D 6838
M11
High Soot Lubricant Performance Test

Version

Conducted For:

	V =Valid; The Reference Oil/Non-Reference Oil Was Evaluated In Accordance With The Test Procedure.
	I = Invalid; The Reference Oil/Non-Reference Oil Was Not Evaluated In Accordance With The Test Procedure.
	N = Not interpretable; The Non-Reference Oil Results Cannot Be Interpreted And Shall Not Be Used For Multiple Test Acceptance.

Stand	Engine No.	Engine Run No.
End Of Test Date	End Of Test Time	
Oil Code/CMIR:[A]		
Formulation/Stand Code		
Altcode1	Altcode2	Altcode3

In my opinion this test been conducted in a valid manner in accordance with ASTM Test Method D 6838 and the appropriate amendments through the information letter system. The remarks included in this report describe the anomalies associated with this test.

[A] CMIR or Non-Reference Oil Code

Submitted By: _____
Testing Laboratory

_____
Signature

_____
Typed Name

_____
Title

D6838
M11 High Soot Lubricant Performance Test
Non-Reference Oil Test Summary
Form 1

Formulation/Stand Code			Test Length
Oil Code No.			
Test Lab	**Test Stand No.**	**Engine Block Serial No.**	**Engine Run Number**

Date Test Started	
Start Time	
Date Test Completed	
EOT Time	
Stand Calibration Expiration Date	
Total Test Hours On Engine	
Engine Kit Serial Number	
Laboratory Oil Code	
SAE Viscosity	
Total Oil Consumption, kg	
TGA Soot % At 150 Hours	

	Adjusted Average Crosshead Mass Loss, (mg)	**+ Filter Plugging Delta P, (kPa)**	**Average Sludge Rating, (merits)**
Original Result			
Transformed Result [A]			
Industry Correction Factor [A]			
Corrected Result [A]			
Severity Adjustment (Lab Based) [A]			
Severity Adjustment Result [A]			
Final Original Unit Result			

[A] Filter Plugging Delta P Value in Transformed Units

D6838
M11 High Soot Lubricant Performance Test
Reference Oil Test Summary
Form 1A

CMIR Code No.		Test Length	
TMC Oil No.			
Test Lab	**Test Stand No.**	**Engine Block Serial No.**	**Engine Run Number**

Date Test Started	
Start Time	
Date Test Completed	
EOT Time	
Stand Calibration Expiration Date	
Total Test Hours On Engine	
Engine Kit Serial Number	
Laboratory Oil Code	
SAE Viscosity	
Total Oil Consumption, kg	
TGA Soot % At 150 Hours (4.5 – 5.5)	

	Adjusted Average Crosshead Mass Loss, (mg)	**Filter Plugging Delta P, (kPa)**	**Average Sludge Rating, -(merits)**
Original Result			
Transformed Result [A]			
Industry Correction Factor [A]			
Corrected Result [A]			
Final Original Unit Result			

[A] Filter Plugging Delta P Value in Transformed Units

D 6838 M11 High Soot Lubricant Performance Test
Form 2
Operational Summary

Laboratory	EOT Date	EOT Time
Test Number		
Stand	Engine	Engine Run No.
Formulation/Stand Code		
Oil Code/CMIR		

	Parameter	Units	QI Threshold	EOT QI [A]	Target	Average	Samples [B]	BQD [C]	Over/Under Range [D]
Controlled Parameters	Speed	R/min	0.000		1800 1600				
	Fuel Flow	kg/h	0.000		53				
	Coolant Out	°C	0.000		88				
	Fuel In	°C	0.000		40				
	Oil Gallery	°C	0.000		115				
	Intake Manifold	°C	0.000		46				
	Exhaust	kPa	0.000		107				
Non-controlled Parameters	**Parameter**	**Units**	**Typical Values [E]**		**Average**				
	Torque	N-m	1262 – 1360	1505 - 1688					
	Power	kW	236 – 257	247 - 283					
	Blowby	L/min	73 – 195						
	Coolant In	°C	81 – 87						
	Intake Air	°C	29 – 37						
	Pre-Turbine (F)	°C	536 – 629						
	Pre-Turbine (R)	°C	548 – 628						
	Tailpipe	°C	406 – 498						
	Fuel	kPa	1048 – 1132						
	Oil Gallery	kPa	217 – 300						
	Coolant	kPa	99 – 107						
	Intake Manifold	kPa	163 – 291						
	Crankcase	kPa	0.5 – 3.4						
	Intake Air	kPa	92 – 99						

