

**1R SCOTE Test Procedure  
Form 1**

Method  
Version  
Conducted For

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

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

|  |  |
|--|--|
|  | Was This Test Run Under a Valid Calibration? (Y/N) |
|--|--|

|  |  |
|--|--|
|  | Lab Is Currently Operating Under An LTMS Precision Alarm *   |
|  | Stand Is Currently Operating Under An LTMS Precision Alarm * |

\* Check box only if YES

| <b>Test Number</b>  |            |
|---------------------|------------|
| 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 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<br>EFFECTIVE<br>DATE | WD | TGC | TLC | BOTOC<br>g/h | EOTOC<br>g/h | Oil Con.<br>Delta<br>EOTOC-<br>BOTOC<br>g/h |
|---|---------------------------------|----|-----|-----|--------------|--------------|---|
| Unadjusted Lab Rating                         |                                 |    |     |     |              |              |   |
| Industry Correction (If Any)                  |                                 |    |     |     |              |              |   |
| Subtotal                                      |                                 |    |     |     |              |              |   |
| Lab Severity <sup>B</sup> Adjustment (If Any) |                                 |    |     |     |              |              |   |
| Total   |                                 |    |     |     |              |              |   |

|                               | EFFECTIVE<br>DATE | WD | TGC | TLC | BOTOC<br>g/h | EOTOC<br>g/h | Oil Con.<br>Delta<br>EOTOC-<br>BOTOC<br>g/h |
|-------------------------------|-------------------|----|-----|-----|--------------|--------------|---|
| Test Target Mean <sup>A</sup> |                   |    |     |     |              |              |   |
| Test Target Std <sup>A</sup>  |                   |    |     |     |              |              |   |
| API <sup>B</sup> Pass Limit   |                   |    |     |     |              |              |   |

|                 | Referee Lab | WD | TGC | TLC |  |
|-----------------|-------------|----|-----|-----|--|
| Referee Ratings |             |    |     |     |  |

|                                  | Rings |          |     | Piston |       | Cylinder<br>Liner |
|----------------------------------|-------|----------|-----|--------|-------|-------------------|
|                                  | Top   | Inter. 1 | Oil | Crown  | Skirt |                   |
| Ring Loss of Side Clearance (mm) |       |          |     |        |       |                   |
| Ring End Gap Increase (mm)       |       |          |     |        |       |                   |
| Is the Ring Stuck?               |       |          |     |        |       |                   |
| Scuffed Area %                   |       |          |     |        |       |                   |
| Average Wear Step (µm)           |       |          |     |        |       |                   |
| % Bore Polish                    |       |          |     |        |       |                   |

Notes: <sup>A</sup>Reference oil tests or as requested by test sponsor  
<sup>B</sup>Non-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 <sup>A</sup>          | BQD <sup>B</sup> |
|                           | 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                   |                   |                               |                  |
|                           | <b>Temperature</b>  |                         |                            |         |                      |                   |                               |                  |
|                           | 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                   |                   |                               |                  |
|                           | <b>Pressures</b>    |                         |                            |         |                      |                   |                               |                  |
|                           | Oil to Manifold     | 0.00                    |                            | kPa     | 415                  |                   |                               |                  |
|                           | Inlet Air (Abs.)    | 0.00                    |                            | kPa     | 292                  |                   |                               |                  |
|                           | Fuel From Head      | 0.00                    |                            | kPa     | 275                  |                   |                               |                  |
|                           | Exhaust (Abs.)      | 0.00                    |                            | kPa     | 252                  |                   |                               |                  |
| NON-CONTROLLED PARAMETERS | Operating Parameter | Process                 |                            |         | Total Data Points    |                   |                               |                  |
|                           |                     | Units                   | Typical Range <sup>D</sup> | Average | Samples <sup>A</sup> | BQD <sup>B</sup>  | Over/Under Range <sup>C</sup> |                  |
|                           | Intake Air Flow     | kg/h                    | 360-410                    |         |                      |                   |                               |                  |
|                           | Power               | kW                      | 65-70                      |         |                      |                   |                               |                  |
|                           | Torque              | Nm                      | 330-350                    |         |                      |                   |                               |                  |
|                           | Blowby              | L/min                   | 20-56                      |         |                      |                   |                               |                  |
|                           | <b>Temperature</b>  |                         |                            |         |                      |                   |                               |                  |
|                           | 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                    |         |                      |                   |                               |                  |
|                           | <b>Pressures</b>    |                         |                            |         |                      |                   |                               |                  |
|                           | Crankcase           | kPa                     | 0.09-0.3                   |         |                      |                   |                               |                  |
|                           | Coolant to Jug      | kPa                     | 64-92                      |         |                      |                   |                               |                  |

