



# Test Monitoring Center

6555 Penn Avenue  
Pittsburgh, PA 15206-4489  
(412) 365-1000

SEQUENCE VIII INFORMATION LETTER NO. 02-2

Sequence No. 4

November 18, 2002

***ASTM consensus has not been obtained on this information letter. An appropriate ASTM ballot will be issued in order to achieve such consensus.***

TO: Sequence VIII Mailing List

SUBJECT: Test Method D6709 Editorial Revisions

This information letter implements action items approved by the Sequence VIII Surveillance Panel. This information letter addresses specific parts and procedures pertaining to quality, consistency, performance, and accountability of test parts as part of the ongoing effort by the panel to ensure continual process improvement of the Sequence VIII test. This information letter references the latest published version of the Sequence VIII procedure, Test Method D6709-01.

### Test Method D6709-01 Editorial Revisions

On October 31, 2002, the Sequence VIII Surveillance Panel approved a motion via e-ballot to make a number of editorial revisions to Test Method D6709. These revisions are included in the attached updated sections of test method.

Fred Gerhart  
Chairman  
Sequence VIII Surveillance Panel

John L. Zalar  
Administrator  
ASTM Test Monitoring Center

Attachment

c: [ftp://ftp.astmtmc.cmu.edu/docs/gas/sequenceviii/procedure\\_and\\_ils/il02-2.pdf](ftp://ftp.astmtmc.cmu.edu/docs/gas/sequenceviii/procedure_and_ils/il02-2.pdf)

Distribution: Email

1.5 This test method is arranged as follows:

Subject	Section
Introduction	
Scope	1
Referenced Documents	2
Terminology	3
Summary of Test Method	4
Before Test Starts	4.1
Power Section Installation	4.2
Engine Operation (Break-in)	4.3
Engine Operation (Test/Samples)	4.4
Stripped Viscosity	4.5
Test Completion (BWL)	4.6
Significance and Use	5
Evaluation of Automotive oils	5.1
Stay in Grade Capabilities	5.2
Correlation of Results	5.3
Use	5.4
Apparatus	6
Test Engineering, Inc.	6.1
Fabricated or Specially Prepared Items	6.2
Instruments and Controls	6.3
Procurement of Parts	6.4
Reagents and Materials	7
Reagents	7.1
Cleaning Materials	7.2
Expendable Power Section-Related Items	7.3
Power Section Coolant	7.4
Reference Oils	7.5
Test Fuel	7.6
Test Oil Sample Requirements	8
Selection	8.1
Inspection	8.2
Quantity	8.3
Preparation of Apparatus	9
Test Stand Preparation	9.1
Conditioning Test Run on Power Section	9.2
General Power Section Rebuild Instructions	9.3
Reconditioning of Power Section After Each Test	9.4
Calibration	10
Power Section and Test Stand Calibration	10.1
Instrumentation Calibration	10.2
Calibration of AFR Measurement Equipment	10.3
Calibration of Torque Wrenches	10.4
Engine Operating Procedure	11
Run-In and Flush	11.1
Test Operating Conditions	11.2
Air-Fuel Ratio and Spark Advance	11.3
Air, Off-Gas and Blowby Measurement	11.4
Unscheduled Shutdowns	11.5
Oil Sampling and Oil Addition	11.6
Periodic Measurements	11.7
Final Oil Drain and Oil Consumption Computation	11.8
Operational Validity Criteria	11.9
Test Completion	11.10
Determination of Test Results	12
Oil Analysis	12.1
Test Bearing Weight Loss Determination	12.2
Report	13
Precision and Bias	14
Precision	14.1
Bias	14.2
Use of ASTM Rounding	15
Keywords	16
ANNEXES	
Measurement of Connecting Rod Bearing Clearance and Journal Taper	Annex A1
Measurement of Main Bearing Clearance	Annex A2
The ASTM Test Monitoring Center Calibration Program	Annex A3
Measurement of Piston-to-Sleeve Clearance	Annex A4
Control Chart Technique for a Laboratory's Severity Adjustment (SA)	Annex A5
Recommended New Liner Honing Procedure	Annex A6
Sequence VIII Oil Priming Procedure	Annex A7
Alternative Crankcase Breather Configuration	Annex A8
Connecting Rod Bearing Cleaning Procedure	Annex A9
Electronic Ignition Conversion	Annex A10
System Response Procedure	Annex A11
Air-Fuel Ratio Measurement	Annex A12
Lead Decontamination Procedure	Annex A13