A Q1 values above the threshold are acceptable by the Mack Surveillance Panel. QI values below the threshold may not be considered acceptable based on an engineering review. Refer to Annex A5
B Total number of data points taken. Minimum acceptable value is 3000
C Number of Bad Quality Data points not used in the calculation of the statistical measures.
D Number of points clipped by over/under range limits.
E Typical values determined from reference oil test database

D 6838
M11 High Soot Lubricant Performance Test
Form 3
200 h Crosshead Mass Loss Summary

Laboratory	EOT Date	EOT Time
Test Number		
Stand	Engine	Engine Run No.
Formulation/Stand Code		
Oil Code/CMIR		

Location	Serial No.	Pretest Mass (g)	EOT Mass (g)	Mass Loss (mg)
1E				
1I				
2I				
2E				
3E				
3I				
4I				
4E				
5E				
5I				
6I				
6E				

Intake/Exhaust Summary	Intake		Exhaust	
	As Measured	Outlier Screened	As Measured	Outlier Screened
Average Crosshead Mass Loss (mg)				
Minimum Crosshead Mass Loss (mg)				
Maximum Crosshead Mass Loss (mg)				
Standard Deviation (mg)				
Outlier Crossheads Locations [A]				

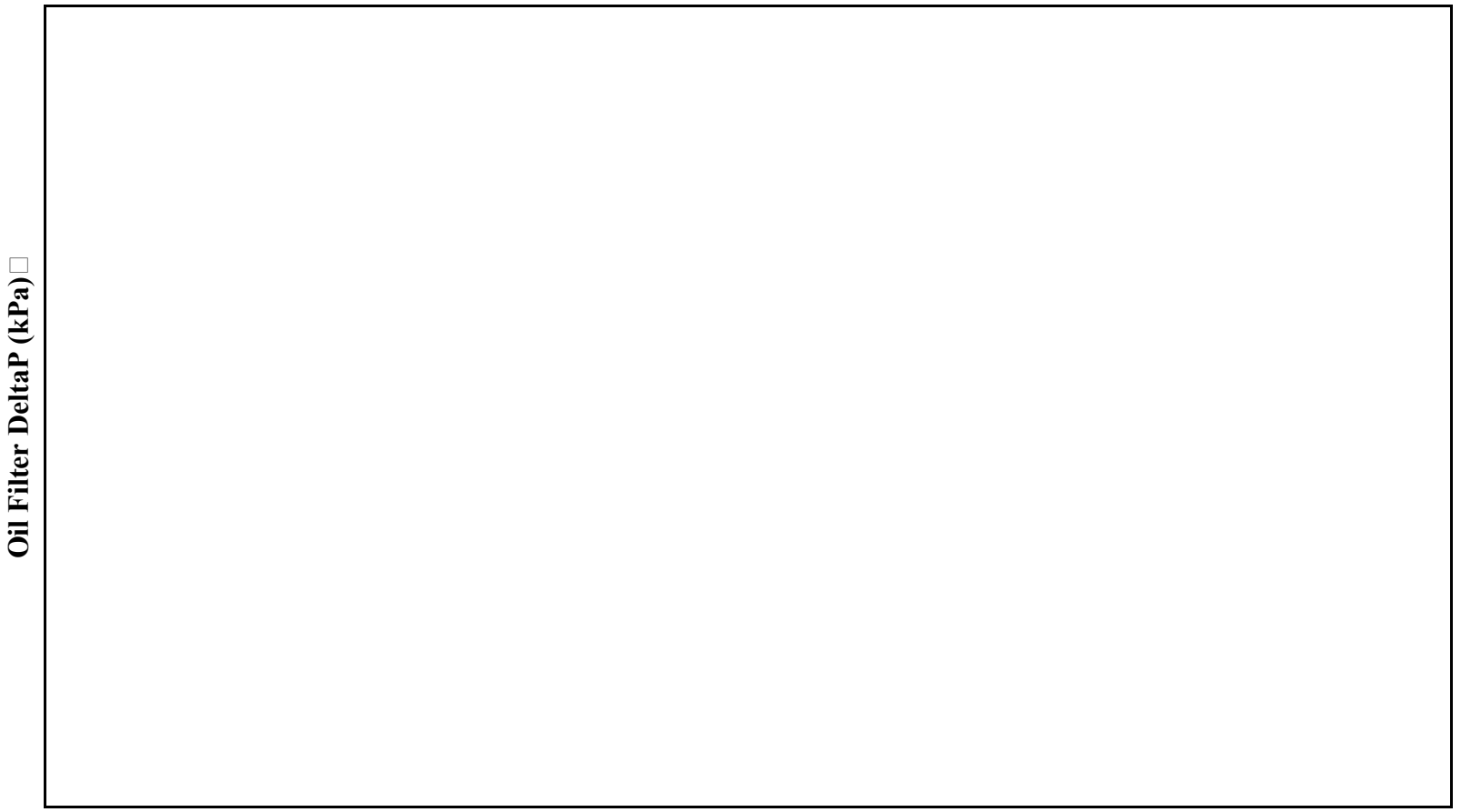
[A] Location Designation. Example: 3E

Overall Summary	As Measured	Outlier Screened	Adjusted to 4.5% Soot
Average Crosshead Mass Loss (mg)			
Minimum Crosshead Mass Loss (mg)			
Maximum Crosshead Mass Loss (mg)			
Standard Deviation (mg)			

D6838 M11 High Soot Lubricant Performance Test
Form 4
Oil Filter Delta Pressure Plot

Laboratory	EOT Date	EOT Time
Test Number		
Stand	Engine	Engine Run No.
Formulation/Stand Code		
Oil Code/CMIR		

Oil Filter Delta Pressure vs Test Hours



D 6838
M11 High Soot Lubricant Performance Test
Form 5
