

**1R SCOTE TEST PROCEDURE
FORM 1**

METHOD

VERSION 20020207

CONDUCTED FOR

	V = VALID
	I = INVALID
	N = RESULTS CAN NOT BE INTERPRETED AS REPRESENTATIVE OF OIL PERFORMANCE (NON-REFERENCE OIL) AND SHALL NOT BE USED FOR MULTIPLE TEST ACCEPTANCE CRITERIA.

	RO = REFERENCE OIL TEST
	NR = ALL OTHER TESTS

	WAS THIS TEST RUN UNDER A VALID CALIBRATION? (Y/N)
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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:	
Formulation/Stand	
Alternate Codes:	
SAE Viscosity Grade:	

In my opinion this test _____ been conducted in accordance with the 1R Test Procedure(Research Report) and the appropriate amendments through the information letter system. The remarks included in the report describe the anomalies associated with this test.

SUBMITTED BY: _____
Testing Laboratory

Signature

Typed Name

Title

**1R SCOTE TEST PROCEDURE
FORM 2
TEST REPORT SUMMARY**

LAB:	EOT DATE:	END TIME:	METHOD:
STAND:	RUN NUMBER:		
FORMULATION/STAND CODE:			
OILCODE:			

START DATE:	START TIME:	TOTAL TEST LENGTH:	TMC OIL
LAB INTERNAL OIL		ENGINE SERIAL NUMBER:	

	CORRECTION EFFECTIVE DATE	WD	TGC	TLC	BOTO C g/h	EOTO C g/h	OIL CON. DELTA EOTO C-BOTO C g/h
UNADJUSTED LAB RATING							
INDUSTRY CORRECTION (IF ANY)							
SUBTOTAL							
LAB SEVERITY ADJUSTMENT (IF ANY) ^B							
TOTAL							

	EFFECTIVE DATE	WD	TGC	TLC	BOTO C g/h	EOTO C g/h	OIL CON. DELTA EOTO C-BOTO C g/h
TEST TARGET MEAN ^A							
TEST TARGET STD ^A							
API PASS LIMIT ^B							

	REFEREE LAB	WD	TGC	TLC	
REFEREE RATINGS ^A					

	TOP	INT. 1	OIL	PISTON CROWN	PISTON SKIRT	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: ^AReference oil tests or as requested by test sponsor
^BNon-reference oil tests only

**1R SCOTE TEST PROCEDURE
FORM 3
OPERATIONAL SUMMARY**

LAB :	EOT DATE :	END TIME :	METHOD :
STAND :		RUN NUMBER :	
FORMULATION/STAND CODE :			
OILCODE :			

CONTROLLED PARAMETERS	OPERATING PARAMETER	QUALITY INDEX THRESHOLD	EOT QUALITY INDEX	PROCESS			TOTAL DATA POINTS		
				UNITS	TARGET	AVERAGE	SAMPLES ^A	BQD ^B	OVER/UNDER RANGE ^C
	ENGINE SPEED	0.00		r/min	1800				
	FUEL FLOW	0.00		g/min	240				
	HUMIDITY	0.00		g/kg	17.8				
	COOLANT FLOW	0.00		L/min	75				
	TEMPERATURE								
	COOLANT OUT	0.00		°C	105				
	OIL TO MANIFOLD	0.00		°C	120				
	INLET AIR MANIFOLD	0.00		°C	60				
	FUEL INTO HEAD	0.00		°C	42				
	PRESSURES								
	OIL TO MANIFOLD	0.00		kPa	415				
	INLET AIR (ABSOLUTE)	0.00		kPa	292				
	FUEL FROM HEAD	0.00		kPa	275				
	EXHAUST (ABSOLUTE)	0.00		kPa	252				
NON-CONTROLLED PARAMETERS	OPERATING PARAMETER	PROCESS			TOTAL DATA POINTS				
		UNITS	TYPICAL RANGE ^D	AVERAGE	SAMPLES ^A	BQD ^B	OVER/UNDER RANGE ^C		
	INTAKE AIR FLOW	kg/h	360-410						
	POWER	kW	65-70						
	TORQUE	Nm	330-350						
	BLOWBY	L/min	20-56						
	TEMPERATURE								
	COOLANT IN	°C	97-101						
	COOLANT DELTA T	°C	4-8						
	OIL COOLER IN	°C	120-124						
	HEATING OIL	°C	165 max.						
	EXHAUST	°C	590-620						
	PRESSURES								
	CRANKCASE	kPa	0.09-0.3						
	COOLANT TO JUG	kPa	64-92						

