

**1K/1N
Final Report Cover**

**Method
Version**

Conducted For:

	V = Valid
	I = Invalid
	N = Results Cannot Be Interpreted As Representative Of Oil Performance (Non-Reference) And Shall Not Be Used In Determining An Average Test Result Using Multiple Test Criteria.

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

In my opinion this test _____ been conducted in a valid manner in accordance with the 1K/1N Test Procedure (Research Report RR:D02-1273/RR:D02-1321) 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

**1K/1N
Form 1
Test Report Summary**

Lab	EOT Date	End Time	Method
Stand	Run Number		
Formulation/Stand Code			
Oilcode/CMIR			
Start Date	Total Test Length	TMC Oil Type	
Laboratory Internal Oil Code			

	Correction Effective Date	WDK/WDN	TGF %	TLHC%	Transformed TLHC%	BSOC g/KW-h	EOTOC g/kW-h
Unadjusted Lab Rating							
Industry Correction(If Any)							
Subtotal							
Lab Severity Adjustment(If Any) ^A							
Total							

	Effective Date	WDK/WDN	TGF %	TLHC %	Transformed TLHC%	BSOC g/KW-h	EOTOC g/kW-h
Test Target Mean ^B							
Test Target STD ^B							
^{A, C}							

	Referee Lab	WDK/WDN	TGF %	
Referee Ratings				

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

Notes: ^A Reference oil tests or as requested by test sponsor ^C See Appendix X4
^B Non-reference oil tests only

**1K/1N
Form 2
Operational Summary**

Lab	EOT Date	End Time	Method		
Stand	Run Number				
Formulation/Stand Code					
Oilcode/CMIR					
Operating Condition		Minimum	Maximum	Average	Specification
Engine Speed	r/min				2100 ± 10
Engine Power	kW				Report
Fuel Flow	g/min				185 ± 1
Humidity	g/kg				17.8 ± 1.7
Temperature °C					
Coolant Out	°C				93 ± 2.5
Coolant In	°C				Report
Coolant delta T	°C				5 ± 1.0
Oil To Bearing	°C				107 ± 2.5
Oil Cooler In	°C				Report
Inlet Air	°C				127 ± 2.5
Exhaust	°C				550 ± 30
Fuel @ Injector Housing	°C				57 + 3
Pressures					
Oil To Bearing	kPa				482 Max
Oil To Jet	kPa				360 ± 13
Inlet Air	kPa				240 ± 1
Exhaust (ABS)	kPa				216 ± 1
Fuel @ Filter HSG	kPa				210 ± 20
Crankcase Vacuum	kPa				0.7 ± 0.1
Coolant Jug Pressure	kPa				Report
Flows					
Blowby	L/min				Report
Coolant Flow	L/min				65 ± 2
Air/Fuel Ratio: 24 hr.			Air/Fuel Ratio: 252 hr.		
Assembly Measurements And Parts Record					
Piston/Head Clearance mm				Intake Valve Open °ATC	
		Fuel Timing °BTC			
	Part No. (1)	Serial No. (2)	Date Code	Inspection Code	
Liner			F	G	
Ring Set (1)			I	H	
Piston			D	E	

D Number blow "E" located on top of piston

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

E Number on top of "E" located on top of piston

F Four alphanumeric characters (NNAN) on liner O.D.

G Four digit number on liner O.D.

**1K/1N
Form 3
Operational Summary - Offset And Deviation**

Lab	EOT Date	End Time	Method
Stand	Run Number		
Formulation/Stand Code			
Oilcode/CMIR:			

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

1K/1N Form 4 Piston Rating Summary

Test	Lab	EOT Date	END Time	Stand	Run No.	Method
Formulation/Stand Code						
Test Fuel		Fuel Batch	Date Rated	Rating Number	Oilcode	Rater
Last Stand Reference Information						
Date Completed		Stand No.		Run No.		TMC Oil Code
WDK/WDN		TGF	TLHC	Transformed TLHC	BSOC	EOTOC
Last Ref. This Stand						
Industry Average						
Industry STD						

