.

3.3 Materials. Materials must be as specified herein and in referenced specifications, standards, and drawings (see 4.10.1).

3.3.1 Slash sheet reference specification.

Army drawing number	Slash sheet reference
7355734	MIL-DTL-13791/1
7762671	MIL-DTL-13791/2
7762685	MIL-DTL-13791/3
12259526	MIL-DTL-13791/4
7353276	MIL-DTL-13791/5
7355596	MIL-DTL-13791/6
7358569	MIL-DTL-13791/7
7374377	MIL-DTL-13791/8
5701239	MIL-DTL-13791/10
7348578	MIL-DTL-13791/11
7374880	MIL-DTL-13791/12
7374883	MIL-DTL-13791/13

MIL-DTL-13791H

7375373	MIL-DTL-13791/14
7539588	MIL-DTL-13791/15
7727531	MIL-DTL-13791/16
8722526	MIL-DTL-13791/17
11640924	MIL-DTL-13791/19
11663066	MIL-DTL-13791/20
10863489	MIL-DTL-13791/21
NASM35206	MIL-DTL-13791/22

3.3.2 Cadmium is not recommended. It is recommended that the use of carbon steel material with cadmium plating be used only when the other materials and plating finishes specified in this document cannot meet performance requirements (see table II).

3.3.2.1 Protected plating. Proper protected coating type plating shall be in accordance with SAE-AMS-C-81562, type II, class 3 or SAE-AMS-QQ-P-416, type II class 2. Fluid passages, other openings, and internal threads shall not be subject to the plating thickness requirement and may have bare areas provided they are protected with a light film of oil.

TABLE II. Material and finish. 1/

Material	Finish
Carbon Steel	Cadmium plating in accordance with SAE-AMS-C-81562, type II, class 3 or SAE-AMS-QQ-P-416, type II, class. 2/
	Zinc plating in accordance with ASTM-B633; type II or III, Fe/Zn 25, or ASTM-B695, type II, class 5. 3/
300 series stainless steel	No additional finish. Passivation in accordance with SAE-AMS2700, type 6 or 7.

1/ Must be capable of withstanding 96 hours salt spray.

2/ Not recommended for use where severe abrasion conditions exist. Max service temperature 120°C.

3/ Embitterment test need not be run.

3.3.3 Recycled, virgin, and reclaimed materials. There are no requirements for the exclusive use of virgin materials. The use of recycled or reclaimed (recovered) materials is acceptable provided that all other requirements of this specification are met (see 4.10.1 and 6.3.5).

3.3.3.1 Recycled, recovered, or environmentally preferable, or biobased materials. Recycled, recovered, or environmentally preferable, or biobased 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.

3.4 Design and construction. Distributors shall conform to applicable drawings and standards for type and class (see 1.2). Authorized repair parts will conform to the form and dimensions specified on the drawings specified in table I (see 3.3.1, 4.10.1, 4.10.2 and 6.2).

3.4.1 Interchangeability. All distributor assemblies and authorized repair parts shall be physically and functionally interchangeable with all other products of the same part number (see 4.10.1 and 4.10.2).

3.4.2 Housing. Distributor housing shall be so constructed as to be electrically continuous (see 4.10.2).

3.4.2.1 Coil-to-distributor lead. When specified (see 6.2), provision shall be made to permit connection to coil-to-distributor lead for testing purposes (see 4.10.1 and 4.10.2).

3.4.3 Timing: initial setting. Timing of distributor shall be accomplished by rotation of the complete distributor assembly in its mounting (see 4.10.2).

3.4.3.1 Advance and retard. Spark advance mechanism will be centrifugal. The centrifugal spark advance mechanisms must continuously adjust timing of voltage output at the spark gap in conformance to the advance curve specified on applicable drawings or military standards (MS) (see 4.10.1 and 4.10.2).

3.4.4 Drive arrangement. Distributor shaft speed will be one-half crankshaft speed. Drive end of the shaft will be designed so that mating parts will not be assembled 180 degrees ($^{\circ}$) out of line (see 4.10.2).

3.4.5 Ventilation. Provision will be made for ventilation as specified on applicable drawing or MS sheet (see 4.10.1 and 4.10.2).

3.4.6 Lubrication. The breaker cam follower will be designed so that no additional lubrication will be required when operation time is less than 100 hours. The rotor shaft bearing must be designed so that no additional lubrication will be required when operation time for class 1 distributor is less than 600 hours and when operation of class 2 distributor is less than 1500 hours (see 4.10.2).

3.4.7 Threaded parts. Screw threads of the form, number per inch, and class specified on the applicable drawing or MS sheet must be in accordance with FED-STD-H28/2 (see 4.10.1 and 4.10.2).

