

**Report Forms  
Sequence VIII Engine Evaluation of Engine Oils**

**Form 1**

Version  
Conducted For

	V = Valid
	I = Invalid

	NR = Non-reference oil
	RO = Reference oil

<b>Test Number</b>			
Test Stand	Power Section	Number of Runs on Power Section Since Calibration Test	Total Runs on Power Section
Date Completed:		Completion Time:	
Oil Code:			
Formulation/Stand Code:			
Alternate Codes:			

<p>In my opinion this test _____ been conducted in a valid manner in accordance with the Sequence VIII Test Method D6709 and the appropriate amendments through the Information Letter System. The remarks included in this report describe anomalies associated with this test.</p>
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SUBMITTED BY:

\_\_\_\_\_ Testing Laboratory

\_\_\_\_\_ Signature

\_\_\_\_\_ Typed Name

\_\_\_\_\_ Title

## Form 2

### Sequence VIII Engine Evaluation of Engine Oils

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**Sequence VIII Engine Evaluation of Engine Oils**  
**Form 3**  
**Summary of Test Method**

The Sequence VIII test is designed to evaluate crankcase lubricating oils for their copper and lead corrosion control capabilities. It also evaluates shear stability under high temperature operating conditions.

The Sequence VIII involves steady state operation of the single cylinder CLR oil evaluation engine. After a 4-hour break-in and a 1/2-hour flush, the engine is operated under constant speed, air-fuel ratio and fuel flow conditions for an additional 40 hours. Prior to each run, the engine is thoroughly cleaned, and pertinent measurements of the engine parts are taken. A new piston, piston rings, and copper/lead connecting rod bearing are installed. The cylinder head is also reconditioned.

The key operating conditions for this procedure are as follows:

<b>Parameter</b>	<b>Set Point</b>
Duration	40 h
Speed	3150 ± 25 r/min
Load	Adjusted to provide proper fuel flow at the specified Air-to-Fuel Ratio
Fuel Flow	2.25 ± 0.11 kg/h
Air-to-Fuel Ratio	13.43 ± 0.5
Engine Jacket Out Coolant Temperature	93.5 ± 1°C
Engine Jacket Coolant Temperature Delta	5.6 ± 1°C
Gallery Oil Temperature	135.0 or 143.5 ± 1°C <sup>B</sup>
Crankcase Off Gas	850 ± 28 SCL/h <sup>A</sup>

<sup>A</sup> Controlled by adding sufficient ambient air to rocker box to achieve an Off Gas Flow of 30 ft<sup>3</sup>/h

<sup>B</sup> 135°C for SAE 5W, 10W; 143.5°C for SAE 20,30,40,50 and multi-viscosity grade oils.

This test utilizes an unleaded fuel named "KA24E" which has a green identifying dye. It is supplied by Haltermann Products.

At the conclusion of the test, the engine is disassembled and the performance of the oil being tested is judged by the following:

- 1) By the weight loss of the copper/lead big end connecting rod bearing.
- 2) By periodic oil sample analysis.

## Sequence VIII Engine Evaluation of Engine Oils

### Form 4 Test Results

Laboratory		Oil Code	
Date Completed		Time Completed	
Test Number			
Formulation/Stand			

SAE Viscosity		Oil Temperature (135.0° or 143.5°C)	
Laboratory Oil Code		Date Started	
Test Fuel Type		Time Started	
Test Fuel Lot		Bearing Batch No.	
Bearing Oil Storage Lead, ppm <sup>A</sup>		Bearing Lot	
Test Length		Industry Reference Oil Code <sup>A</sup>	

<b>Bearing Weight Loss Summary</b>	
Test Length @ Measurement, hours	
Top Bearing Half, mg	
Bottom Bearing Half, mg	
Total, mg	
Industry Correction Factor	
Severity Adjustment (non-reference tests only)	
Final Bearing Weight Loss, mg	

Hours	Viscosity cSt @ 40°C	Viscosity cSt @ 100°C	Stripped Viscosity cSt @ 100°C
New Oil			
10			

<sup>A</sup> Reference Oil Tests Only

**Sequence VIII Engine Evaluation of Engine Oils  
Form 5  
Operational Summary**

Laboratory		Oil Code	
Date Completed		Time Completed	
Test Number			
Formulation/Stand			

Test Parameter	Specification	Minimum	Maximum	Average
Speed, r/min	3150 ± 25			
Air-to-Fuel Ratio	13.43 ± 0.5			
Fuel Flow, kg/h	2.25 ± 0.11			
Output, W	Record			
Oil Heater Input, W (optional)	Record			
Crankcase Off Gas, L/h	850 ± 28			
Temperatures	Specification	Minimum	Maximum	Average
Gallery Oil <sup>A</sup> , °C	143.5 or 135.0 ± 1			
Coolant In, °C	Record			
Coolant Out, °C	93.5 ± 1			
Coolant Delta, °C	5.6 ± 1			
Intake Air, °C	Record			
Pressures	Specification	Minimum	Maximum	Average
Oil, kPa	276 ± 14			
Intake Manifold Vacuum, kPa	Record			
Exhaust, kPa	0 to 3.4			
Crankcase Vacuum, kPa	0.50 ± 0.12			
Spark Advance, °BTDC	35 ± 1			
Blowby, L/h	Record			

Oil Consumption <sup>B</sup>	Initial Oil Charge (ml)	New Oil Added (ml)	Oil Samples (ml)	Final Oil Drain (ml)
Total Oil Consumption:				

<sup>A</sup> 135°C for SAE 5W, 10W; 143.5°C for SAE 20,30,40,50 and multi-viscosity grade oils.

