

# SOUTHWEST RESEARCH INSTITUTE®

## Fuels and Lubricants Research Division

# Sequence VG Engine Test

(ASTM D6593)

## Specifications

- API SL/SM/SN
- ILSAC GF-3/GF-4/GF-5

## Objective

- Evaluate the performance of a lubricant in controlling engine deposits under operating conditions deliberately selected to accelerate deposit formation.

## Field Service Simulated

- Moderate-temperature taxi service, urban and suburban delivery service, commuter service.

## Test Fixture

- 2000 Ford 4.6 L fuel-injected, eight-cylinder, gasoline engine with roller followers, coolant-jacketed rocker covers, and camshaft baffles.

## Test Parameters

- The test duration is 216 hours involving 54 cycles, each cycle consisting of three different operating stages.
- Unleaded Haltermann SVG M2 fuel is used, and engine blow-by is intentionally increased.
- Rocker cover jacket temperature is cycled.

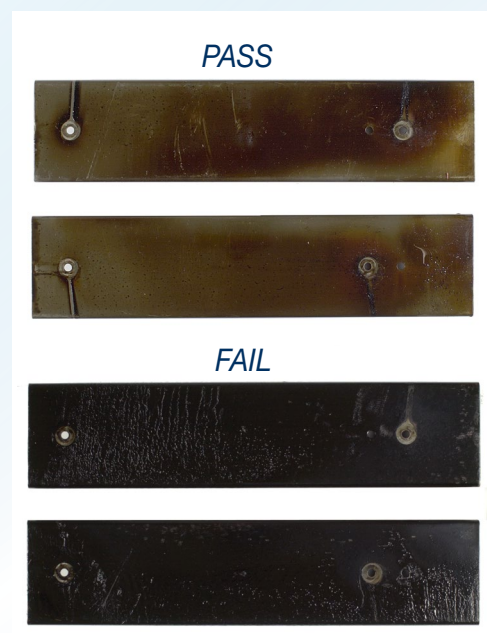
## Test Parts Evaluation

Test Condition	Stage 1	Stage 2	Stage 3
Time, minutes	120	75	45
Engine speed, rpm	1200	2900	700
Intake manifold absolute pressure, kPa	69	66	record
Lubricant temp, °C	68	100	45
Coolant temp, °C	57	85	45
Rocker cover temp, °C	29	85	29

- Sludge deposits are rated on rocker arm covers, cam baffles, timing chain cover, oil pan baffle, oil pan, and valve decks.
- Varnish deposits are rated on piston skirts (thrust) and cam baffles.
- Piston compression rings are inspected for “hot” and “cold” sticking.
- Clogging of oil pump screen and piston oil rings is rated.
- Roller follower pin wear and ring gap increase are measured.

## Used Lubricant Analysis

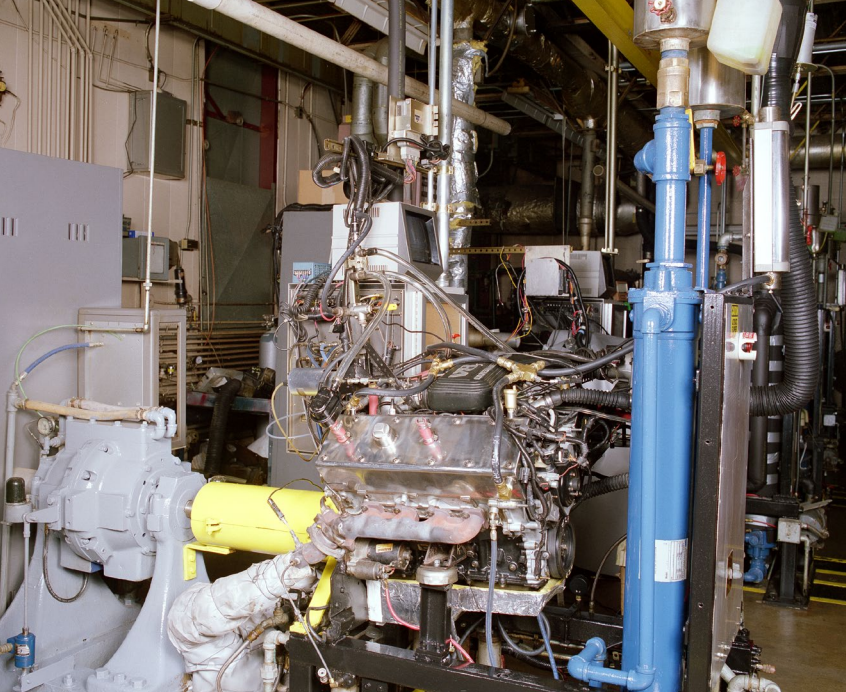
- Viscosity @ 40°C and 100°C (ASTM D445)
- Pentane insolubles (ASTM D893 B)
- Fuel dilution (ASTM D3525 modified)
- Total base number (ASTM D4739)
- Wear metals (ASTM D5185)



## Pass/Fail Criteria

Parameter	GF-3/4 Pass Limit	GF-5 Pass Limit
Average engine sludge	7.8 minimum	8.0 minimum
Rocker cover sludge	8.0 minimum	8.3 minimum
Average engine varnish	8.9 minimum	8.9 minimum
Piston skirt varnish	7.5 minimum	7.5 minimum
Oil screen clogging, %	20 minimum	15 minimum
Hot stuck compression rings	None	None
Oil screen debris	Rate and report	Rate and report
Oil ring clogging	Rate and report	Rate and report
Cold stuck rings	Rate and report	Rate and report
Follower pin wear, average	Rate and report	Rate and report
Ring gap increase, average	Rate and report	Rate and report





◆ We welcome your inquiries.

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