3.5 Performance.

3.5.1 Voltage output. The distributor will produce no less than minimum voltage output at each output terminal under operating conditions specified in table III. Variation of output voltage from output terminal to output terminal will be no more than 10 percent (%). When operating, the distributor will produce no less than 6000 V dc at output terminals. The distributor must then be operated for 3 hours at 300 revolutions per minute (rpm) and 3 hours at 1800 rpm. Thereafter, the distributor cap will be examined and there will be no evidence of cap and rotor interference (see 4.10.3).

TABLE III. Voltage output.

Output	Conditions			
	Voltage output, minimum kilovolts (kV)			
	Ambient air temperature 77 ± 15°F 1/		Ambient air temperature 200 ± 10°F	
Distributor shaft speed (rpm)	18 V input	30 V input	18 V input	30 V input
300 ± 10	14 kV	17 kV	10 kV	15 kV
1800 ± 25	12 kV	17 kV	10 kV	14 kV

1/ °F = degrees Fahrenheit

3.5.1.1 Class 2 low input voltage. The class 2 distributor must withstand operation at any steady state system input voltage from zero to 18 V dc, of correct polarity, without impairing performance when operated as specified in 3.5.1 (see 4.10.3.1).

3.5.1.2 Class 2 high input voltage. The class 2 distributor will withstand operation for one hour at steady state system input voltage of not less than 30 V dc and nor more than 40 V dc, of correct polarity, without impairing performance when operated as specified in 3.5.1 (see 4.10.3.2).

3.5.2 Timing performance. The distributor will provide voltage output at each output terminal, in turn, in regular rotary sequence. Peak voltage output will occur within ± 1 $^{\circ}$ of rotation for each point of actuation (see 6.3).

3.5.3 Dielectric strength. The insulation materials must exhibit no loosening, cracking, chafing, charring, burning, smoking, nor reduction in dielectric strength after distributor assembly operation, with

two output leads connected to ground and remaining leads connected to the spark gap set at eight millimeters, with 32 V dc input. Subsequently, the distributor assembly must conform to 3.5.1 (see 4.10.5).

3.5.4 Endurance. The distributor will be operated and must conform to either 3.5.4.1 or 3.5.4.2 as applicable (see 4.10.6).

3.5.4.1 Class 1 distributor assembly. The class 1 distributor, including distributor shaft to crankshaft coupling, will operate for 600 hours with no maintenance except resetting of breaker points at 100 hour intervals, and lubrication of breaker cam, breaker lever pivot and felt wick under rotor. Subsequently, the distributor assembly must operate as specified in 3.5.1 and 3.5.2.

3.5.4.2 Class 2 distributor assembly. The class 2 distributor, including distributor shaft to crankshaft coupling, will operate for 1500 hours with no maintenance. Subsequently, the distributor assembly must operate as specified in 3.5.1 and 3.5.2.

3.5.5 Polarity, class 2 distributor. The class 2 distributor, will operate in a negatively grounded system, and will be inoperable during reversed polarity. Subsequent to applications of reversed polarity, the distributor assembly must operate as specified in 3.5.1 (see 4.10.7).

3.5.6 Transient voltage. The distributor (class 2) will undergo input of correctly polarized 240 V dc transient in 200°F ambient air temperature. Subsequently, the distributor assembly will operate as specified in 3.5.1 (see 4.10.8).

3.5.7 Environment.

3.5.7.1 Waterproofness. The distributor will undergo, and must pass, waterproofness test. The component shall be submerged in tapwater, with the component uppermost surface a minimum of one inch below the surface of the water. The component shall be checked for leaks, there shall be no bubbles escaping from the interior of the component when the test chamber is evacuated to a pressure six pounds below atmospheric by applying 6 psi internal pressure for one minute while submerged. The internal pressure shall be obtained by applying vacuum over the water. When the component is a starting motor, the pinion opening shall be sealed or covered to achieve the internal pressure. Bubbles which are the result of entrapped air on the exterior surfaces of the component shall not be considered a leak (see 4.10.9).

3.5.7.2 Corrosion resistance. The distributor will be tested for a period of 200 hours in accordance with ASTM-B117. Subsequently, the distributor must operate as specified in 3.5.1 and must conform to 3.6 (see 4.10.10).

3.5.7.3 Fungus resistance. To determine resistance to fungus growth, the distributor will be tested in accordance with method B, class 1 of ASTM-G21. Subsequently, the distributor must operate as specified in 3.5.1 and conform to 3.6 (see 4.10.11).

3.5.7.4 Vibration resistance. The distributor will be tested to determine that mechanical parts will not be affected by vibration. The test must be conducted under electrical-load for 2 hours in each of three mutually perpendicular axes. The assembly must operate as specified in 3.5.1 after completion of vibration testing (see 4.10.12).

3.5.7.4.1 Pitch-filled or oil-filled coil. Distributors with pitch or oil-filled coils will withstand 72 hours of vibration as specified in 3.5.1 after completion of vibration testing (see 4.10.12).

