

# CATERPILLAR 1M-PC

Version

Conducted for-

	<b>V</b> = Valid
	<b>I</b> = Invalid
	<b>N</b> = Results Cannot Be Interpreted As Representative of Oil Performance (Non-Reference Oil) And Shall Not Be Used For Multiple Test Acceptance.

	<b>RO</b> = Reference Oil Test
	<b>NR</b> = All Other Tests

	Was This Test Run Under a Valid Calibration? ( <b>Y/N</b> )
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	Lab Is Currently Operating Under An LTMS Precision Alarm *
	Stand Is Currently Operating Under An LTMS Precision Alarm *

\* Check box only if YES

Test Number	
Test Stand:	Engine Run #:
EOT Time:	EOT Date:
Oil Code <sup>A</sup> :	
Formulation/Stand Code:	
Alternate Codes	

In my opinion this test	been conducted in a valid manner in accordance with the D 6618 and the appropriate amendments through the Information Letter System. The remarks included in this report describe the anomalies associated with this test.
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<sup>A</sup> CMIR or Non-Reference Oil Code

Submitted By:

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

\_\_\_\_\_ Signature

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

\_\_\_\_\_ Title

**CATERPILLAR 1M-PC**

**Form 1**

**Test Report Summary**

Lab	EOT Date	EOT Time
Stand	Run Number	
Formulation/Stand Code		
Oilcode		

Start Date	Total Test Length	TMC Oil Type
Laboratory Internal Oil Code		

	Correction Effective Date	WTD	TGF %	BSOC g/kW-h
Unadjusted Lab Rating				
Industry Correction(If Any)				
Subtotal				
Lab Severity Adjustment(If Any) <sup>A</sup>				
Total				

	Effective Date	WTD	TGF %	BSOC g/kW-h
Test Target Mean <sup>B</sup>				
Test Target Standard Deviation <sup>B</sup>				

	Referee Lab	WTD	TGF %	
Referee Ratings				

	Top	Int. 1	Int. 2	Oil	Piston	Liner
Ring Loss Of Side Clearance(mm)						
Ring End Gap Increase (mm)						
Is The Ring Stuck?						
Scuffed Area %						
Average Wear Step (mm)						

Notes: <sup>A</sup>Non-reference oil tests only

<sup>B</sup>Reference tests only

# CATERPILLAR 1M-PC

## Form 2

### Operational Summary

Lab	EOT Date	EOT Time
Stand	Run Number	
Formulation/Stand Code		
Oilcode		

Operating Condition	Minimum	Maximum	Average	Specification
Engine Speed				1800 ± 10
Engine Power				Report
Fuel Flow				8.13 ± 0.07
Humidity				17.8 ± 1.7
<b>Temperature</b>				
Coolant Out				87.8 ± 2.8
Coolant In				Report
Coolant delta T				Report
Oil To Bearing				96.1 ± 2.8
Oil Cooler In				Report
Inlet Air				123.9 ± 2.8
Exhaust				573 ± 28
<b>Pressures</b>				
Oil To Bearing				220.6 Max
Oil To Jet				165.5 ± 13.8
Inlet Air				179.0 ± 1
Exhaust (ABS)				106.7 ± 1.7
Fuel @ Filter HSG				137.9 ± 13.8
Crankcase Vacuum				0.25 ± 0.12
<b>Flows</b>				
Blowby				Report
Coolant Flow				57.9 ± 3.8

#### Assembly Measurements And Parts Record

Piston/Head Clearance mm				
Initial Viscosity @ 40°C cSt				
SAE Viscosity Grade				
	Part No. (1)	Serial No. (2)	Date Code	Inspection Code
Liner			C	D
Ring Set (1)			F	E
Piston			A	B

