

MILITARY SPECIFICATION SHEETSTARTER, AIRCRAFT ENGINE, AIR TURBINE. MODEL A-29

The complete requirements for procuring the air turbine starter described herein shall consist of this document and the issue in effect of Specification MIL-S-19557C (AS).

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SPECIFICATION

- 3.8.1 Envelope: Figure 1
- 3.7 Wt, Max (Lb): 23
- 3.7.1 Overhung Moment, Max (In Lb): 625
- 6.3.1 Aircraft Model: S-3
- 4.5.16 Engine Model: TF34
- 3.8.2.1 Quick-Attach-Detach Mounting: Buttonhole-type mounting flange
in accordance with MS 3332-2 (Type G)
- 3.8.2.2 Engine Accessory Drive: MS 3327-9S
- 3.8.3 Air Inlet and Exhaust Connections: Figure 1
- 3.5.5 Rotation Viewed from Anti-Drive End: Clockwise
- 3.9.1
- 3.3.2 Exposure Temperature Range (°F): -100 to +350
- 3.3.2 Ambient Temperature Operating Range (°F): -65 to +160
- 3.3.2.3 Control Valve:
- 4.5.1.1 Opening Rate, Max: 22 psig per sec in the first .5 Sec.
- 4.5.6 Opening Time, Max: 3.0 sec.
- Closing Time, Max: 2.0 sec
- Navy Model: Not Assigned
- 3.5.1 Rated Conditions:
- Output Drive Speed (RPM): 2100
- Output Drive Torque, Min (Lb-Ft): 140
- Airflow, Max (Lb per Min): 70
- Air Inlet Total Pressure Max (In, Hg A): 90
- Air Inlet Total Temperature Max (°F): 33±25
- 3.5.1 Cutout Speed (RPM): 3900 ± 100
- 3.5.7
- 3.5.7 Automatic Shutoff Control: Either turbine wheel speed or output
drive speed may be sensed for control operation.

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3.5.8 Altitude: The starter shall be capable of meeting rated speed and output torque at 8000-ft altitude at rated inlet conditions. The starter shall not be damaged when subjected to 75,000-ft altitude in the overrunning mode of operation.

3.5.9 Attitude: The starter shall be capable of meeting the operational requirements of this specification when the starter centerline, taken through the output shaft, is in any position within 10 degrees of the horizontal position, unless specified otherwise on this Specification Sheet.

4.5.4 Initial Calibration:

<u>Drive Torque</u> (Lb-Ft)	<u>Drive Speed</u> (RPM)	<u>Drive Speed</u> <u>Condition</u>
272 Min, 500 Max	0	Stall
140 Min -----	2100	Rated
50 Min -----	3800 Min	cutout
<u>Airflow, Max</u> (Lb per Min)	<u>Drive Speed</u> (RPM)	<u>Drive Speed</u> <u>Condition</u>
70	0	Stall

4.5.5 No-Load Operation:

Time (Sec): 60
Minimum Drive Speed (RPM): 5200

3.3.5 Endurance Test: Number of cycles: 1200. Each cycle shall consist of three consecutive phases as follows:

Test Stand Rotor Polar Moment of Inertia Lb-Ft ²	<u>Phase A -</u> <u>Acceleration</u>		<u>Phase B -</u> <u>At Following Conditions</u>			<u>Phase C -</u> <u>Acceleration</u>	
	<u>Drive</u> <u>Speed</u>	<u>Time</u>	<u>Drive</u> <u>Speed</u>	<u>Drive</u> <u>Torque</u>	<u>Time</u>	<u>Drive</u> <u>Speed</u>	<u>Time</u>
	RPM	Max Sec	RPM	Lb-Ft (Min)	Sec	Min RPM	Sec
300	2100	8	2100	140	10	3100	12
*300	2300	8	2300	---	10	3100	12

*Last 600 cycles only; run at 800°F air inlet temperature.