Stay-in-Grade Oil Analysis Procedure	Annex A14
Crankshaft Rear Seal Conditioning	Annex A15
Report Forms & Data Dictionary	Annex A16

APPENDIXES	
Role of the ASTM Test Monitoring Center and the Calibration Program	Appendix X1
Suggested Method for Salvaging Camshaft Bearing Journals	Appendix X2
Data Log Sheets	Appendix X3

3.2.6 *full-length test, n*—a test of an engine oil conducted using a power section and a test stand that runs 4 1/2-h run-in, 2-h flush and 40 h at test conditions. (See 10.1.3.1, exception for 10-h stay in grade test).

3.2.15 *run-in and flush, n*—the initial 4 1/2-h operation of a new, rebuilt, or reconditioned power section at the beginning of either a conditioning test run or a full-length test.

4.1 Before every Sequence VIII engine oil test, thoroughly clean the power section of the CLR oil test engine, and measure the power section parts. Install a new or cleaned used piston, a complete set of new piston rings, a set of new copper-lead connecting rod test bearing inserts (from a batch approved by the ASTM D02.B0.01 Sequence VIII Test Surveillance Panel), and other specified parts as required.

4.3 The engine is first operated for 4 h according to a run-in schedule shown in Table 1 (See 11.1).

7.6.1 *Fuel Batch Approval*—New batches of KA24E Test Fuel are approved for use by the Subcommittee D02.B0.01 Sequence IVA Surveillance Panel.<sup>A</sup>

<sup>A</sup> Contact the TMC for contact information for the D02.B0.01 Sequence IVA Surveillance Panel.  
{Footnote A is new; insert and renumber footnotes as appropriate.}

7.6.2 *Fuel Batch Analysis*—Details are available from Subcommittee D02.B0.01 Sequence IVA Surveillance Panel.

7.6.3 *Laboratory Storage Tank Fuel Analysis*—Details are available from Subcommittee D02.B0.01 Sequence IVA Surveillance Panel.

7.6.4 *Fuel Batch Shipment and Storage*—Details are available from Subcommittee D02.B0.01 Sequence IVA Surveillance Panel.

10.1.4.2 Submit all reference oil test reports to the TMC for review and acceptance. (See LTMS for reference oil test acceptance criteria<sup>36</sup>). The Test Results sheet for test reports on engine oils other than reference oils (See A16) shall include the test number and completion date of the power section reference oil test(s) used to calibrate the power section/test stand used for the test.

11.1 Run-In and Flush—At the beginning of each test, perform the following 4-h run-in and 1/2-h flush:

11.1.6 Charge the power section with 1660 mL of fresh test oil. Prior to starting the engine and any restarts during the 1/2-h flush, perform the oil priming procedure in Annex A7.

11.1.7 Flush the power section for 1/2 h under the following operating conditions:  $3150 \pm 25$  r/min,  $3.73 \pm 0.15$  kW,  $35 \pm 1^\circ$  before top dead center (BTDC) spark advance,  $107.0^\circ\text{C}$  maximum oil gallery temperature,  $93.5^\circ\text{C}$  maximum water jacket outlet temperature, and  $280 \pm 10$  kPa oil gallery pressure. Do not energize the oil heater during this period. Record the operational data prior to shutdown using forms of the type shown in Figs. X3.1 and X3.2.

11.1.7.2 During the shutdown between the 4-h run-in and 1/2-h flush, consider any time in excess of 85 min as off-test time counted against the 4 h limit listed in 11.1.7.1.

11.1.7.3 During the shutdown after the 1/2-h flush, consider any time in excess of 145 min as off-test time counted against the 2-h limit for the first interval listed in 11.1.7.

12.2.1 If applicable adjust the total bearing weight loss, according to the procedure in Annex A5. Record the severity adjustments (SA) in the test report (see A16).

13.1 For reference oil tests, the standardized report form set and data dictionary for reporting test results and for summarizing the operational data are required.

13.2 Use Forms 1, 2, 4, 5, 6, 7, and 8 (see A16) for initial transmission of reference oil test results to the TMC.

14.1 Precision—Test precision (that is, intermediate precision and reproducibility) is established on the basis of reference oil test results (for operationally-valid tests) monitored by the TMC. The limits, including standard deviations, are given in Table 4. They were computed by the TMC from test results obtained on TMC reference oils 704-1 and 1006 and apply as of June 23, 2003. Respective precision limits were obtained by multiplying respective standard deviations by 2.8.