A Total number of data points taken as determined from test length and procedural specified sampling rate.
 B Number of Bad Quality Data points not used in the calculation of the statistical measures.
 C Number of points clipped by over/under range limits of the statistical measures.
 D Gathered from 1Q Matrix Test data.

**1R SCOTE TEST PROCEDURE
FORM 4
ASSEMBLY MEASUREMENTS AND PART RECORD**

LAB :	EOT DATE :	END TIME :	METHOD :
STAND :		RUN NUMBER :	
FORMULATION/STAND CODE :			
OILCODE :			

ASSEMBLY MEASUREMENTS AND PARTS RECORD	
INJECTOR SETTING (GO / NO-GO)	
WAS TIMING INITIALIZED? (YES/NO)	
PISTON/HEAD CLEARANCE mm	
CAM GEAR BACKLASH mm	
DESIRED FUEL TIMING 'BTC	
INTAKE VALVE OPEN 'ATC	
INJECTOR PLUNGER LIFT mm @ 72°	
INTAKE VALVE LIFT mm @ 456°	
EXHAUST VALVE LIFT mm @ 247°	

	PART NUMBER	SERIAL NUMBER	DATE CODE	INSPECTION CODE
LINER	A	B	A	
TOP RING	C	E		
INTERMEDIATE RING	C	E		
OIL RING	C	E		
PISTON CROWN	D	D	F	G
PISTON SKIRT	H	I		
FUEL INJECTOR	J	K		
ECM EPROM	L			
PISTON COOLING JET				

^A On liner O.D.

^B On liner O.D. (NNNN)

^C On box label

^D On top of piston

^E On paper envelope containing the ring

^F Number below "E" located on piston top

^G Number above "E" located on piston top

^H On bottom surface of skirt rim

^I On bottom surface under pin bore

^J On top surface of plunger

^K On top surface of plunger - 6 digits

^L On ECAT software

1R SCOTE TEST PROCEDURE

FORM 5

PISTON RATING SUMMARY

TEST IDENTIFICATION		LAB:	EOT DATE:		END TIME:		STAND:		RUN #:		METHOD:										
FORMULATION/STAND CODE:							OILCODE:														
TEST FUEL:		FUEL BATCH:		DATE RATED:		RATER INITIALS:		VERIFIED BY:													
LAST STAND REFERENCE INFORMATION		DATE COMPLETED:		STAND #:		RUN #:		TMC OIL CODE:													
		WD		TGC		TLC		BOTOc g/h		EOTOc g/h											
LAST REF. THIS STAND																					
INDUSTRY AVERAGE																					
INDUSTRY STD																					
TOTAL PISTON RATINGS SUMMARY																					
		GROOVES				LANDS						GROOVE		LANDS		OIL COOLING		UNDER			
DEP.		NO. 1		NO. 2		NO. 1		NO. 2		DEP.		NO. 3		NO. 3		NO. 4		GALLERY		CROWN	
FACTOR		A, %	DEM.	A, %	DEM.	A, %	DEM.	A, %	DEM.	FACTOR		A, %	DEM.	A, %	DEM.	A, %	DEM.	A, %	DEM.	A, %	DEM.
C A R B O N	HC - 1.0																				
	MC - 0.5																				
	LC - .25																				
	TOTAL																				
V A R I S H	8 - 9									7.5											
	7 - 7.9																				
	6 - 6.9																				
	5 - 5.9									4.5											
	4 - 4.9																				
	3 - 3.9																				
	2 - 2.9									1.5											
	1 - 1.9																				
	>0 - 0.9																				
CLEAN		0		0		0		0	CLEAN		0		0		0		0		0		
TOTAL																					
RATING																					
LOCATION FACTOR	2		3		1		3				20		20		60		0.5		1		
IND RATING																					
WD:	TLHC %:			TGF %:			IGF %:			TLFC %:											
UNWEIGHTED:	TLC:			TGC:			IGC:			UNDERCROWN CARBON:											