<sup>A</sup> Total number of data points taken as determined from test length and procedural specified sampling rate.

<sup>B</sup> Number of Bad Quality Data points not used in the calculation of the statistical measures.

<sup>C</sup> Number of points clipped by over/under range limits of the statistical measures.

<sup>D</sup> 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 |             |               |           |                 |

<sup>A</sup> On liner O.D.

<sup>B</sup> On liner O.D. (NNNN)

<sup>C</sup> On box label

<sup>D</sup> On top of piston

<sup>E</sup> On paper envelope containing the ring

<sup>F</sup> Number below "E" located on piston top

<sup>G</sup> Number below "E" located on piston top

<sup>H</sup> On bottom surface skirt

<sup>I</sup> On bottom surface under pin bore

<sup>J</sup> On top surface of plunger

<sup>K</sup> On top surface of plunger – 6 digits

<sup>L</sup> On ECAT software

**1R SCOTE Test Procedure  
Form 5  
Piston Rating Summary**

|   |                |            |               |              |              |
|---|----------------|------------|---------------|--------------|--------------|
| Lab                                     | EOT Date       | End Time   | Stand         | Run          | Method       |
| Formulation/Stand Code                  |                |            | Oilcode       |              |              |
| Test Fuel                               | Fuel Batch     | Date Rated | Rater Initial | Verified By  |              |
| <b>Last Stand Reference Information</b> | Date Completed | Stand      | Run           | TMC Oil Code |              |
|   | WD             | TGC        | TLC           | BOTOC<br>g/h | EOTOC<br>g/h |
| Last Reference on this Stand            |                |            |               |              |              |
| Industry Average                        |                |            |               |              |              |
| Industry Standard Deviation             |                |            |               |              |              |