14.1.1 *Intermediate Precision (formerly called repeatability) Conditions*—Conditions where test results are obtained with the same test method using the same test oil, with changing conditions such as operators, measuring equipment, test stands, test engines, and time.

14.1.1.1 *Intermediate Precision Limit (i.p.)*—The difference between two results obtained under intermediate precision conditions that would in the long run, in the normal and correct conduct of the test method, exceed the values shown in Table 4 in only one case in twenty.

14.1.2 *Reproducibility Condition*—Conditions where test results are obtained with the same test method using the same test oil in different laboratories with different operators using different equipment.

14.1.2.1 *Reproducibility Limit (R)*—The difference between two results obtained under reproducibility conditions that would, in the long run, in the normal and correct conduct of the test method, exceed the values in Table 4 in only one case in twenty.

14.2 Bias—Bias is determined by applying an acceptable statistical technique to reference oil test results. When a significant bias is obtained, a severity adjustment is permitted for non-reference oil test results. Contact the TMC for TMC Memo 94-200 (Lubricant Test Monitoring System document).

TABLE 2 Test Operating Conditions

Item	Setting
Speed, r/min	3150 ± 25
Load bhp	Adjust load to provide proper fuel flow at specified air-fuel ratio.
Fuel flow, kg/h (lb/h)	2.15 ± 0.11 (4.75 ± 0.25)
Air-fuel ratio	13.43 ± 0.5
Jacket outlet coolant Temperature, °C (°F)	93.5 ± 1 (200± 2)
Difference between jacket Inlet and jacket outlet Coolant temperatures, °C (°F)	5.6 ± 1 (10± 2)
Gallery oil temperature, °C (°F)	
SAE 5W, 10W	135 ± 1 (275 ± 2)
SAE 20, 30, 40, 50, and multiviscosity-graded oils	143.5 ± 1 (290 ± 2)
Spark advance, °BTDC	35 ± 1
Oil pressure, kPa (psi)	276 ± 14 (40± 2)
Crankcase vacuum, Pa (in. H <sub>2</sub> O)	500 ± 120 (2 ± 0.5)
Exhaust back pressure, Pa (in. Hg)	0 to 3.4 (0 to 1)
Crankcase off-gas, SLH	850 ± 28
Blowby, SLH	Record

**TABLE 4 Reference Oil Test Precision Limits**

Variable	$S_{i.p.}$	$i.p.$	$S_R$	$R$
Bearing weight loss, mg	3.56	9.99	3.56	9.99
Stripped viscosity, cSt at 100°C	0.13	0.36	0.13	0.36

Note—Legend:

- $S_{i.p.}$  = intermediate precision standard deviation
- $i.p.$  = intermediate precision
- $S_R$  = reproducibility standard deviation
- $R$  = reproducibility

## A16. REPORT FORMS & DATA DICTIONARY

A16.1 Download the actual report forms and data dictionary separately from the ASTM Test Monitoring Center Web Page at <ftp://ftp.astmtmc.cmu.edu/datadict/viii/>; or obtain them in hardcopy format from the TMC.<sup>2</sup>

### Sequence VIII Forms

- |     |  |         |
|-----|--|---------|
| 1.  | Title / Validity Declaration Page            | Form 1  |
| 2.  | Table of Contents                            | Form 2  |
| 3.  | Summary of Test Method                       | Form 3  |
| 4.  | Test Results                                 | Form 4  |
| 5.  | Operational Summary                          | Form 5  |
| 6.  | Parts Measurement and Critical Parts Listing | Form 6  |
| 7.  | Downtime Occurrences and Other Comments      | Form 7  |
| 8.  | Operational Outliers Occurrences             | Form 8  |
| 9.  | Deviations of Operational Parameters         | Form 9  |
| 10. | Data Acquisition System Details              | Form 10 |

*{Figures A16.1 through A16.10 have been deleted.}*

*{Section A17 has been deleted.}*

"LABORATORY NAME"  
SEQUENCE VIII TEST DATA LOG SHEET

RUN NUMBER \_\_\_\_\_  
(Stand-Engine-Runs Since Reference-Total Runs)