<sup>A</sup> Number below “E” located on top of piston

(1) And (2) Number On Parts Box Yellow Label

<sup>B</sup> Number on top of “E” located on top of piston

<sup>C</sup> Four alphanumeric characters (NNAN) on liner OD

<sup>D</sup> Four digit number on liner OD

<sup>E</sup> Three or four-digit number on white label on ring set box

<sup>F</sup> NN-NN from part number label on ring set box

**CATERPILLAR 1M-PC  
Form 3  
Operational Summary – Offset And Deviation**

Lab	EOT Date	EOT Time
Stand	Run Number	
Formulation/Stand Code		
Oilcode		

<b>Controlled Parameter</b>	<b>Allowable % Out</b>	<b>This Test % Out</b>	<b>Allowable % Off</b>	<b>This Test % Off</b>
Speed	5		20	
Fuel Flow	10		25	
Humidity	10		25	
Coolant Flow	5		25	
<b>Temperatures</b>				
Coolant Out	5		20	
Oil To Bearing	5		20	
Intake Air	5		20	
<b>Pressures</b>				
Oil Jet	5		25	
Intake Air	10		25	
Exhaust	10		25	
Fuel At Filter Housing	5		20	
Crankcase Vacuum	10		20	

# CATERPILLAR 1M-PC

## Form 4

### Piston Rating Summary

Test Identification															
Lab			EOT Date						EOT time						
Stand			Run Number												
Formulation/Stand Code															
Oilcode															
Test Method					Test Fuel					Fuel Batch					
Date Rated					Rating Number					Rater					
Last Stand Reference Information															
Date Completed				Stand #				Run #				TMC Oil Code			
WTD								TGF							
Industry Average WTD								Industry Average TGF							
Industry WTD STD								Industry TGF STD							
Total Piston Ratings Summary															
	Dep. Factor	Grooves								Lands					
		No. 1		No. 2		No. 3		No. 4		No. 2		No. 3		No. 4	
		A, %	Dem.	A, %	Dem.	A, %	Dem.	A, %	Dem.	A, %	Dem.	A, %	Dem.	A, %	Dem.
<b>Carbon</b>															
	HC-1.0														
	MC-0.5														
	LC-0.25														
	Total														
<b>Lacquer</b>	8-9														
	7-7.9														
	6-6.9														
	5-5.9														
	4-4.9														
	3-3.9														
	2-2.9														
	1-1.9														
	>0-0.9														
	Clean		0		0		0		0		0		0		0
	Total														
Summary															
		Grooves								Lands					
		1	2	3	4	2	3	4							
Rating															
Location FCT		1	10	35	70	3.5	20	35							
IND WTD Rating															
Total Weighted Demerit								Top Groove Filling, %							

**CATERPILLAR 1M-PC  
Form 4A  
Piston Rating Worksheet**

Lab	EOT Date	EOT Time
Stand	Run Number	
Formulation/Stand Code		
Oilcode		

**Refer to Appendix C for an example Piston Rating Worksheet.**

# CATERPILLAR 1M-PC

## Form 5

### Piston Rating Breakdown

Supplemental Piston Deposits(Groove Sides & Rings)															
Lab			EOT Date						EOT Time						
Stand			Run Number												
Formulation/Stand Code															
Oilcode															
Percentage Area Of Coverage															
Deposit		HC	MC	LC	9-8	7.9-7	6.9-6	5.9-5	4.9-4	3.9-3	2.9-2	1.9-1	0.9->0	Clean	
Skirt															
Undercrown															
Liner Above Ring Travel															
Piston Crown															
<b>Groove Top And Bottom</b>		1	T												
			B												
		2	T												
			B												
		3	T												
			B												
		4	T												
			B												
<b>Top Bottom And Back Of Rings</b>		1	T												
			B												
			BK												
		2	T												
			B												
			BK												
		3	T												
			B												
			BK												
		4	T												
			B												
			BK												
<b>Additional Deposit And Condition Ratings</b>															
A. Piston Crown															
B. Oil Ring Slots															
C. Piston Skirt															
D. Liner															
E. Rings															
F. Comments															