**Total Piston Ratings Summary**

|  | Grooves        |         |       |         | Lands         |         |       |         | Deposit Factor | Groove |         | Lands |                            |       |         | Oil Cooling |         | Under Crown |         |
|--|----------------|---------|-------|---------|---------------|---------|-------|---------|----------------|--------|---------|-------|----------------------------|-------|---------|-------------|---------|-------------|---------|
|  | No. 1          |         | No. 2 |         | No. 1         |         | No. 2 |         |                | No. 3  |         | No. 3 |                            | No. 4 |         | A,%         | Demerit | A,%         | Demerit |
|  | A,%            | Demerit | A,%   | Demerit | A,%           | Demerit | A,%   | Demerit |                | A,%    | Demerit | A,%   | Demerit                    | A,%   | Demerit | A,%         | Demerit | A,%         | Demerit |
| <b>C<br/>a<br/>r<br/>b<br/>o<br/>n</b> | HC - 1.0       |         |       |         |               |         |       |         |                |        |         |       |                            |       |         |             |         |             |         |
|  | MC - 0.5       |         |       |         |               |         |       |         |                |        |         |       |                            |       |         |             |         |             |         |
|  | LC - .25       |         |       |         |               |         |       |         |                |        |         |       |                            |       |         |             |         |             |         |
|  |                |         |       |         |               |         |       |         |                |        |         |       |                            |       |         |             |         |             |         |
|  | <b>Total</b>   |         |       |         |               |         |       |         |                |        |         |       |                            |       |         |             |         |             |         |
| <b>V<br/>a<br/>r<br/>i<br/>s<br/>h</b> | 8 - 9          |         |       |         |               |         |       |         |                |        |         |       |                            |       |         |             |         |             |         |
|  | 7 - 7.9        |         |       |         |               |         |       |         |                |        |         |       |                            |       |         |             |         |             |         |
|  | 6 - 6.9        |         |       |         |               |         |       |         | 7.5            |        |         |       |                            |       |         |             |         |             |         |
|  | 5 - 5.9        |         |       |         |               |         |       |         |                |        |         |       |                            |       |         |             |         |             |         |
|  | 4 - 4.9        |         |       |         |               |         |       |         |                |        |         |       |                            |       |         |             |         |             |         |
|  | 3 - 3.9        |         |       |         |               |         |       |         | 4.5            |        |         |       |                            |       |         |             |         |             |         |
|  | 2 - 2.9        |         |       |         |               |         |       |         |                |        |         |       |                            |       |         |             |         |             |         |
|  | 1 - 1.9        |         |       |         |               |         |       |         | 1.5            |        |         |       |                            |       |         |             |         |             |         |
|  | >0 - 0.9       |         |       |         |               |         |       |         |                |        |         |       |                            |       |         |             |         |             |         |
|  | Clean          | 0       |       | 0       |               | 0       |       | 0       | Clean          | 0      |         | 0     |                            | 0     |         | 0           |         | 0           |         |
| <b>Total</b>                           |                |         |       |         |               |         |       |         |                |        |         |       |                            |       |         |             |         |             |         |
| Rating                                 |                |         |       |         |               |         |       |         |                |        |         |       |                            |       |         |             |         |             |         |
| Location Factor                        | 2              |         | 3     |         | 1             |         | 3     |         | 20             |        | 20      |       | 60                         |       | 0.5     |             | 1       |             |         |
| Industry Rating                        |                |         |       |         |               |         |       |         |                |        |         |       |                            |       |         |             |         |             |         |
| <b>WD:</b>                             | <b>TLHC %:</b> |         |       |         | <b>TGF %:</b> |         |       |         | <b>IGF %:</b>  |        |         |       | <b>TLFC %:</b>             |       |         |             |         |             |         |
| <b>Unweighted:</b>                     | <b>TLC:</b>    |         |       |         | <b>TGC:</b>   |         |       |         | <b>IGC:</b>    |        |         |       | <b>Under Crown Carbon:</b> |       |         |             |         |             |         |

**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<br>Top<br>and<br>Bottom                    | 1 | T        |    |    |            |         |         |         |         |         |         |         |      |       |
|   |   | B        |    |    |            |         |         |         |         |         |         |         |      |       |
|   |   |          |    |    |            |         |         |         |         |         |         |         |      |       |
|   | 2 | T        |    |    |            |         |         |         |         |         |         |         |      |       |
|   |   | B        |    |    |            |         |         |         |         |         |         |         |      |       |
|   |   |          |    |    |            |         |         |         |         |         |         |         |      |       |
| 3   | T |          |    |    |            |         |         |         |         |         |         |         |      |       |
|   | B |          |    |    |            |         |         |         |         |         |         |         |      |       |
|   |   |          |    |    |            |         |         |         |         |         |         |         |      |       |
| Top Bottom and<br>Back of<br>Rings                | 1 | T        |    |    |            |         |         |         |         |         |         |         |      |       |
|   |   | B        |    |    |            |         |         |         |         |         |         |         |      |       |
|   |   | BK       |    |    |            |         |         |         |         |         |         |         |      |       |
|   |   |          |    |    |            |         |         |         |         |         |         |         |      |       |
|   | 2 | T        |    |    |            |         |         |         |         |         |         |         |      |       |
|   |   | B        |    |    |            |         |         |         |         |         |         |         |      |       |
|   |   | BK       |    |    |            |         |         |         |         |         |         |         |      |       |
|   |   |          |    |    |            |         |         |         |         |         |         |         |      |       |
|   | 3 | T        |    |    |            |         |         |         |         |         |         |         |      |       |
| B   |   |          |    |    |            |         |         |         |         |         |         |         |      |       |
| BK  |   |          |    |    |            |         |         |         |         |         |         |         |      |       |
|   |   |          |    |    |            |         |         |         |         |         |         |         |      |       |
| <b>Additional Deposit &amp; Condition Ratings</b> |   |          |    |    |            |         |         |         |         |         |         |         |      |       |
| Piston Crown                                      |   |          |    |    |            |         |         |         |         |         |         |         |      |       |
| Piston Skirt                                      |   |          |    |    |            |         |         |         |         |         |         |         |      |       |
| Rings   |   |          |    |    |            |         |         |         |         |         |         |         |      |       |
| Liner   |   |          |    |    |            |         |         |         |         |         |         |         |      |       |