3.5.7.4.2 Molded or potted coil. Distributors with molded or potted coils must withstand 96 hours of vibration as specified in 3.5.7.4 and subsequently must operate as specified in 3.5.1 (see 4.10.12.2).

3.5.7.4.3 Coil mounting. Coil mounting tabs, screws, and clamp will not loosen, crack, or break during 8 hours of vibration of 20 gravity units (g) input while retaining coil as in 6.1 (see 4.10.13).

3.5.7.4.4 Shock resistance. To determine resistance to shock during operation, the distributor will be mounted and subjected to 18 half-sine waveform pulses that will have duration of 11 milliseconds (ms) and obtain a peak value of 50 g. Subsequently, the assembly must operate as specified in 3.5.1 (see 4.10.14).

3.5.7.4.5 Electromagnetic interference. The distributor will conform to requirements of classes A3 and C1 of MIL-STD-461 for tactical and combat vehicle components (see 4.10.15).

3.5.7.4.5.1 Resistor-suppressors. Resistor-suppressors, in the output towers of the distributor cap, will provide the following resistance to high peak voltage pulses specified in 3.5.4 (see 4.10.15.1).

<u>Initial value (ohms)</u>	<u>Value (ohms) after cycling</u>
2750-6250	3750-7500

3.5.7.4.6 High temperature operation. The distributor must operate as specified in 3.5.1 at $200 \pm 10^\circ\text{F}$ ambient air temperature (see 4.10.16).

3.5.7.4.7 Low temperature operation. The distributor must operate as specified in 3.5.1 after the distributor assembly temperature has been stabilized at minus $(-) 65 \pm 5^\circ\text{F}$ (see 4.10.17).

3.5.7.4.8 High temperature stall. The distributor must be operated for 6 hours with 24 V dc applied to the coil primary in an ambient air temperature of $160 \pm 5^\circ\text{F}$. The distributor will then operate as specified in 3.5.1 and will exhibit no damage to the coil or ballast resistor (see 4.10.18).

3.5.7.4.9 Low temperature stall. The distributor must be operated for 6 hours with 24 V dc applied to the coil primary in an ambient air temperature of $-65 \pm 5^\circ\text{F}$. The distributor will then operate as specified in 3.5.1 and will exhibit no damage to coil or ballast resistor (see 4.10.19).

3.6 Finish. The distributor will exhibit no blistering, chipping, peeling, or rust after undergoing tests (see 4.10.2).

3.7 Marking. A nameplate conforming to type I, style II, of A-A-50271 will be affixed to the distributor housing, as shown on the applicable drawing, and must include the following minimum information (see 4.10.1 and 4.10.2):

Ignition system
 24 Volts
 Army Part or Identifying Number (PIN)
 US
 National stock number
 Manufacturer's PIN
 Manufacturer's serial number
 Manufacturer's identification (name or code)
 Direction of rotation (see 3.7.1).

3.7.1 Direction of rotation. Direction of rotation will be indicated by an arrow located on nameplate.

3.7.2 Repair parts. Repair parts will be marked in accordance with MIL-STD-130.

3.8 Workmanship. Workmanship will be such as to assure a product free of burrs, rust, scratches, sharp edges, and chips (see 4.10.2).

4. VERIFICATION

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

- a. First article inspection (see 4.4).
- b. Conformance inspection (see 4.5).

4.2 Test equipment and inspection facilities. Inspection facilities shall be adequate to allow performance of all required tests. Test and measuring equipment shall be of sufficient accuracy, quality, and quantity to permit performance of the required inspections and tests.

4.3 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with the applicable test procedures and under the following conditions:

- a. Air temperature $77 \pm 15^{\circ}\text{F}$.
- b. Barometric pressure $725 + 50 - 75$ millimeter (mm) mercury.
- c. Relative humidity $50 \pm 30\%$.

4.4 First article inspection. Unless otherwise specified (see 6.2), the Government shall select seven distributors of each type and class produced under the production contract for first article inspection. First article samples shall be inspected as specified in table IV. Approval of the first article sample by the Government shall not relieve the contractor of his obligation to supply distributors that are fully representative of those inspected as a first article sample. Any changes or deviation of the production units from the first article sample shall be subject to the approval of the contracting officer.

4.4.1 Authorized repair parts. Unless otherwise specified (see 6.2), the Government shall select the following quantities of authorized repair parts (ARP) produced under the production contract for first article inspection:

<u>Part</u>	<u>Number of parts</u>
Cap	3
Cap cover	1
Coil	5
Contact set	2
Resistor	1
Rotor	3

First article inspection shall consist of a comparison examination of materials, dimensions, and finish in accordance with applicable MS or drawings. Then each part shall be assembled in a distributor assembly that has successfully completed first article inspections as specified in table IV. The installed ARP shall then be inspected for first article as a complete assembly as specified in table IV. Approval of the first article sample by the Government shall not relieve the contractor of his obligation to supply ARPs that are fully representative of those inspected as a first article sample. Any changes or deviation of the production units from the first article sample shall be subject to the approval of the contracting officer.