Total Piston Ratings Summary																									
Dep. Factor	Grooves						Lands						Upper Skirt		Under Crown		Pin Bores								
	NO. 1		NO. 2		NO. 3		NO. 1		NO. 2		NO. 3		A, %		A, %		A, %								
	A, %	Dem.	A, %	Dem.	A, %	Dem.	A, %	Dem.	A, %	Dem.	A, %	Dem.	A, %	Dem.	A, %	Dem.	A, %	Dem.							
C																									
A																									
R																									
B																									
O																									
N																									
Total																									
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		0								
Total Rating																									
Location Factor	1.5		1.5		25		1		1		25		50		20		0								
Weighted Rating																									
TGF %	Intermediate Groove Fill %					WDK/WDN					Unweighted Deposit					T.L. Heavy Carbon %					T.L. Flaked Carbon %				

1K/1N
Form 4A
Piston Rating Worksheet

Lab	EOT Date	END Time	Method
Stand	Run Number		
Formulation/Stand Code			
Oilcode/CMIR:			

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

**1K/1N
Form 5
Supplemental Piston Deposits(Groove Sides And Rings)**

Lab	EOT Date	End Time	Method										
Stand:		Run Number											
Formulation/Stand Code													
Oilcode:													
Deposit Type	Carbon			Varnish									
	HC	MC	LC	8 - 9	7 - 7.9	6 - 6.9	5 - 5.9	4 - 4.9	3 - 3.9	2 - 2.9	1 - 1.9	>0 -	Clean
Groove Top And Bottom	1	T											
		B											
	2	T											
		B											
	3	T											
		B											
Top Bottom And Back Of Rings	1	T											
		B											
		BK											
	2	T											
		B											
		BK											
3	T												
	B												
	BK												
Additional Deposit & Condition Ratings													
Piston Crown													
Rings													
Liner													

**1K/IN
Form 5A
Referee Rating**

Test Identification				EOT Date		End Time		Method				
Lab		Run No.		Rating Number		Date Rated		Rater				
Formulation/Stand Code				Oilcode								
Referee Rating Information												
Company				Rating Number		Date Rated		Rater				
Total Piston Ratings Summary												
Dep.. Factor	Grooves			Lands			Upper Skirt		Under Crown		Pin Bores	
	No. 1 A.%	No. 2 A.%	No. 3 DEM.	No. 1 A.%	No. 2 DEM.	No. 3 A.%	A.%	Dem.	A.%	Dem.	Front A.%	Rear Dem.
C												
A												
R												
B												
O												
N												
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	0	0	0	0
Total												
Rating												
Location Factor	1.5	1.5	25	1	1	25	50	20	0	0	0	0
Weighted Rating												
TGF %	Intermediate Groove Fill %			WDK/WDN			Unweighted Deposit		Test Lab TLHC%		Test Lab TLHC %	

**1K/1N
Form 6
Oil Analysis And Results Summary**

Test Identification									
Lab	EOT Date	End Time	Method						
Stand	Run Number								
Formulation/Stand Code									
Oilcode									
Test Fuel		Fuel Batch							
Oil Analysis/Engine Hours		NEW / 0	24	204	252				
Viscosity @ 100°C									
TBN D4739									
Wear Metals: Fe/Al									
Si/Cu									
Cr/Pb									
Fuel Dilution									
Blowby (L/min)									
24 Hr.. Avg. BSOC (g/kW-h) For Hours End		0-252 Hr. Avg. BSOC (g/kW-h):		EOT Oil Consumption(g/kW-h):					
24	48	72	108	132	156	180	204	228	252
Inspection And Measurement Summary									
Top Ring									
Int. Ring									
Oil Ring									
Piston									
Cylinder Liner									
Piston Deposit Summary		TGF %	Int. Gr. F. %	WDK/WDN	Un Wt Dep	T.L. Heavy Carb. %	T.L. Flaked Carb. %		
UNWEIGHTED PISTON DEPOSITS									
Grooves									
1	2	3	1	2	3	Upper Skirt	Under Crown	Pin Bores	Rear
								Front	Rear

**1K/1N
Form 7
Unscheduled Downtime & Maintenance
Maintenance Summary**

Lab	EOT Date	END Time	Method
Stand	Run Number		
Formulation/Stand Code			
Oilcode/CMIR:			

Number of Downtime Occurrences			
Test Hours	Date	Downtime	Reasons
			Total Downtime (125 Hr. Max)

Other Comments	
Number of Comment Lines	

**1K/1N
Form 7A
Unscheduled Downtime & Maintenance Summary**

Lab	EOT Date	END Time	Method
Stand	Run Number		
Formulation/Stand Code			
Oilcode/CMIR:			

Number of Downtime Occurrences			
Test Hours	Date	Downtime	Reasons
			Total Downtime (125 Hr. Max)