**1R SCOTE Test Procedure  
Form 6A  
Referee Rating**

|                                   |               |            |        |
|-----------------------------------|---------------|------------|--------|
| <b>Test Identification</b>        |               |            |        |
| Lab                               | EOT Date      | End Time   | Method |
| Stand                             | Run           |            |        |
| Formulation/Stand Code            |               |            |        |
| Oilcode                           |               |            |        |
| <b>Referee Rating Information</b> |               |            |        |
| Company                           | Rating Number | Date Rated | Rater  |

| <b>Total Piston Ratings Summary</b> |                |         |      |       |               |       |      |       |               |                |        |      |                           |      |       |      |             |      |             |      |
|-------------------------------------|----------------|---------|------|-------|---------------|-------|------|-------|---------------|----------------|--------|------|---------------------------|------|-------|------|-------------|------|-------------|------|
|                                     | Deposit Factor | Grooves |      |       |               | Lands |      |       |               | Deposit Factor | Groove |      | 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. |             |      |             |      |
| <b>CARBON</b>                       | HC - 1.0       |         |      |       |               |       |      |       |               |                |        |      |                           |      |       |      |             |      |             |      |
|                                     | MC - 0.5       |         |      |       |               |       |      |       |               |                |        |      |                           |      |       |      |             |      |             |      |
|                                     | LC - .25       |         |      |       |               |       |      |       |               |                |        |      |                           |      |       |      |             |      |             |      |
|                                     |                |         |      |       |               |       |      |       |               |                |        |      |                           |      |       |      |             |      |             |      |
|                                     | TOTAL          |         |      |       |               |       |      |       |               |                |        |      |                           |      |       |      |             |      |             |      |
| <b>VAH</b>                          | 8 - 9          |         |      |       |               |       |      |       |               | 7.5            |        |      |                           |      |       |      |             |      |             |      |
|                                     | 7 - 7.9        |         |      |       |               |       |      |       |               |                |        |      |                           |      |       |      |             |      |             |      |
|                                     | 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       |         |      |       |               |       |      |       |               |                |        |      |                           |      |       |      |             |      |             |      |
|                                     | 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    |             |      |
| Industry Rating                     |                |         |      |       |               |       |      |       |               |                |        |      |                           |      |       |      |             |      |             |      |
| <b>WD:</b>                          | <b>TLHC %:</b> |         |      |       | <b>TGF %:</b> |       |      |       | <b>IGF %:</b> |                |        |      | <b>TLFC %:</b>            |      |       |      |             |      |             |      |
| <b>Unweighted:</b>                  | <b>TLC:</b>    |         |      |       | <b>TGC:</b>   |       |      |       | <b>IGC:</b>   |                |        |      | <b>Undercrown Carbon:</b> |      |       |      |             |      |             |      |



**1R SCOTE Test Procedure  
Form 7  
Oil Analysis Data**

|                            |            |          |        |
|----------------------------|------------|----------|--------|
| <b>Test Identification</b> |            |          |        |
| Lab                        | EOT Date   | End Time | Method |
| Stand                      | Run        |          |        |
| Formulation/Stand Code     |            |          |        |
| Oilcode                    |            |          |        |
| Test Fuel                  | Fuel Batch |          |        |

|                                       |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|---------------------------------------|-----|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| <b>Oil Analysis</b>                   | New |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| VISC @ 100 °C                         |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| VISC @ 40 °C                          |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| TBN D4739                             |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| TAN D664                              |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| TGA Soot %                            |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| <b>Wear Metals (ppm)</b>              |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Fe                                    |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Al                                    |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Si                                    |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Cu                                    |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Cr                                    |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Pb                                    |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| <b>Other Results</b>                  |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Fuel Dilution                         |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| IR O <sub>2</sub>                     |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Blowby(L/min)                         |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Oil Consumption g/h<br>for hrs ending |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Oil Consumption r <sup>2</sup>        |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Fuel Position (mm)                    |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Note:

- (1) Total oil in system 5800 ± 50 g
- (2) Refill oil scale cart to full level every 36 h. Take oil samples at hours shown before adding oil.







