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Land Sea Air and Space®

INTERNATIONAL

400 Commonwealth Drive, Warrendale, PA 15096-0001

Submitted for recognition as an American National Standard

## AEROSPACE STANDARD

AS 28B

Issued 3-1-42

Revised 11-5-87

Superseding AS 28A

### SPARK PLUGS, AIRCRAFT ENGINE

#### THIS REVISION CONTAINS ONLY EDITORIAL CHANGES

1. SCOPE: This specification covers reciprocating engine shielded and unshielded spark plugs.
2. CLASSIFICATION: Spark plugs covered by this specification shall be of the following type and sizes, as specified:

#### 14MM

1/2" Reach British Whitworth Thread Barrel  
1/2" Reach 5/8"-24 Thread Barrel  
3/8" Reach 5/8"-24 Thread Barrel

#### 18MM

13/16" Reach 5/8"-24 Thread Barrel  
13/16" Reach 3/4"-20 Thread Barrel  
1/2" Reach 5/8"-24 Thread Barrel  
1/2" Reach 3/4"-20 Thread Barrel  
1/2" Reach Unshielded

3. APPLICABLE DOCUMENTS:

- 3.1 The following documents shall form a part of this specification to the extent specified herein. The applicable issue of each shall be that in effect on the date of the Aerospace Standard unless otherwise agreed between manufacturer and purchaser. Supplementary specifications, standards, etc., which by reference in any of the following publications are indicated to be part thereof, shall not be considered as effective except as specifically stated in the manufacturer's detail specification or as may be otherwise mutually agreed upon between the manufacturer and the purchaser.

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Drawings

AS 368 Spark Plug Thread Form Data  
ARP 590 Spark Plug - Aircraft Reciprocating Engine  
AS 678 Gasket - Folded Steel Spark Plug  
AN 4027 Gasket - Spark Plug  
AND 10219 Spark Plug - 14MM British Type Shielded

Specifications

MIL-F-5572 Gasoline Aviation, Grades 80/87, 91/96, 100/130, 115/145  
MIL-C-6529 Compound - Aircraft Engine Corrosion Preventive  
MIL-E-25111 Engines - Aircraft - Reciprocating - Qualification Tests for

4. REQUIREMENTS:

- 4.1 Strength: The spark plug shall be capable of withstanding an installation torque of 75 foot-pounds for 18MM spark plugs and 55 foot-pounds for 14MM spark plugs without permanent distortion or development of gas leakage in excess of that allowed in Paragraph 5.2.6. For this test, the threads shall be lubricated with Corrosion Preventive Compound, MIL-C-6529 Type III.
- 4.2 Gap Design and Setting: The gap between the electrodes of the spark plug shall be as specified by the procuring agency. The gap shall not contract or expand sufficiently at maximum engine operating temperature to interfere with engine operation. The design of the gap shall be such that electrodes can be reset when the gap becomes too wide for satisfactory operation. Electrode design shall be such that spark plugs can be satisfactorily cleaned and serviced.
- 4.3 Interchangeability: All removable parts of spark plugs of the same type and model shall be interchangeable with corresponding parts furnished by the same vendor.
- 4.4 Screw Threads: All threaded connections used in the construction of spark plugs except internal threads shall conform to screw thread standards listed in the latest issue of AS 368 and the requirements of the applicable drawing.
- 4.5 Lubrication - Threads: Unless otherwise specified, a thin coating of corrosion preventive compound conforming to Specification MIL-C-6529, Type III, shall be applied to the threads of each spark plug before shipment.
- 4.6 Packaging: Spark Plugs shall be so packed as to insure that no damage will accrue to the spark plug threads or internal parts during shipment.
- 4.7 Gasket: Unless otherwise specified, each spark plug shall be furnished with a solid copper gasket of the appropriate size as listed in AN 4027 drawing. When specified, each 18MM spark plug shall be furnished with a gasket conforming to AS 678.

4.8 Markings: Each spark plug shall be permanently and legibly marked to contain the following information:

Manufacturer's Name  
Manufacturer's Type Designation  
and Latest Change Letter  
Date Code Indicating Date of Manufacture

4.8.1 Markings may appear on either the shielding barrel or shell hexagon of shielded plugs and on the  
Ø insulator, shell or shell hexagon of unshielded plugs, or packaging identification (of gap setting only).

4.9 Dimensions: Spark plugs shall be in accordance with the dimensions shown on the applicable drawings unless otherwise specified.

4.10 Performance Limits: The design of the spark plug shall be such that operation at temperatures up to those producing preignition and after firing shall be possible without material or structural failure for a period of time equal to that required during the prescribed heat rating test.

5. QUALIFICATION TESTS: These tests shall be conducted by or at the direction of the purchaser unless otherwise agreed upon between the purchaser and the manufacturer.

5.1 Samples: Samples for qualification test shall consist of three complete sets of plugs for the engines in which the manufacturer desires qualification.

5.2 Tests:

5.2.1 Examination of Product: Each spark plug shall be carefully examined externally to determine conformance with this specification with respect to material, workmanship and general requirements.

5.2.2 Resistor Test: Each spark plug shall be checked for stability of internal resistance and/or contact by measurement of the center wire resistance by the use of a low voltage ohmmeter (8 volts or less). Center wire resistance values of any spark plug which has been subjected to engine operation shall be within the limits of plus 100% or minus 50% of the values listed by the spark plug manufacturer. Any spark plug showing a resistance value outside of the above-specified limits must pass a reference test utilizing a 1000-volt megger ohmmeter. The above limits shall apply for the referee test.