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NOTE: The above values do not allow for flywheel windage losses, test stand drag, or inertia of the starter. In order to determine compliance with this specification, the test equipment must be calibrated and specific tests results corrected accordingly. If the acceleration specified for Phase C is not developed because of test stand drag torque, the test stand inertia load may be reduced or external power may be applied to assist acceleration to cutout speed. Time from end of Phase C to starter cutout shall not exceed 15 seconds.

4.5.8 Rated Torque Calibration:

Minimum Output Drive Speed (RPM): 2100
Airflow, Max (Lb per Min): 70

3.3.5 Overrunning: The starter output drive shall be driven for 1000
4.5.9 hours in a clockwise direction (viewed from the anti-output shaft end) in accordance with the following tabulation. The ambient air temperatures, starter output drive speeds, and attitudes shall vary in accordance with the following tabulation while the stater pad temperature is maintained at 350°F ± 20°F. The attitude transitions are to be completed within 30 seconds.

<u>Time</u> <u>Minutes</u>	<u>Attitude</u> <u>±20</u> <u>(See Note)</u>	<u>Ambient</u> <u>Temperature</u> <u>±10°F</u>	<u>Drive Speed</u> <u>RPM</u> <u>..0, +500</u>
4	0°	130	7500
6	+45°	130	7500
4	0°	130	7500
1	+90°	130	7500
30	0°	370	7500
1	-90°	130	7500
4	0°	130	7500
6	-45°	130	7500
4	0°	130	7500

NOTE: Position of the starter anti-drive end with respect to the horizontal centerline.

After 300 hours of overrunning the starter shall be subjected to 300 endurance test cycles. Lubricant addition or change is permitted only after the 300 endurance test cycles.

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4.5.10 Extreme Temperature Operation:

<u>Inlet Air Conditions</u>		
<u>Total Press.</u>	<u>Total</u>	<u>Ambient</u>
<u>In. Hg A ± 0.5</u>	<u>Temp. ($^{\circ}$F)</u>	<u>Temp ($^{\circ}$F)</u>
110	280	-40
78	800	+160

4.5.11 Consecutive Cyclical Operation: Number of cycles: 5

4.5.12 Sustained Motoring: Time (Minutes): 5 on
30 off
5 on
30 off
start

4.5.13 Vibration: MIL-STD-810, Method 514, Procedure I, Curve F (Parts 1, 2, and 3).

4.5.15.1 Slip Clutch Torque, Max (Lb-Ft): 1000

4.5.15.2 Shear Section Strength, (Lb-Ft): 950+50

4.5.18 Containment Tests: Applicable

4.5.18.1 HUB Containment Test:

Inlet Air Pressure (PSIA): 49
Inlet Air Temperature (OF'): 345

4.5.18.2 Failure at No-Load:

Inlet Air Pressure (PSIA): 110
Inlet Air Temperature (F): 760

Project No. 2995-N028-9

SPECIFICATION ANALYSIS SHEET		Form Approved Budget Bureau No. 22-R255
INSTRUCTIONS: This sheet is to be filled out by personnel, either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity. Comments and suggestions submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or serve to amend contractual requirements.		
SPECIFICATION MIL-S-19557/9(AS) STARTER, AIRCRAFT ENGINE, AIR TURBINE MODEL A-29		
ORGANIZATION		
CITY AND STATE	CONTRACT NUMBER	
MATERIAL PROCURED UNDER A <input type="checkbox"/> DIRECT GOVERNMENT CONTRACT <input type="checkbox"/> SUBCONTRACT		
1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE? A. GIVE PARAGRAPH NUMBER AND WORDING.		
B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES		
2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID		
3. IS THE SPECIFICATION RESTRICTIVE? <input type="checkbox"/> YES <input type="checkbox"/> NO (If "yes", in what way?)		
4. REMARKS (Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)		
SUBMITTED BY (Printed or typed name and activity - Optional)		DATE

DD FORM 1426
1 JAN 66

REPLACES EDITION OF 1 OCT 64 WHICH MAY BE USED.

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