Sludge Rating Summary

Laboratory	EOT Date	EOT Time
Test Number		
Stand	Engine	Engine Run No.
Formulation/Stand Code		
Oil Code/CMIR		

Sludge Rating Summary

Sludge Depth	Valve Cover % of Area	Valve Cover Volume Factor	Oil Pan % of Area	Oil Pan Volume Factor
1/4A				
1/2A				
3/4A				
A				
AB				
B				
BC				
C				
D				
E				
F				
G				
H				
I				
J				
	Total Volume Factor		Total Volume Factor	
	Merit Rating		Merit Rating	
		Average Sludge Rating:		

D 6838
M11 High Soot Lubricant Performance Test
Form 6
Rod Bearing Mass Loss

Laboratory	EOT Date	EOT Time
Test Number		
Stand	Engine	Engine Run No.
Formulation/Stand Code		
Oil Code/CMIR		

Cylinder Number	Bearing Location	Pre-Test Mass (g)	Post-Test Mass (g)	Mass Loss (mg)
1	Upper			
	Lower			
2	Upper			
	Lower			
3	Upper			
	Lower			
4	Upper			
	Lower			
5	Upper			
	Lower			
6	Upper			
	Lower			

	Bearing Mass Loss
Average	
Minimum	
Maximum	
Standard Deviation (mg)	

D 6838
M11 High Soot Lubricant Performance Test
Form 7
Piston Rating Summary

Laboratory	EOT Date	EOT Time
Test Number		
Stand	Engine	Engine Run No.
Formulation/Stand Code		
Oil Code/CMIR		

Unweighted Demerits										
Piston Number	**Lands**				**Grooves**			**Under Crown**	**Oil Cooling Gallery**	**Total Demerits**
	1	2	3	4	1	2	3			
1										
2										
3										
4										
5										
6										
Average Demerits										
						Average Total Unweighted Demerits				

Parameter	**Piston Number**						**Average**
	1	2	3	4	5	6	
TGC							
TLC							

D 6838 M11 High Soot Lubricant Performance Test
Form 8
Piston 1 Deposit Ratings

Laboratory	EOT Date	EOT Time
Test Number		
Stand	Engine	Engine Run No.
Formulation/Stand Code		
Oil Code/CMIR		