1R SCOTE TEST PROCEDURE
Form 5A

LAB :	EOT DATE :	END TIME :	METHOD :
STAND :		RUN NUMBER :	
FORMULATION/STAND CODE :			
OILCODE :			

**1R SCOTE TEST PROCEDURE
FORM 6
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														
PISTON SKIRT														
RINGS														
LINER														

**1R SCOTE TEST PROCEDURE
FORM 6A
REFEREE RATING**

TEST IDENTIFICATION			
LAB:	EOT DATE:	END TIME:	METHOD:
STAND:	RUN #:		
FORMULATION/STAND CODE:			
OILCODE:			
REFEREE RATING INFORMATION			
COMPANY:	RATING NUMBER:	DATE RATED:	RATER:

TOTAL PISTON RATINGS SUMMARY																						
	DEP. FACTOR	GROOVES				LANDS				DEP. FACTOR	GROOVES				LANDS				OIL COOLING		UNDER CROWN	
		NO. 1		NO. 2		NO. 1		NO. 2			NO. 3		NO. 3		NO. 4		A, %	DEM.	A, %	DEM.		
		A, %	DEM.	A, %	DEM.	A, %	DEM.	A, %	DEM.		A, %	DEM.	A, %	DEM.	A, %	DEM.	A, %	DEM.	A, %	DEM.		
C A R B O N	HC-1.0																					
	MC-0.5																					
	LC-.25																					
	TOTAL																					
	V A R I S H	8 - 9									7.5											
7 - 7.9																						
6 - 6.9																						
5 - 5.9										4.5												
4 - 4.9																						
3 - 3.9																						
2 - 2.9										1.5												
1 - 1.9																						
>0 - 0.9																						
CLEAN		0		0		0		0		0		0		0		0		0				
TOTAL																						
RATING																						
LOCATION FACTOR		2		3		1		3			20		20		60		0.5		1			
IND RATING																						
WD:	TLHC %:				TGF %:				IGF %:				TLFC %:									
UNWEIGHTED:	TLC:				TGC:				IGC:				UNDERCROWN CARBON:									

1R SCOTE TEST PROCEDURE

FORM 7

OIL ANALYSIS DATA

TEST IDENTIFICATION			
LAB:	EOT DATE:	END TIME:	METHOD:
STAND:		RUN NUMBER:	
FORMULATION/STAND CODE:			
OILCODE:			
TEST FUEL:		FUEL BATCH:	

OIL ANALYSIS	NEW														
VISC @ 100°C															
VISC @ 40°C															
TBN D4739															
TAN D664															
TGA Soot %															
WEAR METALS (ppm)															
Fe															
Al															
Si															
Cu															
Cr															
Pb															
FUEL DILUTION %															
IR O ₂															
BLOWBY (L/min)															
Oil Consumption g/h for hrs ending															
Oil Consumption r ²															
FUEL POSITION (mm)															

NOTE:

- (1) Total Oil In System 5800 ± 50 grams.
- (2) Refill oil scale cart to full level every 36 hours. Take oil samples, as shown, before adding oil.

**1R SCOTE TEST PROCEDURES
FORM 9
RING MEASUREMENTS**

LAB:	EOT DATE:	END TIME:	METHOD:
STAND:		RUN NUMBER:	
FORMULATION/STAND CODE:			
OILCODE:			

ALL RING MEASUREMENTS ARE MADE USING METRIC FEELER GAGES

RING GAPS (mm)	1Y4014 TOP	1Y4013 INTERMEDIATE	1Y4012 OIL
SPECIFICATIONS	0.350mm - 0.550mm	0.754mm - 0.906mm	0.400mm - 0.750mm
PRE-TEST			
POST-TEST			
INCREASE			