**CATERPILLAR 1M-PC**

**Form 5A**

**Referee Rating**

**Test Identification**

Lab	EOT Date	EOT Time
Stand	Run Number	
Formulation/Stand		
Oilcode		

**Referee Rating Information**

Company	Rating Number	Date Rated	Rater
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**Total Piston Ratings Summary**

	Dep. Factor	Grooves								Lands							
		NO. 1		NO. 2		NO. 3		NO. 4		NO. 2		NO. 3		NO. 4			
		A, %	Dem.	A, %	Dem.	A, %	Dem.	A, %	Dem.	A, %	Dem.	A, %	Dem.	A, %	Dem.		
<b>Carbon</b>	HC-1.0																
	MC-0.5																
	LC-0.25																
	Total																
<b>Lacquer</b>	8-9																
	7-7.9																
	6-6.9																
	5-5.9																
	4-4.9																
	3-3.9																
	2-2.9																
	1-1.9																
	>0-0.9																
	Clean		0		0		0		0		0		0		0		0
	Total																

	Grooves				Lands		
	1	2	3	4	2	3	4
Rating							
Location FCT	1	10	35	70	3.5	20	35
Ind. WTD Rating							
Total Weighted Demerit				Top Groove Filling, %			



**CATERPILLAR 1M-PC**

**Form 6  
CF-2 Rating**

<b>Test Identification</b>							
Lab	EOT Date				EOT Time		
Stand	Run Number						
Formulation/Stand Code							
Oilcode							
Test Method			Test Fuel			Fuel Batch	
Date Rated			Rating Number			Rater	
<b>Last Stand Reference Information</b>							
Date Completed		Stand #		Run #		TMC Oil Code	
WTD				TGF			
Industry Average WTD				Industry Average TGF			
Industry WTD STD				Industry TGF STD			
<b>Upper Piston Ratings Summary</b>							
		<b>Grooves</b>				<b>Lands</b>	
Dep. Factor		No. 1		No. 2		No. 2	
		A, %	Dem.	A, %	Dem.	A, %	Dem.
<b>Carbon</b>							
	HC-1.0						
	MC-0.5						
	LC-0.25						
Total							
		<b>Grooves</b>				<b>Lands</b>	
		No. 1		No. 2		No. 2	
Rating							
Location FCT		1		0.5		0.75	
Ind. WTD Rating							
Total Weighted Demerits							







# CATERPILLAR 1M-PC

## Form 8

### Ring Measurements

Lab	EOT Date	EOT Time
Stand	Run Number	
Formulation Stand Code:		
Oilcode		

Ring Gap (mm)	Top	Intermediate		Oil
		1	2	
Specifications	0.508 – 0.660 mm (0.020 – 0.026 in.)	0.508 – 0.660 mm (0.020 – 0.026 in.)	0.508 – 0.660 mm (0.020 – 0.026 in.)	0.381 – 0.762 mm (0.015 – 0.030 in.)
Pre-Test				
Post-Test				
Increase				

Ring Side Clearance <sup>A</sup>		Minimum	Maximum	Specification
Top	PRE-TEST			0.114 – 0.185 mm (0.0045 – 0.0073")
	POST-TEST			
	LSC			
Int. 1	PRE-TEST			0.076 – 0.122 mm (0.0030 – 0.0048")
	POST-TEST			
	LSC			
Int. 2	PRE-TEST			0.076 – 0.122 mm (0.0030 – 0.0048")
	POST-TEST			
	LSC			
Oil	PRE-TEST			0.038 – 0.076 mm (0.0015 – 0.0030")
	POST-TEST			
	LSC			

<sup>A</sup> Notes:

1. Write "Stuck" In Place Of Dimension Where Applicable.
2. LSC: Loss Of Side Clearance.
3. Report Metric Units.
4. Report 0 in instances where LSC < 0.