**1R SCOTE Test Procedure  
Form 9  
Ring Measurements**

|                        |          |          |        |
|------------------------|----------|----------|--------|
| Lab                    | EOT Date | End Time | Method |
| Stand                  | Run      |          |        |
| Formulation/Stand Code |          |          |        |
| Oilcode                |          |          |        |

All Ring Measurements Are Made Using Metric Feeler Gages

| Ring Gaps Specifications (mm) | 1Y4014 Top | 1Y4013 Intermediate | 1Y4012 Oil    |
|-------------------------------|------------|---------------------|---------------|
|                               |            | 0.350 – 0.550       | 0.754 – 0.906 |
| Pre-Test                      |            |                     |               |
| Post-Test                     |            |                     |               |
| Increase                      |            |                     |               |

| Ring Side Clearance* |           | A | B | C | D | Average | Minimum | Specification       |
|----------------------|-----------|---|---|---|---|---------|---------|---------------------|
| Top                  | Pre-Test  |   |   |   |   |         |         | 0.090 mm – 0.127 mm |
|                      | Post-Test |   |   |   |   |         |         |                     |
|                      | LSC       |   |   |   |   |         |         |                     |
| Int.                 | Pre-Test  |   |   |   |   |         |         | 0.060 mm – 0.110 mm |
|                      | Post-Test |   |   |   |   |         |         |                     |
|                      | LSC       |   |   |   |   |         |         |                     |
| Oil                  | Pre-Test  |   |   |   |   |         |         | 0.030 mm – 0.080 mm |
|                      | 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      |          |        |
| Formulation/Stand Code |          |          |        |
| Oilcode                |          |          |        |

| <b>Liner Surface Finish (µm)</b>          |                   |                     |                |
|---|-------------------|---------------------|----------------|
| <b>Distance From Top</b>                  | <b>Transverse</b> | <b>Longitudinal</b> | <b>Average</b> |
| 130 mm                                    |                   |                     |                |
| 50 mm                                     |                   |                     |                |
| 25 mm                                     |                   |                     |                |
| <b>Total Average (Spec: 0.4 – 0.8 µm)</b> |                   |                     |                |

| <b>% Liner Bore Polish – Grid<br/>(Add T/AT Values From Grid)</b> |  |
|---|--|
| Thrust  |  |
| Anti-Thrust   |  |
| Total   |  |

| <b>Liner Bore Measurement (137.154 mm minimum)</b> |                        |                   |  |           |
|--|------------------------|-------------------|--|-----------|
| <b>Before Test - Diameter (Dial Bore Gage)</b>     |                        |                   |  |           |
| <b>Bore Height</b>                                 | <b>Longitudinal</b>    | <b>Transverse</b> | <b>Out of Round<br/>(0.038 mm max)</b> |           |
| 250 mm   |                        |                   |  |           |
| 210 mm   |                        |                   |  |           |
| 170 mm   |                        |                   |  |           |
| 130 mm   |                        |                   |  |           |
| 50 mm  |                        |                   |  |           |
| 25 mm  |                        |                   |  |           |
| 15 mm  |                        |                   |  |           |
| Taper (0.050 mm max.)                              |                        |                   |  |           |
| <b>After Test – (Surface Profile)</b>              |                        |                   |  |           |
|  | <b>Longitudinal µm</b> |                   | <b>Transverse µm</b>                   |           |
|  | <b>Front</b>           | <b>Rear</b>       | <b>T</b>                               | <b>AT</b> |
| Wear Step @ 13 mm                                  |                        |                   |  |           |