RING SIDE CLEARANCE*		A	B	C	D	AVG.	MIN.	SPECIFICATION
TOP	PRE-TEST							0.090mm - 0.127mm
	POST-TEST							
	LSC							
INT.	PRE-TEST							0.060mm - 0.110mm
	POST-TEST							
	LSC							
OIL	PRE-TEST							0.030mm - 0.080mm
	POST-TEST							
	LSC							

* NOTES:

1. WRITE "STUCK" IN PLACE OF DIMENSION WHEN APPLICABLE
2. WRITE "<0.03 mm" FOR CLEARANCE WHEN APPLICABLE.
3. WRITE ">" BEFORE CALCULATED DECREASE OR AVERAGE DECREASE VALUES THAT INCORPORATE A "<0.03 mm" IN CALCULATION.
- 4 LSC = LOSS OF SIDE CLEARANCE
5. MIN: OIL RING MINIMUM SIDE CLEARANCE IS MEASURED 360' AROUND PISTON.

**1R SCOTE TEST PROCEDURE
FORM 10
LINER MEASUREMENTS**

LAB :	EOT DATE :	END TIME :	METHOD :
STAND :		RUN NUMBER :	
FORMULATION/STAND CODE :			
OILCODE :			

LINER SURFACE FINISH (μm)			
DISTANCE FROM TOP	TRANSVERSE	LONGITUDINAL	AVERAGE
130 mm			
50 mm			
25 mm			
TOTAL AVERAGE (Spec: 0.4 - 0.8 μm)			

% LINER BORE POLISH - GRID (ADD T/AT VALUES FROM GRID)	
THRUST	
ANTI-THRUST	
TOTAL	

LINER BORE MEASUREMENT (137.154mm minimum)				
BEFORE TEST - DIAMETER (DIAL BORE GAGE)				
BORE HEIGHT	LONGITUDINAL	TRANSVERSE	OUT OF ROUND (0.038 mm max)	
250 mm				
210 mm				
170 mm				
130 mm				
50 mm				
25 mm				
15 mm				
TAPER (0.050 max)				
AFTER TEST - (SURFACE PROFILE)				
	LONGITUDINAL μm		TRANSVERSE μm	
	FRONT	REAR	T	AT
WEAR STEP @ 13 mm				

**1R SCOTE TEST PROCEDURE
FORM 11
CHARACTERISTICS OF THE DATA ACQUISITION SYSTEM**

LAB :	EOT DATE :	END TIME :	METHOD :
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)
OPERATION CONDITIONS							
ENGINE SPEED (r/min)							
ENGINE POWER (kW)							
FUEL FLOW (g/min)							
HUMIDITY (g/kg)							
TEMPERATURES (°C)							
COOLANT OUT							
COOLANT IN							
OIL TO MANIFOLD							
OIL COOLER IN							
INLET AIR							
EXHAUST							
FUEL TO HEAD							
PRESSURES (kPa)							
OIL TO MANIFOLD							
INLET AIR							
EXHAUST							
FUEL FROM HEAD							
CRANKCASE							
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 - HANDLOG 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 THE OUTPUT TO REACH 63.2% OF FINAL VALUE FOR STEP CHANGE AT INPUT

**1R SCOTE TEST PROCEDURE
FORM 12
ENGINE OPERATIONAL DATA PLOTS**

LAB :	EOT DATE :	END TIME :	METHOD :
STAND :		RUN NUMBER :	
FORMULATION/STAND CODE :			
OILCODE :			

1R SCOTE TEST PROCEDURE
Form 15
PISTON, RING AND LINER PHOTOGRAPHS

LAB :	EOT DATE :	END TIME :	METHOD :
STAND :	RUN NUMBER :		
FORMULATION/STAND CODE :			
OILCODE :			

1R SCOTE TEST PROCEDURE

Form 17

FUEL BATCH ANALYSIS

LAB :	EOT DATE :	END TIME :	METHOD :
STAND :	RUN NUMBER :		
FORMULATION/STAND CODE :			
OILCODE :			

1R SCOTE TEST PROCEDURE
Form 18
TMC CONTROL CHART ANALYSIS
(Reference Oil Tests Only)

LAB :	EOT DATE :	END TIME :	METHOD :
STAND :		RUN NUMBER :	
FORMULATION/STAND CODE :			
OILCODE :			