5.2.3 Electrical Test of Insulator: Each spark plug insulator shall be tested before assembly for electrical breakdown at a voltage of not less than 15 KV peak. The voltage shall be impressed so that the entire periphery of the ceramic is subjected to the electrical potential.

5.2.4 Electrical Testing of Shielding Barrel Insulators - Two-Piece Insulator Only: Each insulator used in the shielding barrel of a shielded plug shall be tested before assembly in accordance with Insulator Test 5.2.3.

#### 5.2.4 Electrical Testing of Shielding Barrel Insulators - Two-Piece Insulator Only: (Continued)

In this case, a mandrel shall be used instead of the center electrode, with sufficient voltage applied to cause sparking over the insulator sleeve between the mandrel and test fixture ring; no sparking shall occur through the insulator sleeve. Any evidence of breakdown shall be cause for rejection.

5.2.5 Dielectric Test: There shall be no indication of insulation breakdown when the assembled plugs are tested with the gaps extinguished for three seconds and a minimum potential equivalent to 9,000 volts (rms) is applied to the center electrode. If there is indication of failure, further checks shall be made to determine that shielding barrel flashover has not occurred because of foreign matter or high humidity. Flashover of clean, dry, shielding barrel insulators shall not be cause of rejection.

5.2.6 Gas leakage: Each spark plug shall be installed in a pressure bomb at room temperature and the firing end subjected to a gas pressure of 800 psi. The rate of leakage through the plug shall not exceed 20 cc. in a five-minute period. For this test the spark plugs shall be installed with the threads lubricated with 1010 oil, and they shall be torqued in at 36 ft. lb. An approved gasket shall be used at the spark plug seat.

#### 5.2.7 Heat Rating Tests:

5.2.7.1 For Qualification Test: When spark plugs are submitted for Qualification Test, the number of plugs to be subjected to the heat rating test shall be at least one-half of the number required for the type of engine for which the spark plugs are to be qualified but not less than ten. The spark plugs shall be installed in a cylinder head designed for the particular thread length of spark plug to be rated. No spacers of a thickness other than that of a standard gasket may be permitted under the gasket seat. A description of the above test engine can be secured from the manufacturer (Laboratory Equipment Corporation, Mooresville, Indiana). The test procedure and engine operation conditions shall be as specified in the SAE Recommended Practice, "Preignition Rating of Spark Plugs for Ground Vehicles" in the latest issue of the SAE Handbook. The individual ratings of a given lot of spark plugs shall be within 90% and 110% of the average of all the ratings of the lot. If one or more samples is not within 90% and 110% of the average, a duplicate set of specimens shall be obtained and rated. If the second group of samples is within 90% and 110% of the average ratings, the spark plugs may be accepted. If samples of the second lot are not within 90% and 110% of the average of all the ratings, the procuring agency will consult with the manufacturer to determine the action to be taken. When the average rating of the new spark plug is being established during the Qualification Test, that rating shall be agreed upon by the testing agency and the manufacturer.

5.2.7.2 For Inspection Tests: Samples selected in accordance with Paragraph 7.1 shall be subjected the heat rating test. Test procedure and requirements for individual ratings shall be the same as described in Paragraph 5.2.7.1 above.

5.2.8 Tests After Heat Rating: Upon completion of the Heat Rating Tests, the plugs shall be subjected to the following tests in the order shown:

|                 |                        |
|-----------------|------------------------|
| Paragraph 5.2.5 | Dielectric Test        |
| Paragraph 5.2.2 | Resistor Test          |
| Paragraph 5.2.6 | Gas Leakage Test       |
| Paragraph 5.2.1 | Examination of Product |

Before the above tests are conducted, the spark plugs should be examined to see that the firing ends are not covered with carbon or oil deposits. If deposits are present, the spark plugs should be cleaned before these tests. Failure of the spark plugs to satisfactorily pass the above tests may be cause for rejection.

5.3 Ground Endurance Test: A Ground Endurance Test of at least 150 hours shall be completed with plugs installed in approximately one-half the cylinders of a service engine. Plugs of an approved type shall be installed in the remaining cylinders. All spark plugs, both for which qualification is desired and the approved spark plugs, shall either have the gaps set accurately to .001" tolerance or a record shall be made of all gaps at the time of installation. The tests shall be conducted in accordance with the 150-hour endurance run for the particular type of engine as outlined in Specification MIL-E-25111 using fuel recommended for the particular engine being used. The fuel shall contain the maximum amount of tetraethyl lead as permitted under Specification MIL-F-5572. The specific fuel consumption shall be maintained within limits of plus 3, minus 0 percent of the minimum guaranteed values specified in the engine model specification for the corresponding powers and speeds. After the Ground Endurance Test, the average increase in the gap between the electrodes shall be determined at room temperature. If this increase is greater for the test plugs than for the approved plugs, the plug model under test may be rejected. If engine malfunction is experienced which is attributable to premature failure of the spark plug prior to the completion of the 150-hour model test, this shall be reason for rejecting the test spark plugs.

5.3.1 Tests After Ground Endurance: Upon completion of ground endurance testing, plugs shall be subjected to the following tests in the order shown:

|                 |                        |
|-----------------|------------------------|
| Paragraph 5.2.5 | Dielectric Test        |
| Paragraph 5.2.2 | Resistor Test          |
| Paragraph 5.2.6 | Gas Leakage Test       |
| Paragraph 5.2.1 | Examination of Product |

Failure of the plugs to satisfactorily pass the above tests may be cause for rejection.