**1R SCOTE Test Procedure  
Form 11  
Characteristics of the Data Acquisition System**

|                        |          |          |        |
|------------------------|----------|----------|--------|
| Lab                    | EOT Date | End Time | Method |
| Stand                  | Run      |          |        |
| Formulation/Stand Code |          |          |        |
| Oilcode                |          |          |        |

| Parameter<br>(1)            | Sensing Device<br>(2) | Calibration Frequency<br>(3) | Record Device<br>(4) | Observation Frequency<br>(5) | Record Frequency<br>(6) | Log Frequency<br>(7) | System Response<br>(8) |
|-----------------------------|-----------------------|------------------------------|----------------------|------------------------------|-------------------------|----------------------|------------------------|
| <b>Operation Conditions</b> |                       |                              |                      |                              |                         |                      |                        |
| Engine Speed (r/min)        |                       |                              |                      |                              |                         |                      |                        |
| Engine Power (kW)           |                       |                              |                      |                              |                         |                      |                        |
| Fuel Flow (g/min)           |                       |                              |                      |                              |                         |                      |                        |
| Humidity (g/kg)             |                       |                              |                      |                              |                         |                      |                        |
| <b>Temperatures (°C)</b>    |                       |                              |                      |                              |                         |                      |                        |
| Coolant Out                 |                       |                              |                      |                              |                         |                      |                        |
| Coolant In                  |                       |                              |                      |                              |                         |                      |                        |
| Oil to Manifold             |                       |                              |                      |                              |                         |                      |                        |
| Oil Cooler In               |                       |                              |                      |                              |                         |                      |                        |
| Inlet Air                   |                       |                              |                      |                              |                         |                      |                        |
| Exhaust                     |                       |                              |                      |                              |                         |                      |                        |
| Fuel To Head                |                       |                              |                      |                              |                         |                      |                        |
| <b>Pressures (kPa)</b>      |                       |                              |                      |                              |                         |                      |                        |
| Oil to Manifold             |                       |                              |                      |                              |                         |                      |                        |
| Inlet Air                   |                       |                              |                      |                              |                         |                      |                        |
| Exhaust                     |                       |                              |                      |                              |                         |                      |                        |
| Fuel from Head              |                       |                              |                      |                              |                         |                      |                        |
| Crankcase                   |                       |                              |                      |                              |                         |                      |                        |
| <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) THE FREQUENCY AT WHICH THE MEASUREMENT IS CALIBRATED
- (4) THE TYPE OF DEVICE WHERE DATA IS RECORDED  
 LG – HANDLOG SHEET  
 DL – AUTOMATIC DATA LOGGER  
 SC – STRIP CART RECORDER  
 C/N – COMPUTER, USING MANUAL ENTRY  
 C/D – COMPUTER, USING DIRECT I/O ENTRY

- (5) DATA 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:  
 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**