<sup>B</sup> Total Oil Consumption = (Initial Oil Charge + New Oil Added) – (Oil Samples + Final Oil Drain)

**Sequence VIII Engine Evaluation of Engine Oils  
Form 6  
Parts Measurement and Critical Parts Listing**

Laboratory		Oil Code	
Date Completed		Time Completed	
Test Number			
Formulation/Stand			

Power Section Measurements, mm				
Measurement	Specification	Minimum	Maximum	Average
Valve Stem Clearance in Guide, Inlet	0.0508 – 0.1016			
Valve Stem Clearance in Guide, Exhaust	0.0762 – 0.1270			
Connecting Rod Bearing Clearance	0.0610 – 0.0762			
Main Bearing Clearance, Front	0.0508 – 0.0762			
Main Bearing Clearance, Rear	0.0508 – 0.0762			
Connecting Rod Journal Out-of-Round	0.0254 Maximum			

Runs on Liner		Liner may be used as long as the piston-to-liner clearance is in the specified range.
Piston to Liner Clearance		0.0305 to 0.0635 mm

Critical Parts Listing	
Parts	ID Code
Crankshaft	
Camshaft	
Main Bearings	
Camshaft Bearings	
Connecting Rod	
Piston	
Cylinder Liner	















**Sequence VIII Engine Evaluation of Engine Oils**

**Form 9**

**Deviation of Operational Parameters**

Laboratory		Oil Code	
Date Completed		Time Completed	
Test Number			
Formulation/Stand			

<b>Primary Parameter</b>	<b>Maximum Permitted Deviation Percentage</b>	<b>Calculated Total Deviation Percentage</b>
Engine Oil Gallery Temperature	2.5%	
Engine Coolant Outlet Temperature	2.5%	
Engine Coolant Temperature Delta	2.5%	
Fuel Flow	2.5%	
Crankcase Off Gas	2.5%	
Oil Pressure	2.5%	
<b>Secondary Parameter</b>		
Engine Speed	5%	
Air-to-Fuel Ratio	5%	
Spark Advance	5%	
Exhaust Pressure	5%	
Crankcase Vacuum	5%	

**Sequence VIII Engine Evaluation of Engine Oils**  
**Form 10**  
**Data Acquisition System Details**

Laboratory		Oil Code	
Date Completed		Time Completed	
Test Number			
Formulation/Stand			

Parameter (1)	Sensing Device (2)	Calibration Frequency (3)	Record Device (4)	Observation Frequency (5)	Record Frequency (6)	Log Frequency (7)	System Response (8)
<b>TEMPERATURES</b>							
Oil Gallery							
Coolant Out							
Coolant Delta							
<b>OTHER</b>							
Fuel Flow							
Engine Speed							
Air-to-Fuel Ratio							
Exhaust Pressure							
Crankcase Off Gas							
Oil Pressure							
Crankcase Vacuum							

**LEGEND:**

- (1) OPERATING PARAMETER
- (2) THE TYPE OF DEVICE USED TO MEASURE TEMPERATURE, PRESSURE OR FLOW
- (3) FREQUENCY AT WHICH THE MEASUREMENT SYSTEM IS CALIBRATED
- (4) THE TYPE OF DEVICE WHERE DATA IS RECORDED  
 LG -HANDLOG SHEET  
 DL -AUTOMATIC DATA LOGGER  
 SC - STRIP CHART RECORDER  
 CIM - COMPUTER, USING MANUAL DATA ENTRY  
 C/D -COMPUTER, USING DIRECT I/O ENTRY
- (5) DATA ARE OBSERVED BUT ONLY RECORDED IF OFF SPEC
- (6) DATA ARE RECORDED BUT ARE NOT RETAINED AT EOT
- (7) DATA ARE LOGGED AS PERMANENT RECORD, NOTE SPECIFY IF:  
 SS -SNAPSHOT TAKEN AT SPECIFIED FREQUENCY  
 AG/X AVERAGE OF X DATA POINTS AT SPECIFIED FREQUENCY
- (8) TIME FOR THE OUTPUT TO REACH 63.2% OF FINAL VALUE FOR STEP CHANGE AT INPUT
- (9) SEE ANNEX AII FOR PROCEDURE TO DETERMINE SYSTEM RESPONSE OF THE CHARACTERISTICS OF THE ACQUISITION SYSTEM.

**Sequence VIII Engine Evaluation of Engine Oils  
Form 11**

**American Chemistry Council Code of Practice  
Test Laboratory Conformance Statement**

Test Laboratory					
Test Sponsor					
Formulation / Stand Code					
Test Number					
Start Date		Start Time		Time Zone	

***Declarations***

No. 1 All requirements of the ACC Code of Practice for which the test laboratory is responsible were met in the conduct of this test. Yes \_\_\_\_\_ No \_\_\_\_\_\*

No. 2 The laboratory ran this test for the full duration following all procedural requirements; and all operational validity requirements of the latest version of the applicable test procedure (ASTM or other), including all updates issued by the organization responsible for the test, were met.  
Yes \_\_\_\_\_ No \_\_\_\_\_\*

If the response to this Declaration is “No”, does the test engineer consider the deviations from operational validity requirements that occurred to be beyond the control of the laboratory? Yes \_\_\_\_\_\* No \_\_\_\_\_

No 3. A deviation occurred for one of the test parameters identified by the organization responsible for the test as being a special case. Yes \_\_\_\_\_\* No \_\_\_\_\_ (*This currently applies only to specific deviations identified in the ASTM Information Letter System*)

***Check The Appropriate Conclusion***

	Operational review of this test indicates that the results should be included in the Multiple Test Acceptance Criteria calculations.
	*Operational review of this test indicates that the results should not be included in the Multiple Test Acceptance Criteria calculations.

*Note: Supporting comments are required for all responses identified with an asterisk.*

<b>Comments</b>	

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Typed Name

\_\_\_\_\_  
Title