ENGINE NUMBER \_\_\_\_\_

STAND NUMBER \_\_\_\_\_

OIL CODE \_\_\_\_\_

HEADER	RUN-IN					FLUSH	
	OBSERVER						
	DATE						
	TIME						
	TOTAL HOURS ON "RUN-IN" OR "FLUSH"	1	2	3	4		1/2
TEST PARAMETER							
ENGINE	ENGINE SPEED (Specified, ± 25 r/min)	1500	2000	2500	3150	3150	
	ENGINE SPEED (Actual, r/min)						
	ENGINE OUTPUT (Specified, ± 150 W)	1500	3000	3700	3700	3730	
	ENGINE OUTPUT (Actual, W)						
TEMPERATURES	OIL GALLERY (107.0 °C MAX)						
	COOLANT OUTLET (93.5 °C MAX)						
	**COOLANT INLET (Record, °C)						
	**COOLANT DIFFERENTIAL (5.6 ± 1 °C)						
	**CARBURETOR INTAKE AIR (Record, °C)						
	**EXHAUST (Record, °C)						
PRESSURES	OIL GALLERY (280 ± 10 kPa)						
	**CRANKCASE VACUUM (.500 ± .120 kPa)						
	**EXHAUST BACK PRESSURE (0 to 3.4 kPa)						
	**INTAKE VACUUM (Record, kPa)						
FLOWS	**FUEL (2.15 ± 0.11 kg/h @ 3150 r/min)						
	**CARBURETOR AIR (Record, kg/h)						
	**AIR FUEL RATIO (13.43 ± 0.5)						
	**CRANKCASE OFF-GAS (850 ± 28 SLH)						
	**ROCKER AIR (Record, SLH)						
	**BLOWBY (approx. 280 ± 60 SLH)						
MISC	IGNITION ADVANCE (Specified, ± 1° Before Top Dead Center, BTDC)	25	25	35	35	35	
	IGNITION ADVANCE (Actual, BTDC)						
	OIL HEATER POWER (W)	Oil Heater not in Oil Circuit.				OFF	

\*\* Recommended but Not Required.

**Required Oil Charge & Sample Volumes**

Run-in Oil Charge: 2840mL

Flush Oil Charge: 1660mL

Test Oil Charge: 1660mL

Purge Sample: 60mL

Oil Sample: 180mL

New Oil Additions: 240mL

FIG. X3.1 Run-in and Flush Data Log Sheet

Page Number \_\_\_\_\_

"LABORATORY NAME"  
SEQUENCE VIII TEST DATA LOG SHEET

RUN NUMBER \_\_\_\_\_  
(Stand-Engine-Runs Since Reference-Total Runs)

ENGINE NUMBER \_\_\_\_\_

STAND NUMBER \_\_\_\_\_

OIL CODE \_\_\_\_\_

		Column No. ----->	1	2	3	4	5	6	7	8	9	10
HEADER	OBSERVER											
	DATE											
	TIME											
	TOTAL HOURS ON STEADY-STATE TEST											
TEST PARAMETER												
ENG	ENGINE SPEED (3150 ± 25 r/min)											
	ENGINE OUTPUT (Record, W)											
TEMPERATURES	OIL GALLERY (135 ± 1°C: SAE 5W, 10W oils) (143.5 ± 1°C: SAE 20, 30, 40, 50 & multigrade oils)											
	COOLANT OUTLET (93.5 ± 1°C)											
	COOLANT INLET (Record, °C)											
	COOLANT DIFFERENTIAL (5.6 ± 1 °C)											
	CARBURETOR INTAKE AIR (Record, °C)											
PRESSURES	OIL GALLERY (280 ± 10 kPa)											
	CRANKCASE VACUUM (.500 ± .120 Pa)											
	EXHAUST BACK PRESSURE (0 to 3.4 kPa)											
	INTAKE VACUUM (Record, kPa)											
FLOWS	FUEL (2.15 ± 0.11 kg/h)											
	*CARBURETOR AIR (approx. 30.2 kg/h)											
	*AIR FUEL RATIO (13.43 ± 0.5)											
	CRANKCASE OFF-GAS (850 ± 28 SLH)											
	ROCKER AIR (Record, SLH)											
	BLOWBY (approx. 280 ± 60 SLH)											
MISC	*IGNITION ADVANCE (35 ± 1° Before Top Dead Center, BTDC)											
	OIL HEATER POWER (Optional, record if used for oil temp control, W)											

\* Required during Hours: 1, 10, 20 and 30.

FIG. X3.2 Test Data Log Sheet