

**TWO-STROKE-CYCLE GASOLINE ENGINE LUBRICANT EVALUATION**  
**D4858 ASTM TC SEQUENCE III Test Procedure**  
**Title / Validity Declaration Page**

**VERSION**

CONDUCTED FOR

	I = Invalid
	V =Valid

<b>Non-Reference</b>
Primary Oil Code:
Test Number:
EOT Date:
EOT Time:
Alternate Codes:

I certify that test number \_\_\_\_\_ was conducted to the best of my knowledge, in accordance with the conditions specified in Test Method D4858. The results of this test indicate that the candidate lubricant \_\_\_\_\_ demonstrated performance equal to or better than that of the reference lubricant within the tolerences specified in Test Method D4858.

SUBMITTED BY:

\_\_\_\_\_

Testing Laboratory

\_\_\_\_\_

Signature

\_\_\_\_\_

Typed Name

\_\_\_\_\_

Title

# TWO-STROKE-CYCLE GASOLINE ENGINE LUBRICANT EVALUATION D4858 ASTM TC SEQUENCE III

## Objective

This procedure is designed to evaluate the performance of a two-cycle engine lubricant relative to the incidence of deposit-induced engine malfunction. Specifically, the following characteristics are considered:

1. Preignition
2. Spark Plug Fouling
3. Exhaust Blockage

## Summary of Procedure

The engine employed is an air-cooled, single cylinder Yamaha CE50S engine with the following general specifications:

Displacement	3.0 cu. in.(49 cm) 3
Cylinder Bore	1.57 in. (40 mm)
Stroke	1.54 in. (39.2 mm)
Compression Ratio	7.2:1

The cylinder head is fitted with a combustion chamber thermocouple to facilitate observation of preignition frequency and severity (magnitude). The engine is assembled with a new piston, rings, piston pin, gaskets, muffler, and spark plug. Other components are replaced as necessary.

A two-hour cyclic break-in is completed before each test begins. Next, the cylinder head is re-torqued and the engine is run until it is stabilized at test operating conditions. At this time the 50-hour test begins. These are the test conditions:

Engine, r/min	4000 ± 100
Engine Load	W.O.T.
Spark Plug Gasket Temp., °C	392 ± 5
Fuel Oil Ratio	20:1

Test operation is halted whenever any one of three engine malfunctions occur:

1. Major Preignition - a sudden increase in combustion chamber temperature 18°F or greater.
2. Spark Plug Fouling - a rapid decrease in spark plug gasket temperature accompanied by engine speed, torque, and combustion chamber temperature decreases.
3. Exhaust Blockage - a constant torque reading of 10% below nominal torque.

The test is restarted after appropriate correction of malfunction. Correction many consist of cleaning piston and cylinder head, replacement of spark plug, or replacement of muffler.

At the conclusion of the test, the number of occurrences of the above malfunctions is used to rate a non-reference lubricant.

The non-reference oil shall have no more than 1 major preignition in a test period of 50 h.

**TWO-STROKE-CYCLE GASOLINE ENGINE LUBRICANT EVALUATION  
ASTM TC SEQUENCE III**

**SUMMARY OF ENGINE TEST RESULTS  
YAMAHA CE50S TIGHTENING TEST**

<u>Sponsor Code:</u> _____	<u>Test Number:</u> _____	<u>Start Date:</u> _____
<u>Lab Code:</u> _____	<u>Fuel Oil Ratio:</u> _____	<u>E.O.T. Date:</u> _____
<u>Fuel Code:</u> _____	<u>Stand Number:</u> _____	<u>Hours:</u> _____
<u>Industry Oil Code:</u> _____		

Test Conditions Data

<u>Miscellaneous</u>	<u>Maximum</u>	<u>Minimum</u>	<u>Average</u>
Engine Speed, r/min			
Observed Load, hp			
Corrected Load, hp*			
Fuel Flow, lb/h.			
Exhaust Back Press. in. H2O			
Barometer, in. Hg			

Temperature, °F

Spark Plug  
Combustion Chamber  
Exhaust  
Fuel  
Intake Air, Carburetor  
Ambient  
Wet  
Dry

	<u>Preignition</u>	<u>Spark Plug</u>	<u>Exhaust</u>
	<u>Major</u>	<u>Minor</u>	<u>Change</u>
Totals			

Previous Reference Data

<u>Code</u>	<u>Test No.</u>	<u>Date</u>	<u>Preignition</u>
			<u>Major</u> <u>Minor</u>