TABLE IV. Classification of inspections.

Title	Requirement	Inspection	First article	Quality conformance		Control	
				Examination	Tests		
					<u>1/</u>		<u>2/</u>
Materials and construction	3.3 thru 3.4.1, 3.4.2.1, 3.4.3.1, 3.4.5, 3.4.7, and 3.7	4.10.1	X				
Defects	3.4 thru 3.4.7, 3.6 thru 3.8	4.10.2	X	X			
Voltage output	3.5.1	4.10.3	X		X	X	
Low input voltage	3.5.1.1	4.10.3.1	X				
High input voltage	3.5.1.2	4.10.3.2	X				
Timing performance	3.5.2	4.10.4	X		X	X	
Dielectric strength	3.5.3	4.10.5	X		X	X	
Endurance	3.5.4	4.10.6	X				
Polarity	3.5.5	4.10.7	X				
Transient voltage	3.5.6	4.10.8	X				
Saline submersion	3.5.7.1	4.10.9.1	X		X	X	
Freshwater submersion	3.5.7.1	4.10.9.2	X		X	X	
Corrosion resistance	3.5.7.2	4.10.10	X				
Fungus resistance	3.5.7.3	4.10.11	X				
Vibration resistance	3.5.7.4	4.10.12	X				
Pitch-filled or oil-filled coil	3.5.7.4.1	4.10.12.1	X				
Molded or potted coil	3.5.7.4.2	4.10.12.2	X				
Coil mounting	3.5.7.4.3	4.10.13	X				
Shock resistance	3.5.7.4.5	4.10.14	X				
Electromagnetic interference	3.5.7.4.6	4.10.15	X				
Resistor suppressor	3.5.7.4.6.1	4.10.15.1	X			X	
High temperature operation	3.5.7.4.5.1	4.10.16	X				
Low temperature operation	3.5.7.4.8	4.10.17	X				
High temperature stall	3.5.7.4.8	4.10.18	X				
Low temperature stall	3.5.7.4.9	4.10.19	X				

1/ Distributor assemblies

2/ Repair parts

4.4.2 First article inspection failure. Deficiencies found during, or as a result of, first article inspection shall be cause for rejection of the first article sample until evidence has been provided by the contractor that corrective action has been taken to eliminate the deficiency. Any deficiency found during, or as a result of, first article inspection shall be evidence that all items already produced prior to completion of first article inspection are similarly deficient unless contrary evidence satisfactory to the contracting officer is furnished by the contractor. Such deficiencies on all items shall be corrected by the contractor. The Government shall not accept products until first article inspection is completed to the satisfaction of the Government.

4.5 Conformance inspection.

4.5.1 Sampling.

4.5.1.1 Lot formation. An inspection lot shall consist of all the components, or distributors of one type and part number, from an identifiable production period, from one manufacturer, submitted at one time for acceptance.

4.5.1.2 Test equipment and inspection facilities. Test and measuring equipment and inspection facilities of sufficient accuracy, quality, and quantity to permit performance of the required inspection shall be used.

4.6 First article inspection. First article inspection, if not done by the manufacturer, shall be performed at a laboratory acceptable to the procuring activity on sample units produced with equipment and procedures used in production.

4.6.1 Samples for first article. Samples for first article shall be representative of the products proposed to be furnished to this specification. Sampling shall be in accordance with 4.10.2.

4.6.2 First article inspection routine. All samples shall be subjected to first article testing in accordance with table V. Sequence is manufacturing's discretion.

4.6.3 Acceptance of first article inspection. Required first article tests performed at the bulk distributor level need not be repeated at the assembly level if documented approval has been obtained from the procuring activity.

4.7 First article samples. Samples shall be representative of the construction workmanship, components, and materials to be used during production. When a manufacturer is in continuous production of the distributor from one contract to another, submission of additional first article samples for a new contract may be waived at the discretion of the acquiring activity (see 6.2).

4.7.1 First article information. Upon completion of first article inspection, the Government activity responsible for conducting the inspection program (see 6.2), shall report the results of the inspection, with appropriate recommendation, to the contracting officer. Approval of the first article samples or the waiving of first article inspection does not preclude the requirements for performing conformance inspection.

4.7.1.1 Disposition of samples. First article samples shall be furnished to the Government as directed by the contracting officer (see 6.2).

4.7.1.2 First article inspection failure. Deficiencies found during, or as a result of, first article inspection shall be cause for rejection of the first article sample until evidence has been provided by the contractor that corrective action has been taken to eliminate the deficiency. Any deficiency found during, or as a result of, first article inspection shall be evidence that all items already produced prior to completion of first article inspection are similarly deficient unless contrary evidence satisfactory to the contracting officer is furnished by the contractor. Such deficiencies on all items shall be corrected by the contractor. The Government shall not accept products until first article inspection is completed to the satisfaction of the Government.