Other Comments			
Number of Comment Lines			

**1K/1N
Form 8
Ring Measurements**

Lab	EOT Date	END Time	Method
Stand	Run Number		
Formulation/Stand Code			
Oilcode/CMIR:			

Ring Gaps (mm)	Top	Intermediate	Oil
Specifications	0.724 ± 0.076 mm	0.673 ± 0.076 mm	0.572 ± 0.190 mm
Pre-Test			
Post-Test			
Increase			

Ring Side Clearance*	A	B	C	D	Avg.	Min.	Specification
Top	Pre-Test						0.193+0.032 mm
	Post-Test						
	LSC						
Int..	Pre-Test						0.090+0.020 mm
	Post-Test						
	LSC						
Oil	Pre-Test						0.073 +0.016 mm
	Post-Test						
	LSC						

***Notes:**

1. Write "Stuck" In Place Of Dimension When Applicable.
2. Write "<0.038 mm" For Clearance When Applicable.
3. Write ">" Before Calculated Decrease Or Average Decrease Values That Incorporate A "<0.038 mm" In Calculation.
- 4 LSC: Loss Of Side Clearance.
5. Min: Intermediate And Oil Ring Minimum Side Clearance Is Measured 360° Around Piston.

**1K/1N
Form 9
Liner Measurements**

Lab	EOT Date	END Time	Method
Stand	Run Number		
Formulation/Stand Code			
Oilcode/CMIR:			

Liner Surface Finish (Micrometer)			
Distance From Top	Transverse	Longitudinal	Average
130 mm			
50 mm			
25 mm			
			Total Average

% Liner Bore Polish - Grid (Add T/AT Values From Grid)	
Thrust	
Anti-Thrust	
Total	

Liner Bore Measurement (mm)				
Before Test – Diameter (Dial Bore Gage)				
Bore Height	Longitudinal	Transverse		
230 mm				
130 mm				
50 mm				
25 mm				
15 mm				
After Test - (Surface Profile)				
	Longitudinal		Transverse	
	Front	Rear	T	AT
Wear Step @ 15mm				

Characteristics Of The Data Acquisition System

Lab	EOT Date	END Time	Method
Stand	Run Number		
Formulation/Stand Code			
Oilcode/CMIR:			

Parameter (1)	Sensing Device (2)	Calibration Frequency (3)	Record Device (4)	Observation Frequency (5)	Record Frequency (6)	Log Frequency (7)	System Response (8)
Operation Conditions							
Engine Speed (R/min)							
Engine Power (kW)							
Fuel Flow (g/min)							
Humidity (g/kg)							
Coolant							
Coolant Out							
Coolant In							
Oil To Bearing							
Oil Cooler In							
Inlet Air							
Exhaust							
Fuel							
Pressures (kPa)							
Oil To Bearing							
Oil To Jet							
Inlet Air							
Exhaust							
Fuel @ Filter HSG							
Crankcase VAC							
Flows (L/min)							
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
 - C/M - Computer, Using Manual Data Entry
 - SC - Strip Chart Recorder
 - 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 The Output To Reach 63.2% Of Final Value For Step Change At Input

1K/1N
Form 12

Lab	EOT Date	End Time	Method
Stand	Run Number		
Formulation/Stand Code			
Oilcode/CMIR:			

	0	24	48	72	108	132	156	180	204	228	252
	Hours										
Oil to Bearing kPa	482										
Oil to Jet kPa	441										
	400										
	375										
	360										
	345										
	241										
	240										
	239										
	217										
	216										
	215										
	67										
	65										
	63										
	0.8										
	0.7										
	0.6										
	57										
	52										
	47										
	30										
	20										
	10										

Oil to Bearing kPa

Oil to Jet kPa

Inlet Air kPa

Exhaust kPa

Humidity grams/kg

Coolant Flow L/min

Crankcase Vacuum kPa

Blowby L/min

1K/1N
Form 14
Piston, Ring And Liner Photographs

Lab	EOT DATE:	End Time	Method
Stand	Run Number		
Formulation/Stand Code			
Oilcode/CMIR:			

Refer to Appendix C for example of Photo Layout.

1K/1N
Form 16
TMC Control Chart Analysis

Lab	EOT Date	End Time	Method
Stand	Run Number		
Formulation/Stand Code			
Oilcode/CMIR:			

1K/1N
Form 17
Fuel Batch Analysis

Lab	EOT Date	End Time	Method
Stand	Run Number		
Formulation/Stand Code			
Oilcode/CMIR:			