

D 6750
1K/1N Final Report Cover

Method
Version

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) |
|--|----------------------------------------------------|

| | |
|--|--------------------------------------------------------------|
| | 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 ^A : | |
| Formulation/Stand Code: | |
| Alternate Codes: | |

In my opinion this test _____ been conducted in a valid manner in accordance with ASTM Test Method D 6750 (1K/1N) 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 | EOT Time | Method |
| Stand | Run Number | | |
| Formulation/Stand Code | | | |
| Oilcode | | | |
| Start Date | Total Test Length | TMC Oil Type | |
| Laboratory Internal Oil Code | | | |
| Number of Test Starts Since Stand Calibration ^A | | | |

| | Correction Effective Date | WDK/WDN | TGF % | TLHC% | BSOC g/KW-h | EOTOC g/kW-h |
|------------------------------------------|---------------------------|---------|-------|-------|-------------|--------------|
| Original Result | | | | | | |
| Transformed Result | | | | | | |
| Correction Factor | | | | | | |
| Corrected Transformed Result | | | | | | |
| Severity Adjustment(If Any) ^B | | | | | | |
| Final Transformed Result | | | | | | |
| Final Result | | | | | | |

| | Effective Date | WDK/WDN | TGF % | TLHC % | BSOC g/KW-h | EOTOC g/kW-h |
|-------------------------------|----------------|---------|-------|--------|-------------|--------------|
| Test Target Mean ^B | | | | | | |
| Test Target STD ^B | | | | | | |
| C, D | | | | | | |

| | 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 (mm) | | | | | |
| % Bore Polish | | | | | |

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

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

| Lab | EOT Date | EOT Time | Method | | |
|----------------------------------------|--------------|------------------|-------------------------|-----------------|---------------|
| Stand | Run Number | | | | |
| Formulation/Stand Code | | | | | |
| Oilcode | | | | | |
| Operating Condition | Units | 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) | | | | | |
| Piston | | | D | E | |

D Number below "E" located on top of piston

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.

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

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

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

| 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 | EOT Time | Stand | Run No. | Method |
| Formulation/Stand Code | | | | | Oilcode | |
| Test Fuel | | Fuel Batch | Date Rated | | Rating Number | 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,% | Dem. | A,% | Dem. | Front | | Rear | |
| | | 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 | | | | | | | | | | | | | | | | | | | | |
| L A C Q U E R | 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 |
| Total | | | | | | | | | | | | | | | | | | | | | |
| Rating | | | | | | | | | | | | | | | | | | | | | |
| Location Factor | 1.5 | | 1.5 | | 25 | | 1 | | 1 | | 25 | | 50 | | 20 | | 0 | | 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 | EOT Time | Method |
| Stand | Run Number | | |
| Formulation/Stand Code | | | |
| Oilcode | | | |

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 | | | | EOT 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- |
| 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/1N
Form 5A
Referee Rating**

| Test Identification | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------------------|-----------------|----------------|------|-----------------------------------|------|-------|------|----------------|------|-------|------|---------------------------|------|--------------------|------|-----------------------|------|------------------|------|------------------------|------|--|--|--|
| Lab | | | | EOT Date | | | | EOT Time | | | | Method | | | | | | | | | | | | |
| Stand | | | | Run No. | | | | | | | | | | | | | | | | | | | | |
| 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 | | No. 2 | | No. 3 | | No. 1 | | No. 2 | | No. 3 | | A,% | Dem. | A,% | Dem. | Front | | Rear | | | | |
| | | 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 | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| L A C Q U E R | 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 | | 0 | | | | |
| Weighted Rating | | | | | | | | | | | | | | | | | | | | | | | | |
| TGF % | | | | Intermediate Groove Fill % | | | | WDK/WDN | | | | Unweighted Deposit | | | | Test Lab TLHC% | | | | Test Lab TLHC % | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | |

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

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

| 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 | EOT Time | Method |
| Stand | Run Number | | |
| Formulation/Stand Code | | | |
| Oilcode | | | |

| 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 | | | | |

1K/1N
Form 10
Characteristics Of The Data Acquisition System

| | | | |
|------------------------|------------|----------|--------|
| Lab | EOT Date | EOT 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) | | | | | | | |
| | | | | | | | |
| 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:

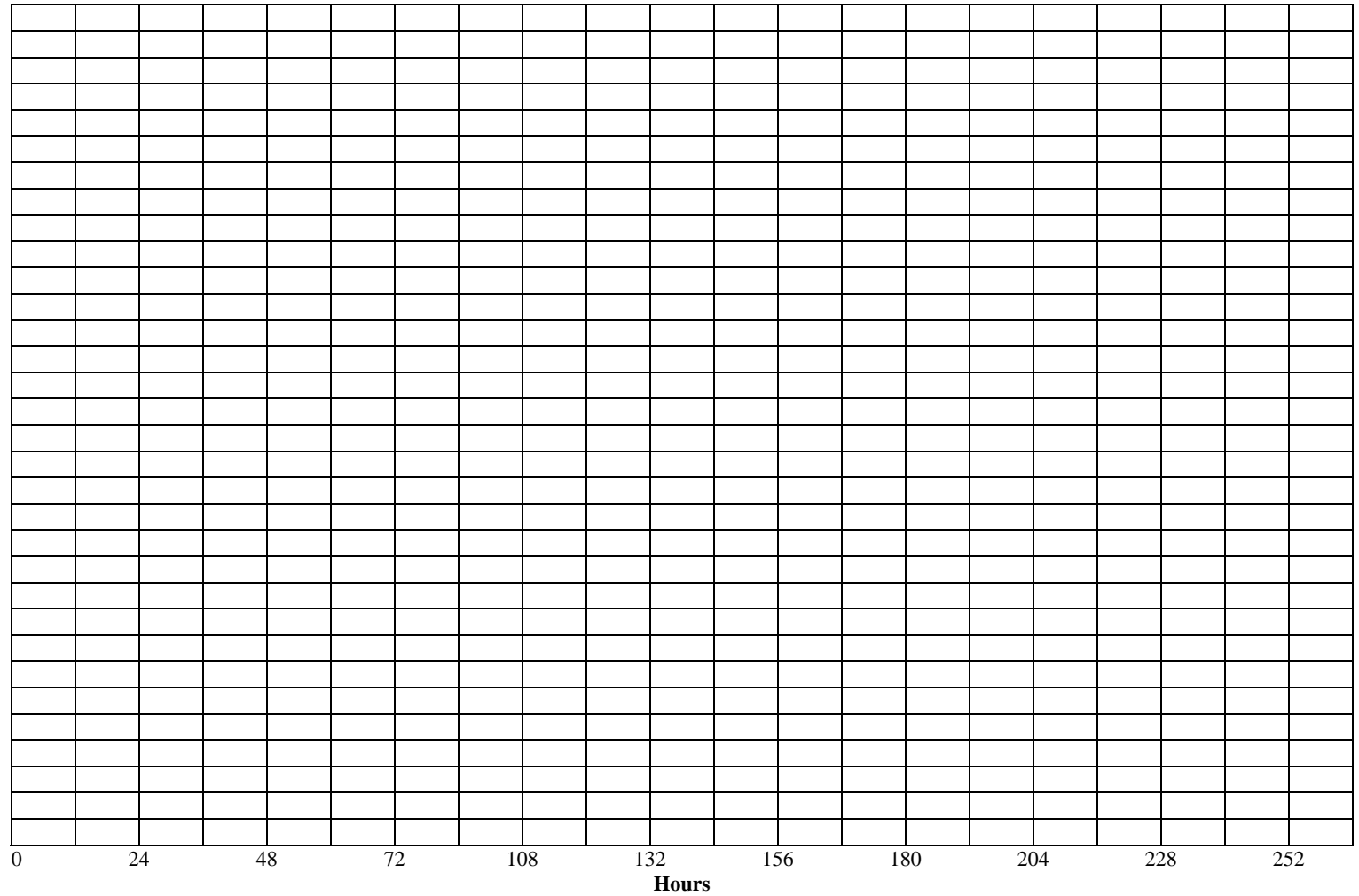
- (1) Operating Parameter
- (2) The Type Of Device Used To Measure Temperature, Pressure Or Flow
- (3) Frequency At Which The Measurement System Is Calibrated
- (4) The Type Of Device Where Data Is Recorded
 - LG – Hanglog Sheet
 - DL - Automatic Data Logger
 - C/M - Computer, Using Manual Data Entry
 - 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 11**