4.7.1.3 Group A inspection. For manufacturers that have successfully passed first article inspections and are continuously producing distributors to this specification, an on going inspections shall consist of individual inspections (see table V) and sampling and periodic inspections (see table VI). If first article is waived due to prior successful first article inspection the individual inspections and sampling and periodic inspections shall be the manufactures in house inspection procedures.

TABLE V. First article inspection.

Inspection	Requirement	Test method
Visual and mechanical inspections	3.8	4.10.2
Finish	3.3.1	3.6

MIL-DTL-13791H

4.7.1.4 Group B inspection. Sampling and periodic inspections shall consist of the inspections specified in table VI.

TABLE VI. Group B inspections.

Inspections	Requirement paragraph	Inspection paragraph	Number of samples
Timing Performance	3.5.2	4.10.4	4.7.2.1
Dielectric Strength	3.5.3	4.10.5	4.7.2.1
Endurance	3.5.4	4.10.5	4.7.2.1

4.7.2 Inspection lot.

4.7.2.1 Lot and sample. The inspection lot shall be product selected at random from the production lot without regard to quality and shall be the sample size specified in table VII.

TABLE VII. Lot and sample size.

Production lot size	Sample size
1 to 90	8
91 to 150	12
151 to 280	19
281 to 500	21
501 to 1200	27
1201 to 3200	35
3201 to 10,000	38
10,001 to 35,000	46

4.7.2.2 Tests. All samples of distributor assemblies, selected in accordance with 4.7.2.1, shall be examined for the defects and subjected to tests specified in table VIII in order listed (see table X).

TABLE VIII. Order of conformance testing.

Requirement	Test method	Inspection
3.5.3	4.10.5	Dielectric strength
3.4.1	4.10.3	Voltage output
3.4.7.1	4.10.9	Waterproofness
3.5.1	4.10.3	Voltage output
3.5.2	4.10.3	Timing
3.5.1	4.10.3	Voltage output

4.8 Authorized repaired parts. Samples of repaired parts (see table I) selected in accordance with 4.6, shall be examined for the defects specified and subjected to test specified. Repaired substituted parts (see 3.2.3.1) in distributor assemblies that have previously passed inspection specified herein.

TABLE IX. Order of quality conformance testing – repair parts.

Repair part	Requirement	Test
Cap	3.5.7.4.5.1	4.10.15.1 Resistor-suppressor 4.10.3 Voltage output
	3.5.3	4.10.3 Dielectric strength
	3.5.1	4.10.3 Voltage output
	3.5.7.4.5.1	4.10.15.1 Resistor-suppressor
Coil	3.5.1	4.10.3 Voltage output
	3.5.3	4.10.5 Dielectric strength
	3.5.1	4.10.3 Voltage output
Cover	3.5.3	4.10.5 Dielectric strength
	3.5.1	4.10.3 Voltage output
	3.5.7.1	4.10.9 Waterproofness
	3.5.1	4.10.3 Voltage output
Point set	3.5.3	4.10.5 Dielectric strength
	3.5.1	4.10.3 Voltage output
Resistor	3.5.3	4.10.5 Dielectric strength
	3.5.1	4.10.3 Voltage output
Rotor	3.5.7.4.5.1	4.10.15.1 Resistor-suppressor (if resistor is part of rotor)
	3.5.3	4.10.5 Dielectric strength
	3.5.1	4.10.3 Voltage output

4.8.1 Sampling - control testing. Samples for control testing shall be selected from production lots which have passed the conformance examination specified in 4.7.2.2. Control test samples shall be selected at the rate of 1 out of each 200 units produced, except that not less than 1, and not more than 2, shall be selected and tested in any 30-day period. Samples selected shall not have previously been subjected to quality conformance testing (see table IX).

TABLE X. Order of control testing.

Requirement	Test	Inspection
3.5.1	4.10.3	Voltage output
3.5.2	4.10.4	Timing
3.5.1	4.10.3	Voltage output
3.5.3	4.10.5	Dielectric strength
3.5.1	4.10.3	Voltage output
3.5.7.1	4.10.9	Waterproofness <u>1/</u>

1/ Coil, point set, resistor, or rotor, when being tested as repair parts, need not be subjected to waterproofness test.

4.9 Failure. Failures of a control test sample to pass any specified examination or test may be cause for the Government to refuse to accept subsequent lots until it has been proved to the satisfaction of the Government that the faults revealed by the tests have been corrected.

4.10 Methods of inspection.

4.10.1 Materials and construction. Conformance to 3.3 through 3.4.1, 3.4.2.1, 3.4.3.1, 3.4.5, and 3.4.7 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 drawings, specifications, design data, receiving inspection records, processing and quality control standards, vendor catalogs and certifications, industry standards, test reports, and rating data.

MIL-DTL-13791H

4.10.2 Conformance Inspection. Conformance inspection to 3.4 through 3.4.7 and 3.6 through 3.8 shall be determined by visual examination for defects.