**CATERPILLAR 1M-PC**

**Form 9**

**Liner Measurements**

Lab	EOT Date	EOT Time
Stand		
Formulation/Stand Code		
Oilcode		

<b>Liner Bore Measurements (mm)</b>			
Before Test – Diameter(Dial Bore Gage)			
<b>Bore Height</b>	<b>Longitudinal</b>	<b>Transverse</b>	<b>Out Of Round</b>
22.86 cm (9 in.)			
20.32 cm (8 in.)			
17.78 cm (7 in.)			
15.24 cm (6 in.)			
12.70 cm (5 in.)			
10.16 cm (4 in.)			
7.62 cm (3 in.)			
5.08 cm (2 in.)			
2.54 cm (1 in.)			
Taper (Max)			
Max. Out Of Round			
Liner Surface Finish	0.4 – 0.8 micrometers (R <sub>a</sub> )		

<b>After Test - (Surface Profile)</b>				
	<b>Longitudinal</b>		<b>Traverse</b>	
	<b>Front</b>	<b>Rear</b>	<b>T</b>	<b>AT</b>
Wear Step				

**CATERPILLAR 1M-PC**  
**Form 10**  
**Characteristics of the Data Acquisition System**

Lab	EOT Date	EOT Time
Stand	Run Number	
Formulation/Stand Code		
Oilcode		

Parameter (1)	Sensing Device (2)	Calibration Frequency (3)	Record Device (4)	Observation Frequency (5)	Record Frequency (6)	Log Frequency (7)	System Response (8)
<b>Operational Conditions</b>							
Engine Speed (r/min)							
Engine Power (kW)							
Fuel Flow (L/min)							
Humidity (g/kg)							
<b>Temperatures (°C)</b>							
Coolant OUT							
Coolant In							
Oil To Bearing							
Oil Cooler In							
Inlet Air							
Exhaust							
<b>Pressures (kPa)</b>							
Oil To Bearing							
Oil To Jet							
Inlet Air							
Exhaust							
Fuel @ Filter HSG							
Crankcase Vacuum							
<b>Flows (L/min)</b>							
Blowby							
Coolant Flow							

**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 – Hanglog Sheet
  - DL – Automatic Data Logger
  - SC – Strip Chart Recorder
  - C/M – Computer, Using Manual Data Entry
  - C/D – Computer, Using Direct I/O Entry

- (5) Data Area 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 Output To Reach 63.2% Of Final Value For Step Change At Input

**CATERPILLAR 1M-PC  
Form 11  
Operational Plots**

Lab	EOT Date	EOT Time
Stand	Run Number	
Formulation/Stand Code		
Oilcode		



**CATERPILLAR 1M-PC  
Form 12  
Operational Plots**

Lab	EOT Date	EOT Time
Stand	Run Number	
Formulation/Stand Code		
Oilcode		

**CATERPILLAR 1M-PC  
Form 13  
Oil Consumption Plot**

Lab	EOT Date	EOT Time
Stand	Run Number	
Formulation/Stand Code		
Oilcode		

**CATERPILLAR 1M-PC**  
**Form 14**  
**Piston and Ring Photographs**

Lab	EOT Date	EOT Time
Stand	Run Number	
Formulation/Stand Code		
Oilcode		

Refer to Appendix C for example of Photo Layout



**CATERPILLAR 1M-PC**

**Form 16**

**Fuel Batch Analysis**

Lab	EOT Date	EOT Time
Stand	Run Number	
Formulation/Stand Code		
Oilcode		

Refer to Appendix C for examples of appropriate Fuel Batch Analysis page.

**CATERPILLAR 1M-PC  
Form 17  
TMC Control Chart Analysis  
(Reference Oil Tests Only)**

Lab	EOT Date	EOT Time
Stand	Run Number	
Formulation/Stand Code		
Oilcode		

Refer to Appendix C for example of Control Chart Analysis page.

**CATERPILLAR 1M-PC**

Form 18

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***

<input type="checkbox"/>	Operational review of this test indicates that the results should be included in the Multiple Test Acceptance Criteria calculations.
<input type="checkbox"/>	*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.*

<i>Comments</i>

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

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

\_\_\_\_\_  
Title