	Grooves				**Lands**					**Grooves**		**Lands**				**Oil Cooling Gallery(2)**		**Under Crown(1)**	
	No. 1		No. 2		No. 1		No. 2			No. 3		No. 3		No. 4					
Dep. Factor	A,%	Dem.	A,%	Dem.	A,%	Dem.	A,%	Dem.	Dep. Factor	A,%	Dem.	A,%	Dem.	A,%	Dem.	A,%	Dem.	A,%	Dem.
CARBON																			
HC - 1.0																			
MC - 0.5																			
LC - .25																			
Total																			
VARNISH																			
8 – 9																			
7 - 7.9									7.5										
6 - 6.9																			
5 - 5.9																			
4 - 4.9									4.5										
3 - 3.9																			
2 - 2.9																			
1 – 1.9									1.5										
>0 - 0.9																			
Total																			
Rating																			
TGC%									Unweighted Dep.			T.L. Carbon				T.L. Flaked Carbon %			

D 6838 M11 High Soot Lubricant Performance Test
Form 9
Piston 2 Deposit Ratings

Laboratory	EOT Date	EOT Time
Test Number		
Stand	Engine	Engine Run No.
Formulation/Stand Code		
Oil Code/CMIR		

	Grooves				**Lands**					**Grooves**		**Lands**				**Oil Cooling Gallery(2)**		**Under Crown(1)**	
	No. 1		No. 2		No. 1		No. 2			No. 3		No. 3		No. 4					
Dep. Factor	A,%	Dem.	A,%	Dem.	A,%	Dem.	A,%	Dem.	Dep. Factor	A,%	Dem.	A,%	Dem.	A,%	Dem.	A,%	Dem.	A,%	Dem.
CARBON																			
HC - 1.0																			
MC - 0.5																			
LC - .25																			
Total																			
VARNISH																			
8 – 9																			
7 - 7.9									7.5										
6 - 6.9																			
5 - 5.9																			
4 - 4.9									4.5										
3 - 3.9																			
2 - 2.9																			
1 – 1.9									1.5										
>0 - 0.9																			
Total																			
Rating																			
TGC%									Unweighted Dep.			T.L. Carbon				T.L. Flaked Carbon %			

D6838 M11 High Soot Lubricant Performance Test
Form 10
Piston 3 Deposit Ratings

Laboratory	EOT Date	EOT Time
	Test Number	
Stand	Engine	Engine Run No.
Formulation/Stand Code		
Oil Code/CMIR		

	Grooves				**Lands**					**Grooves**		**Lands**				**Oil Cooling Gallery(2)**		**Under Crown(1)**	
	No. 1		No. 2		No. 1		No. 2			No. 3		No. 3		No. 4					
Dep. Factor	A,%	Dem.	A,%	Dem.	A,%	Dem.	A,%	Dem.	Dep. Factor	A,%	Dem.	A,%	Dem.	A,%	Dem.	A,%	Dem.	A,%	Dem.
CARBON																			
HC - 1.0																			
MC - 0.5																			
LC - .25																			
Total																			
VARNISH																			
8 – 9																			
7 - 7.9									7.5										
6 - 6.9																			
5 - 5.9																			
4 - 4.9									4.5										
3 - 3.9																			
2 - 2.9																			
1 – 1.9									1.5										
>0 - 0.9																			
Total																			
Rating																			
TGC%									Unweighted Dep.			T.L. Carbon				T.L. Flaked Carbon %			

D 6838 M11 High Soot Lubricant Performance Test
Form 11
Piston 4 Deposit Ratings

Laboratory	EOT Date	EOT Time
Test Number		
Stand	Engine	Engine Run No.
Formulation/Stand Code		
Oil Code/CMIR		