4.10.3 Voltage output. To determine conformance to 3.5.1, the distributor assembly shall be electrically connected and mechanically mounted in an apparatus to simulate operation. Each secondary lead shall be shunted through load capacitance of 150 ± 10 picofarads (pF). One secondary lead shall be connected to a peak voltage measuring device. Remaining secondary leads shall be connected to spark gap as specified in MIL-DTL 13791/16. Spark gap shall be 3 mm. The distributor assembly shall be operated at each input speed and voltage specified in table II. The distributor assembly shall be operated for 3 minutes before taking each measurement. Measurement of output voltage shall be taken at each lead, and recorded. The lowest voltage measured at any secondary lead shall be considered voltage output at that input speed and voltage. Thereafter, total capacitance of each secondary lead shall be adjusted to 150 ± 10 pF with resistance ungrounded. With 250,000 ohms \pm 25,000 ohms shunted across the secondary lead, and with 30 V dc and 1800 rpm input, the output voltage shall be measured and recorded at each secondary lead. The lowest reading shall be considered voltage output for the distributor assembly. Subsequently, the distributor cap shall be removed and examined for interference with rotor. Satisfactory distributors, or repair parts, shall be reassembled and the test sequence resumed.

4.10.3.1 Low input voltage. To determine conformance to 3.5.1.1, a class 2 distributor, assembled, mounted and operating, shall be subjected to correctly polarized input voltages between zero and 18 V dc.

4.10.3.2 High input voltage. To determine conformance to 3.5.1.2, a class 2 distributor, assembled, mounted and operating, shall be subjected to correctly polarized input voltages between 30 and 40 V dc.

4.10.4 Timing performance. To determine conformance to 3.5.2 and 3.5.1.2, distributor assembly shall be operated through range of speeds, and timing of spark shall be measured and recorded for comparison with requirements.

4.10.5 Dielectric strength. To determine conformance to 3.5.3, each output lead of the distributor shall be connected to the spark gap, as specified in MIL-DTL-13791/16, set at 8 mm. No additional load shall be imposed on distributor. Input voltage shall be 32 ± 0.5 V dc. The distributor shall be operated at 200 rpm for 2 minutes. Two output leads adjacent to the coil shall then be connected to ground, remaining leads to 8 mm gaps, and tests repeated for 2 minutes. The distributor shall then be examined for evidence of breakdown of insulation materials.

4.10.6 Endurance. To determine conformance to 3.5.4, the distributor shall be electrically connected and mechanically mounted, as specified in 4.7.1, in ambient air temperature of $160 + 10^\circ\text{F}$. Spark gap, as specified in MIL-DTL 13791/16, shall be set at 3 mm and loaded with a capacitance of 150 ± 10 pF. With input of $28.5 \text{ V dc} \pm 0.5 \text{ V dc}$, the assembly shall be operated continuously through 300 cycles for class 1, or 750 cycles for class 2 of the following four phases as specified in table XI (phases I - IV equal one cycle):

TABLE XI. Endurance cycles.

Phase	Time (minutes)	Distributor Shaft speed (rpm)
I	30	300
II	30	800
III	30	1500
IV	30	2000

After each 100 hours (50 cycles) of operation as specified above, the distributor shall undergo the following:

MIL-DTL-13791H

- a. Observe sparking regularity for 10 minutes at each specified speed.
- b. Observe output voltage at 300 rpm.
- c. Observe output voltage at 1800 rpm.
- d. Reset breaker points (class I only).
- e. Apply trace of approved high temperature grease on breaker cam (class 1 only).
- f. Apply one or two drops of approved light preservation oil on breaker lever pivot (class 1 only).
- g. Apply three or four drops of approved light preservation oil on felt wick under rotor (class 1 only).

4.10.7 Polarity - class 2 distributors. To determine conformance to 3.5.5, apply reverse polarity to the class 2 distributor, connected and operated as described in 4.10.3, except that no leads shall be connected to the peak voltage measuring device. A reverse polarity voltage of 30 V shall be applied 10 consecutive times for 1 minute, at 4-minute intervals.

4.10.8 Transient voltage. To determine conformance to 3.5.6, the class 2 distributor shall be tested at 200°F and subjected to a properly polarized transient voltage of 240 V dc above ground for 50 ± 5 ms duration. The voltage shall be applied to the input terminals of the distributor 10 consecutive times at 1 minute intervals

4.10.9 Waterproofness.

4.10.9.1 Saline submersion. To determine conformance to 3.5.7.1 in salt water, the distributor shall be tested in accordance to a or b.