<sup>A</sup> Corrected To:  
Barometric Pressure - 29.92  
Temperature - 60°F

**TWO-STROKE-CYCLE GASOLINE ENGINE LUBRICANT EVALUATION  
ASTM TC SEQUENCE III**

**SUMMARY OF ENGINE TEST RESULTS  
YAMAHA CE50S TIGHTENING TEST**

Sponsor Code: \_\_\_\_\_ Lab Code: \_\_\_\_\_ Test Number: \_\_\_\_\_

Test Conditions Data

<u>Test</u> <u>Hours</u>	<u>Preignition, °F</u> <u>Major</u>	<u>Minor</u>	<u>Spark Plug</u> <u>Change</u>	<u>Exhaust</u> <u>Change</u>
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**TWO-STROKE-CYCLE GASOLINE ENGINE LUBRICANT EVALUATION  
ASTM TC SEQUENCE III**

**SUMMARY OF ENGINE TEST RESULTS  
YAMAHA CE50S TIGHTENING TEST**

Sponsor Code: \_\_\_\_\_ Lab Code: \_\_\_\_\_ Test Number: \_\_\_\_\_

Test Conditions Data

<u>Test</u> <u>Hours</u>	<u>Preignition, °F</u> <u>Major</u>	<u>Preignition, °F</u> <u>Minor</u>	<u>Spark Plug</u> <u>Change</u>	<u>Exhaust</u> <u>Change</u>
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**TWO-STROKE-CYCLE GASOLINE ENGINE LUBRICANT EVALUATION  
ASTM TC SEQUENCE III**

**SUMMARY OF ENGINE TEST RESULTS  
YAMAHA CE50S TIGHTENING TEST**

Sponsor Code: \_\_\_\_\_ Lab Code: \_\_\_\_\_ Test Number: \_\_\_\_\_

Test Conditions Data

<u>Test</u> <u>Hours</u>	<u>Preignition, °F</u> <u>Major</u>	<u>Minor</u>	<u>Spark Plug</u> <u>Change</u>	<u>Exhaust</u> <u>Change</u>
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**TWO-STROKE-CYCLE GASOLINE ENGINE LUBRICANT EVALUATION  
ASTM TC SEQUENCE III**

**SUMMARY OF ENGINE TEST RESULTS  
YAMAHA CE50S TIGHTENING TEST**

Sponsor Code: \_\_\_\_\_ Lab Code: \_\_\_\_\_ Test Number: \_\_\_\_\_

Engine Inspection

Merit  
Number

Piston Varnish

Thrust  
Anti-Thrust  
Average

Top Ring Land  
Second Ring Land  
Undercrown

Ring Sticking  
Top Ring  
Second Ring

Cylinder Liner Varnish

Wristpin Varnish  
Wristpin Bearing Varnish

Deposits  
Piston Crown  
Cylinder Head  
Exhaust Port Clogging

Piston Scuffing  
Thrust  
Anti-Thrust

Cylinder Linder Scuffing

Total CRC Demerit  
Top Ring Land  
Second Ring Land

**TWO-STROKE-CYCLE GASOLINE ENGINE LUBRICANT EVALUATION  
ASTM TC SEQUENCE III TEST PROCEDURE**

<b>Test Oil Code:</b>	<b>Test Number:</b>	<b>EOT Date:</b>
Total Number of Remarks or Deviations  <u>Remark or Deviation</u>		



**TWO-STROKE-CYCLE GASOLINE ENGINE LUBRICANT EVALUATION  
ASTM TC SEQUENCE III TEST PROCEDURE**

<b>Test Oil Code:</b>	<b>Test Number:</b>	<b>EOT Date:</b>
Total Number of Remarks or Deviations <u>Remark or Deviation</u>		

**TWO-STROKE-CYCLE GASOLINE ENGINE LUBRICANT EVALUATION  
ASTM TC SEQUENCE III TEST PROCEDURE**

<b>Test Oil Code:</b>	<b>Test Number:</b>	<b>EOT Date:</b>
Total Number of Remarks or Deviations  <u>Remark or Deviation</u>		

**TWO-STROKE-CYCLE GASOLINE ENGINE LUBRICANT EVALUATION  
ASTM TC SEQUENCE III**

**SUMMARY OF ENGINE TEST RESULTS**

<b>Lab:</b>	<b>EOT Date:</b>	<b>End Time:</b>
<b>Stand:</b>	<b>Run Number:</b>	
<b>Formulation / Stand Code:</b>		
<b>Supplier:</b>	<b>Batch Identifier:</b>	

Measurement	Specs.	Analysis	Test Method
Gravity, °API			
Color			
Doctor Test			
Copper Corrosion, 3h @ 212 °F	1 Maximum		D 130
Reid Vapor Pressure, psig			
Research Octane Number			
Motor Octane Number			
(Research + Motor) / 2			
Total Sulfur, % Weight	0.04 - 0.05		D 2622
Gum, mg/100 mL			
Oxidation Stability, min			
Lead, g/gal			
<b>Distillation, °C</b>			
IBP	Report		D 86
10%	Report		D 86
50%	Report		D 86
90%	282 - 338		D 86
EP	Report		D 86
Recovery, %			
<b>Pona, % vol</b>			
Paraffins + Napthenes			
Olefin	Report		D 1319
Aromatics % Vol.	28 - 33		D 1319