	Grooves				**Lands**					**Grooves**		**Lands**				**Oil Cooling Gallery(2)**		**Under Crown(1)**	
	No. 1		No. 2		No. 1		No. 2			No. 3		No. 3		No. 4					
Dep. Factor	A,%	Dem.	A,%	Dem.	A,%	Dem.	A,%	Dem.	Dep. Factor	A,%	Dem.	A,%	Dem.	A,%	Dem.	A,%	Dem.	A,%	Dem.
CARBON																			
HC - 1.0																			
MC - 0.5																			
LC - .25																			
Total																			
VARNISH																			
8 – 9																			
7 - 7.9									7.5										
6 - 6.9																			
5 - 5.9																			
4 - 4.9									4.5										
3 - 3.9																			
2 - 2.9																			
1 – 1.9									1.5										
>0 - 0.9																			
Total																			
Rating																			
TGC%									Unweighted Dep.			T.L. Carbon				T.L. Flaked Carbon %			

D 6838 M11 High Soot Lubricant Performance Test
Form 12
Piston 5 Deposit Ratings

Laboratory	EOT Date	EOT Time
Test Number		
Stand	Engine	Engine Run No.
Formulation/Stand Code		
Oil Code/CMIR		

	Grooves				**Lands**					**Grooves**		**Lands**				**Oil Cooling Gallery(2)**		**Under Crown(1)**	
	No. 1		No. 2		No. 1		No. 2			No. 3		No. 3		No. 4					
Dep. Factor	A,%	Dem.	A,%	Dem.	A,%	Dem.	A,%	Dem.	Dep. Factor	A,%	Dem.	A,%	Dem.	A,%	Dem.	A,%	Dem.	A,%	Dem.
CARBON																			
HC - 1.0																			
MC - 0.5																			
LC - .25																			
Total																			
VARNISH																			
8 – 9																			
7 - 7.9									7.5										
6 - 6.9																			
5 - 5.9																			
4 - 4.9									4.5										
3 - 3.9																			
2 - 2.9																			
1 – 1.9									1.5										
>0 - 0.9																			
Total																			
Rating																			
TGC%									Unweighted Dep.			T.L. Carbon				T.L. Flaked Carbon %			

D 6838 M11 High Soot Lubricant Performance Test
Form 13
Piston 6 Deposit Ratings

Laboratory	EOT Date	EOT Time
Test Number		
Stand	Engine	Engine Run No.
Formulation/Stand Code		
Oil Code/CMIR		

	Grooves				**Lands**					**Grooves**		**Lands**				**Oil Cooling Gallery(2)**		**Under Crown(1)**	
	No. 1		No. 2		No. 1		No. 2			No. 3		No. 3		No. 4					
Dep. Factor	A,%	Dem.	A,%	Dem.	A,%	Dem.	A,%	Dem.	Dep. Factor	A,%	Dem.	A,%	Dem.	A,%	Dem.	A,%	Dem.	A,%	Dem.
CARBON																			
HC - 1.0																			
MC - 0.5																			
LC - .25																			
Total																			
VARNISH																			
8 – 9																			
7 - 7.9									7.5										
6 - 6.9																			
5 - 5.9																			
4 - 4.9									4.5										
3 - 3.9																			
2 - 2.9																			
1 – 1.9									1.5										
>0 - 0.9																			
Total																			
Rating																			
TGC%									Unweighted Dep.			T.L. Carbon				T.L. Flaked Carbon %			

D 6838
M11 High Soot Lubricant Performance Test
Form 14
Ring Mass Loss Summary

Laboratory	EOT Date	EOT Time
Test Number		
Stand	Engine	Engine Run No.
Formulation/Stand Code		
Oil Code/CMIR		

Top Ring			
Cylinder No.	**Pretest Mass (g)**	**EOT Mass (g)**	**Mass Loss (mg)**
1			
2			
3			
4			
5			
6			
	Average Top Ring Mass Loss		
	Std. Dev. Top Ring Mass Loss		
	Maximum Top Ring Mass Loss		
	Minimum Top Ring Mass Loss		

Second Ring			
Cylinder No.	**Pretest Mass (g)**	**EOT Mass (g)**	**Mass Low (mg)**
1			
2			
3			
4			
5			
6			
	Average Second Ring Mass Loss		
	Std. Dev. Second Ring Mass Loss		
	Maximum Second Ring Mass Loss		
	Minimum Second Ring Mass Loss		

D 6838
M11 High Soot Lubricant Performance Test
Form 15
Oil Analysis Summary

Laboratory	EOT Date	EOT Time
Test Number		
Stand	Engine	Engine Run No.
Formulation/Stand Code		
Oil Code/CMIR		