- a. The distributor assembly shall be subjected to procedures as specified, the component with its electrical connections, shall be submerged in a container with the uppermost surface a minimum of one inch below the surface of the saline solution and installed in the chamber. The component shall be carefully observed during its entire period of submersion and shall be operated while submerged for 30 minutes at hill rated current and voltage. The chamber shall be evacuated to a pressure six pounds below atmospheric so as to apply a minimum of six pounds per square inch (psi) in internal pressure to all voids within the component. Pretest performance shall be recorded.
- b. The distributor assembly shall be tested as specified in 4.10.9.1a, except that air pressurization and evacuation may be applied directly to the interior of the distributor that has an access port for this purpose. The test chamber shall not be required. The distributor shall be submerged in an open tank of water. Distributors, of qualified design that do not include access ports, shall not be altered for the purpose of using this method.

4.10.9.2 Freshwater submersion. To determine conformance to 3.5.7.1 in freshwater, the distributor shall be tested in accordance with a or b.

- a. The distributor shall be subjected to procedures specified (see 3.5.7.1). Pretest performance shall be recorded.
- b. The distributor shall be tested as specified in 4.10.9.2a, except that air pressurization may be applied directly to the interior of the distributor that has an access port for this purpose. The test chamber shall not be required. The distributor shall be submerged in open tank of water. Distributors of qualified design that do not include access ports shall not be altered for the purpose of using this method.

4.10.10 Corrosion resistance. To determine conformance to 3.5.7.2, distributor shall be subjected to the procedure specified in method 101 of MIL-STD-202 for a total of 200 hours. Subsequently, the distributor shall be examined for conformance to 3.6.

4.10.11 Fungus resistance. To determine conformance to 3.5.7.3, distributor shall be subjected to the procedure specified in ASTM-G21 for a total of 90 days. Subsequently, the distributor shall be examined for conformance to 3.6.

4.10.12 Vibration resistance. To determine conformance to 3.5.7.4, the distributor shall be electrically connected and mechanically mounted in a suitable apparatus over the test frequency range and shall be capable of applying vibration in each of the three axes. Each distributor output lead shall be connected to the spark gap shown on MIL-DTL-13791/16 and set at 3 mm. With 28.5 V dc input and operating at 1200 rpm, the specimens shall be subjected to a simple harmonic motion having an amplitude of 0.03 inch (0.06 inch maximum total excursion), the frequency being varied uniformly between 10 and 55 hertz (Hz). The entire frequency range, from 10 to 55 Hz and return to 10 Hz, shall be traversed in approximately 1 minute.

4.10.12.1 Pitch-filled or oil-filled coil. To determine conformance to 3.5.7.4.1, the distributors with pitch-filled or oil-filled coil shall be subjected to 24 hours of specified vibration in each of three mutually perpendicular axes (total 72 hours).

4.10.12.2 Molded or potted coil. To determine conformance to 3.5.7.4.2, the distributors with molded or potted coil shall be tested in an ambient air temperature of $180 \pm 5^\circ\text{F}$. The distributors shall be subjected to 32 hours of specified vibration in each of three mutually perpendicular axes (total 96 hours). Testing shall be accomplished in two phases as follows:

Phase I	The distributor shall be subjected to a simple harmonic motion having an amplitude of 0.08 inches (0.16 inch maximum total excursion). Frequency shall be varied uniformly between 5 and 50 Hz. Frequency range shall be traversed in 1 minute, from 5 to 50 Hz.
Phase II	Amplitude shall be 0.02 inches (0.04 inch maximum total excursion). Frequency shall be varied uniformly between 50 and 100 Hz. Frequency range shall be traversed in 1 minute, from 50 to 100 to 50 Hz.

4.10.13 Coil mounting. To determine conformance to 3.5.7.4.3, mount the ignition coil in the distributor base and secure with clamp assembly and screws. The distributor shall be assembled in the adapter and mounted in the vibrator fixture so that vibration is in the plane of centerlines of the distributor shaft and coil. Input vibration of 20 g shall be applied at the worst resonant frequency of the coil (between 60 and 150 Hz).

4.10.14 Shock resistance. To determine conformance to 3.5.7.4.5, the distributor assembly shall be subjected to the procedure as specified in condition A, method 213 of MIL-STD-202.

4.10.15 Electromagnetic interference. To determine conformance to 3.5.7.4.6, class A3 distributor assemblies shall be subjected to test methods CE03 and RE02 as specified in MIL-STD-461. Class CI assemblies shall be subjected to test methods CE03 and RE05 as specified in MIL-STD-461.

4.10.15.1 Resistor-suppressor. To determine conformance to 3.5.7.4.5.1, resistance values of resistor-suppressors shall be measured and recorded. While undergoing short duration, high peak voltage pulses in accordance with the following:

Pulse repetition rate	4 ± 1 pulses per second
Pulse duration	100 microseconds or less
Pulse magnitude	5000 V dc \pm 250 V dc
Pulse rise time	10 to 15 microseconds

4.10.16 High temperature operation. To determine conformance to 3.5.7.4.6, the distributor assembly shall be installed in a chamber in which ambient air temperature is controlled at $200 \pm 10^\circ\text{F}$.