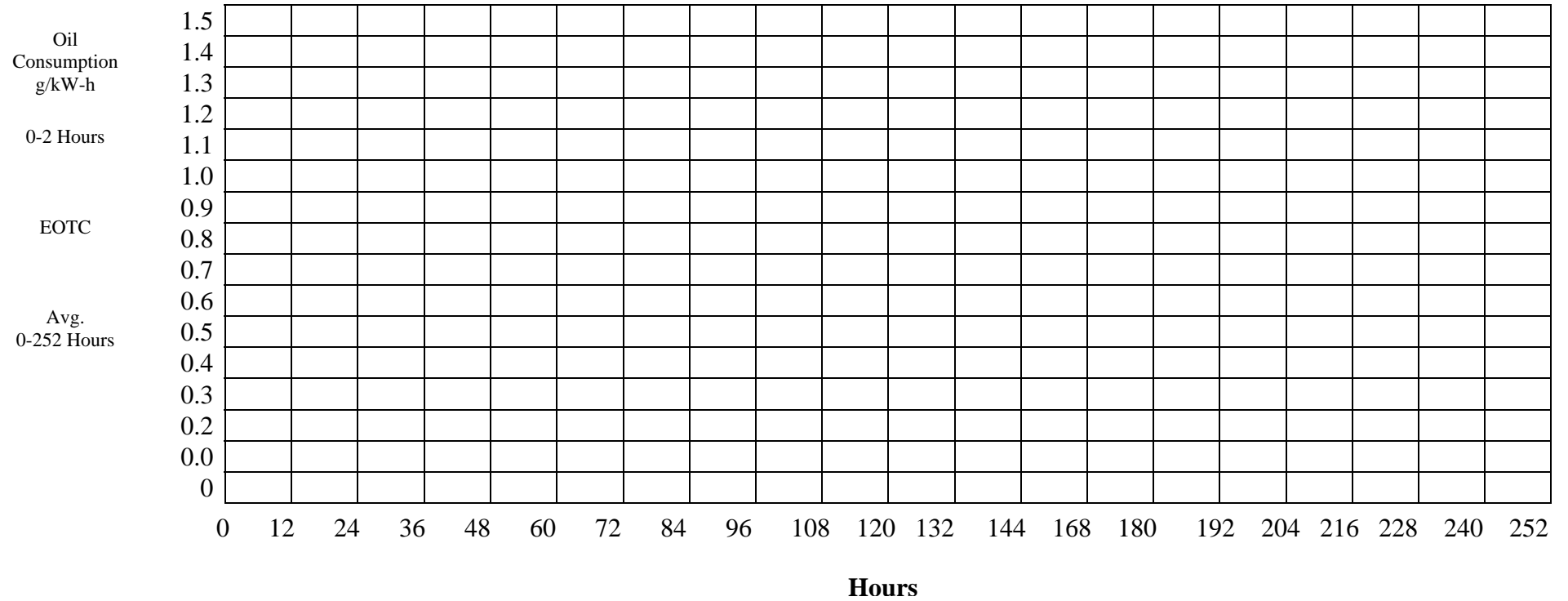
| | | | |
|------------------------|------------|----------|--------|
| Lab | EOT Date | EOT Time | Method |
| Stand | Run Number | | |
| Formulation/Stand Code | | | |
| Oilcode | | | |

| | |
|--------------|------|
| Inlet Air | 130 |
| C | 127 |
| | 124 |
| Oil to | 110 |
| Bearing | 107 |
| C | 104 |
| Coolant In | 91 |
| C | 88 |
| | 85 |
| Coolant Out | 96 |
| C | 93 |
| | 90 |
| Exhaust | 580 |
| C | 550 |
| | 520 |
| Fuel Rate | 186 |
| g/min | 185 |
| | 184 |
| Engine Speed | 2110 |
| r/min | 2100 |
| | 2090 |
| Power | 57 |
| kW | 52 |
| | 47 |



**1K/1N
Form 13
Oil Consumption Plot**

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



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

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

Refer to Appendix C for example of Photo Layout.

1K/1N
Form 16
TMC Control Chart Analysis

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

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

1K/1N
Form 17
Fuel Batch Analysis

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

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

1K/1N
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 |

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