Test Hours	Viscosity @ 100°C, cSt	TGA % Soot	TBN D4739	TAN D664	Copper (ppm)	Iron (ppm)	Lead (ppm)
NEW							

D 6838
M11 High Soot Lubricant Performance Test
Form 16
Test Fuel Analysis (Last Batch)

Laboratory	EOT Date	EOT Time
Test Number		
Stand	Engine	Engine Run No.
Formulation/Stand Code		
Oil Code/CMIR		

Fuel Supplier	Fuel Batch Identifier

Measurement	Specifications	Analysis		Test Method
		New	EOT	
Total Sulfur, % Weight	0.03 - 0.05			D 2662
Gravity, °API	32 – 36			D 287 or D 4052
Hydrocarbon Composition				
Aromatics % Volume	28 – 35			D 1319
Olefin	Report			D 1319
Saturates	Report			D 1319
Cetane Index	Report			D 4737
Cetane Number	42 –48			D 613
Copper Strip Corrosion	3 Maximum			D 130
Flash Point, °C	54 Maximum			D 93
Cloud Point, °C	-12 Maximum			D 2500
Pour Point, °C	-18 Maximum			D 97
Carbon Residue on 10% Residuum, %	0.35 Maximum			D 524 (10% Bottoms)
Water & Sediment, % Volume	0.05 Maximum			D 2709
Ash, % Weight	0.01 Maximum			D 482
Viscosity, cSt @ 40 °C	2.0 - 3.2			D 445
Distillation, °C				
IBP	177 – 199			D 86
10%	210 – 232			D 86
50%	249 – 327			D 86
90%	299 – 327			D 86
EP	327 – 360			D 86

D 6838
M11 High Soot Lubricant Performance Test
Form 17
Unscheduled Downtime & Maintenance Summary

Laboratory	EOT Date	EOT Time
Test Number		
Stand	Engine	Engine Run No.
Formulation/Stand Code		
Oil Code/CMIR		

Number of Downtime Occurrences			
Test Hours	**Date**	**Downtime**	**Reasons**
			Total Downtime (hours)

Other Comments		
Number of Comment Lines		

D6838
M11 High Soot Lubricant Performance Test
Form 17A
Unscheduled Downtime & Maintenance Summary

Laboratory	EOT Date	EOT Time
Test Number		
Stand	Engine	Engine Run No.
Formulation/Stand Code		
Oil Code/CMIR		

Number of Downtime Occurrences			
Test Hours	**Date**	**Downtime**	**Reasons**
			Total Downtime (hours)

Other Comments		
Number of Comment Lines		

D 6838
M11 High Soot Lubricant Performance Test
Form 17B
Unscheduled Downtime & Maintenance Summary

Laboratory	EOT Date	EOT Time
Test Number		
Stand	Engine	Engine Run No.
Formulation/Stand Code		
Oil Code/CMIR		

Number of Downtime Occurrences			
Test Hours	**Date**	**Downtime**	**Reasons**
			Total Downtime (hours)

Other Comments		
Number of Comment Lines		

D 6838
M11 High Soot Lubricant Performance Test
Form 18
Characteristics Of The Data Acquisition System

Laboratory	EOT Date	EOT Time
Test Number		
Stand	Engine	Engine Run No.
Formulation/Stand Code		
Oil Code/CMIR		

Parameter (1)	Sensing Device (2)	Calibration Frequency (3)	Record Device (4)	Observation Frequency (5)	Record Frequency (6)	Log Frequency (7)	System Response (8)
Temperatures							
Oil Gallery							
Fuel In.							
Intake Air							
Intake Man.							
Pre-Turb.							
Cool. Out							
Pressure							
Inlet Air							
Exhaust							
Oil Gallery							
Other							
Fuel Flow							
Speed							
Load							

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
DL – Automatic Data Logger
C/D – Computer, Using Direct I/O Entry
(5) Data Are Observed But Only If Recorded 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

D 6838
M11 High Soot Lubricant Performance Test
Form 19
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.*

Comments

_____ _____
Signature Date

_____ _____
Typed Name Title