

Mack T-12 Engine Lubricant Test (ASTM D7422)



Test Engine

The test uses a Mack ASET Engine with electronically controlled fuel injection, 2002 low-swirl cylinder heads and two modified configured dual-fitted turbochargers in series; a Variable Geometry Turbocharger (VGT) and a cooled Exhaust Gas Recirculation (EGR). This is an open-chamber, in-line six cylinder 12L engine with lead-based bearings.

Test Operation

Run engine for 300 hours at two test conditions with ULSD (ultra-low sulfur diesel). The first 100 hours at 1800 RPM and rated power with 35% cooled EGR and retarded injection timing to generate 4.0 – 4.6% soot, then transition to 1200 RPM and peak torque (~2600 N·m), 15% cooled EGR, Oil Temperature at 116°C, and 3500 psi PCP (peak cylinder pressure) for 200 hours to evaluate oil consumption, piston rings, liners, and connecting rod bearings for wear.

Oil Specifications

Mack, Volvo, Renault: EO-N, EO-O Premium Plus, EOS-4.5, VDS-3, VDS-4, VDS-4.5, RLD-2, RLD-3, & RLD-4
API: CH-4, CI-4, CI-4 Plus, CJ-4, CK-4, and FA-4
ACEA: E6, E7, and E9

Pass/Fail Determination*

	Delta Pb @ EOT (ppm)	Cylinder Liner Wear (μ m)	Top Ring Weight Loss (mg)	Oil Consumption (g/h)	Delta Pb 250-300 (ppm)
CJ-4 Limit	≤ 35	≤ 24	≤ 105	≤ 85	≤ 15
T-12 CJ-4 Pass Limit in Merits	$\leq 1,000.00$ min.				
EO-O Premium Plus Limit in Merits	$\leq 1,300.00$ min.				

*As specified by ASTM D4485, excluding Premium EO-O

**For more information,
please contact:**

Intertek Automotive Research Services
+1 (210) 684-2310
intertek.com/automotive

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Engine Test Mack T-12

Manufacturer Mack Truck Company, part of Volvo Group
Bore X Stroke, 124.0mm x 165.0mm
12.0L, 2002 Inline 6-Cylinder
Two-piece (Articulated) Steel Piston with Aluminum Skirt

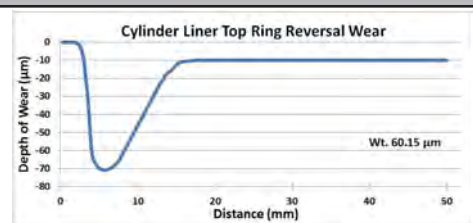
Total Piston Height 141.80mm

Top Crown to Center Pin Bore 94.03mm

Crownland Configuration Radial Crownland to Liner Clearance 0.405mm

Piston Rings	Type	Groove Widths
Top Ring	Keystone	3.12mm
Second Ring	Positive Twist w/ Inside Bevel	2.44mm
Oil Ring	Rectangular	4.78mm

Land Widths	
Crownland	9.05mm
Second	6.86mm
Third	4.64mm



Parameters	Phase I	Phase II	Units
Operating Conditions			
Test Duration	100	200	Hours
Injection Timing	Variable	21	BTDC
Speed	1800	1200	r/min
Fuel Flow	59.2	63.5	kg/h
Intake CO ₂	3.09 ± 0.05	1.42 ± 0.05	%
Exhaust CO ₂	9.10-9.40 range	9.78-10.08 range	
Temperatures			
Intake Manifold	90	80	DegC
Coolant Out	66	108	DegC
Intake Air	25	25	DegC
Fuel In	40	40	DegC
Oil Gallery	88	116	DegC
EGR Pre-Venturi	104 min	104 min	DegC
Intercooler Out	30 min	30 min	DegC
Pressures			
Crankcase	0.5 ± 0.25	0.5 ± 0.25	kPa
Inlet Air	3.5-4.0 range	3.5-4.0 range	kPa
Exhaust	2.7-3.5 range	2.7-3.5 range	kPa
Intake Manifold	266 nominal	302-312 range	kPa
Oil Filter Delta*	138 max		kPa

*If the Oil Filter delta P exceeds 138kPa, change the two full flow filters

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