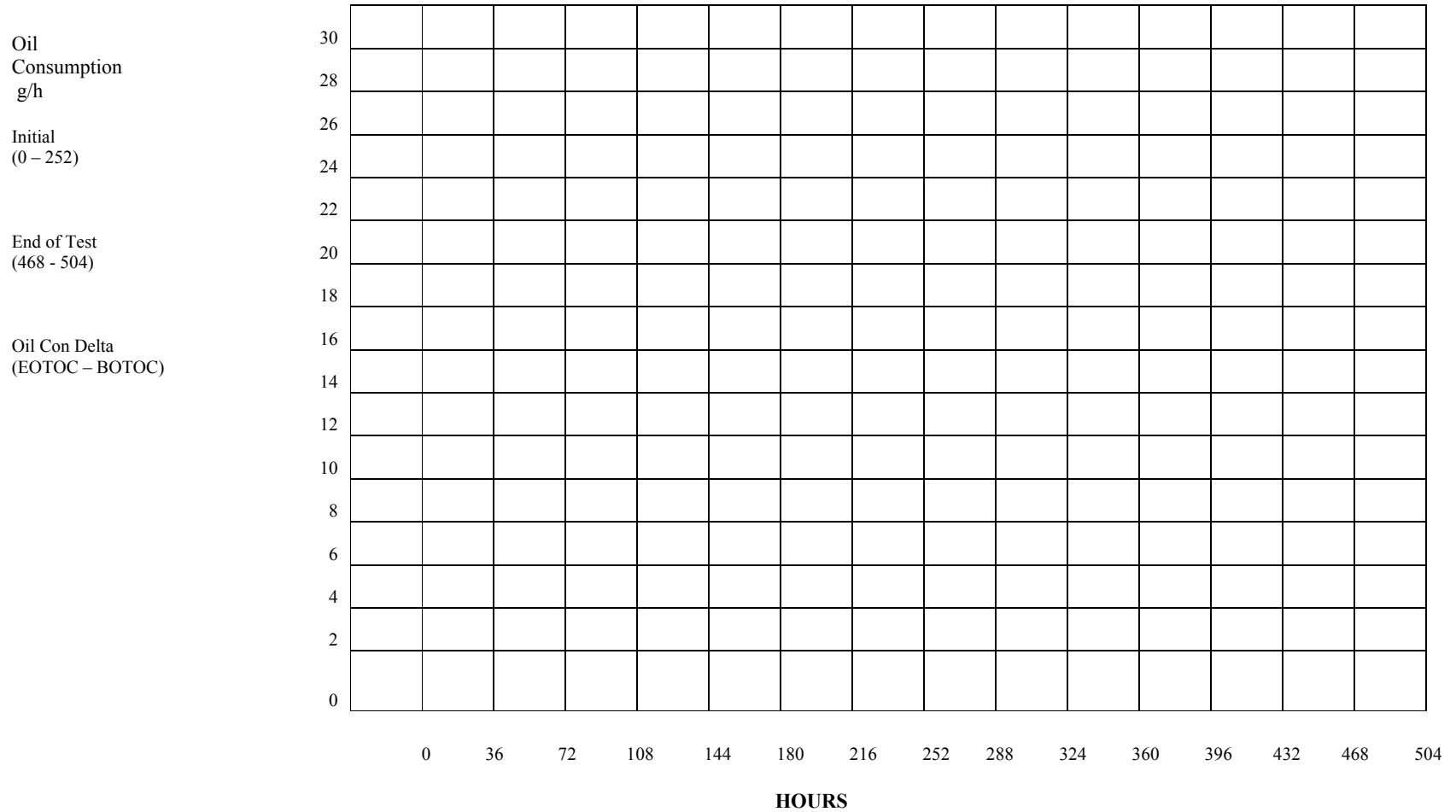
|                        |          |          |        |
|------------------------|----------|----------|--------|
| Lab                    | EOT Date | End Time | Method |
| Stand                  | Run      |          |        |
| Formulation/Stand Code |          |          |        |
| Oilcode                |          |          |        |





**1R SCOTE Test Procedure  
Form 14  
Oil Consumption**

|                         |          |          |        |
|-------------------------|----------|----------|--------|
| Lab                     | EOT Date | End Time | Method |
| Stand                   | Run      |          |        |
| Formulation/Stand Code: |          |          |        |
| Oilcode                 |          |          |        |



**1R SCOTE Test Procedure  
Form 15  
Piston, Ring and Liner Photographs**

|                        |          |          |        |
|------------------------|----------|----------|--------|
| Lab                    | EOT Date | End Time | Method |
| Stand                  | Run      |          |        |
| Formulation/Stand Code |          |          |        |
| Oilcode                |          |          |        |

Refer to Appendix A14 for an example of Photo



**1R SCOTE Test Procedure  
Form 17  
Fuel Batch Analysis**

|                        |          |          |        |
|------------------------|----------|----------|--------|
| Lab                    | EOT Date | End Time | Method |
| Stand                  | Run      |          |        |
| Formulation/Stand Code |          |          |        |
| Oilcode                |          |          |        |

Refer to Appendix A14 for examples of appropriate Fuel Batch Analysis

**1R SCOTE Test Procedure  
Form 18  
TMC Control Chart Analysis  
(Reference Oil Tests Only)**

|                        |          |          |        |
|------------------------|----------|----------|--------|
| Lab                    | EOT Date | End Time | Method |
| Stand                  | Run      |          |        |
| Formulation/Stand Code |          |          |        |
| Oilcode                |          |          |        |

Refer to Appendix A14 for examples of Control Chart Analysis page.

# 1R SCOTE Test Procedure

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 |  |

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*)

|  |   |
|--|---|
|  | 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