4.10.17 Low temperature operation. To determine conformance to 3.5.7.4.8, the distributor temperature shall be stabilized at $-65 \pm 5^\circ\text{F}$ for 24 hours, removed from the cold chamber and allowed to warm in air not more than 5 minutes. The distributor shall then be operated as specified in 3.5.1, except that only one lead shall be checked and values obtained shall be within 25% of the lowest value obtained in the first output test.

4.10.18 High temperature stall. To determine conformance to 3.5.7.4.8, the distributor, with breaker apparatus at point of actuation, shall be placed in a test chamber at $160 \pm 5^\circ\text{F}$. After the temperature has stabilized, the test chamber shall be shut off, including air circulating fans, and the chamber kept closed. The distributor shall immediately be energized from two 6TN batteries connected in series. The batteries shall be fully charged, in good condition, with electrolyte having a corrected specific gravity of $1.280 \pm .005$ at 77°F . The distributor shall be energized in this manner for 6 hours.

4.10.19 Low temperature stall. To determine conformance to 3.5.7.4.9, the distributor with breaker apparatus at the point of actuation, shall be placed in a test chamber at $-65^\circ \pm 5^\circ\text{F}$ for 24 hours. The distributor shall be energized from two 6TN batteries connected in series. The batteries shall be fully charged, in good condition, with electrolyte having a corrected specific gravity of $1.280 \pm .005$ at 77°F . The distributor shall be energized in this manner for 6 hours.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the Military Service's system commands. 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 that may be helpful, but is not mandatory.)

6.1 Intended use. Distributors finished under this specification are intended for use in military motor vehicles, or other military equipment requiring waterproof ignition system.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. PIN see 1.2.
- c. Quantity required.
- d. Whether first article inspection is waived (see 3.2.1).
- e. Packaging requirements (see 5.1).

6.3 Definitions.

6.3.1 Point of actuation. Point of actuation is that point on the circumference of the distributor actuating device (see 6.3.2) at which current is actuates in the secondary circuit.

6.3.2 Distributor shaft actuating device. Distributor shaft actuating device is that portion of the distributor that operates the mechanism that actuates current in the secondary circuit.

6.3.3 Breaker point design. Distributors in which the secondary circuit is actuated by a switch (contact set) operated by a positive contact with the distributor actuating device (cam), whether or not the switch is in primary circuit should be referred to as “breaker point design” (class 1).

6.3.4 Breakerless design. Distributors in which the secondary circuit actuation is induced by various non-mechanical means should be referred to as “breakerless design” (class 2).

6.3.5 Recovered materials. “Recovered materials” means materials that have been collected or recovered from solid waste (see 6.3.6).

6.3.6 Solid waste. “Solid waste” means (a) any garbage, refuse, or sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility; and (b) other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities. It does not include solid or dissolved material in domestic sewage, or solid or dissolved material in irrigation return flows or industrial discharges which are point sources subject to permits under section 402 of the Clean Water Act, (33 U.S.C. 1342 et seq.) or source nuclear, or byproduct material as defined by the atomic Energy Act of 1954 (42 U.S.C. 2011 et seq.) (Source: Federal Acquisition Regulations, section 23.402).

6.4 High peak voltage test generator. Equipment to produce the high peak voltage necessary to calculate electrical resistance, as specified in 4.10.15.1 may be of any design producing requiring parameters. Information pertaining to approved equipment and test methods may be obtained from the US Army Tank-Automotive Command, ATTN: AMSTA-GDS, Warren, Michigan 48397-5000.

6.5 Environmentally preferable material. Environmentally preferable materials should be used to the maximum extent possible to meet the requirements of this specification. As of the dating of this document, the U.S. Environmental Protection Agency (EPA) is focusing efforts on reducing 31 priority chemicals. The list of chemicals and additional information is available on their website <http://www.epa.gov/osw/hazard/wastemin/priority.htm>. Use of these materials should be minimized or eliminated unless needed to meet the requirements specified herein (see Section 3).

6.6 First article. The contracting officer should include specific instructions in acquisition documents regarding arrangements for examinations, approval of first article test results, and disposition of first article samples. Invitations 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.

6.7 Guidance on use of alternative parts with less hazardous or non-hazardous materials. This specification provides for a number of alternative plating materials via the PIN. Users should select the PIN with the least hazardous material that meets the form, fit, and function requirements of their application.

6.8 Subject term (key word) listing:

- Direct current
- Electrical components
- Mounting
- Rotor shaft
- Shock resistance
- Vehicles

6.9 Changes from previous issue. The margins of this specification are marked with vertical lines to indicate where changes from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and

MIL-DTL-13791H

contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

CONCLUDING MATERIAL

Custodians:

Army - AT
Navy - SH
DLA - CC

Preparing activity:
DLA - CC

(Project 2920-2015-001)

Review activities:

Army - CR, CR4
Navy - MC

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <https://assist.dla.mil>.