ACEA — ACEA 2008 european oil sequence for service-fill oils for gasoline and diesel engines — Dec 2008

This sequence defines the minimum quality level of a product for self-certification to EELQMS and for presentation to ACEA members.
Performance parameters other than those covered by the tests shown or more stringent limits may be indicated by individual member companies.

1. LABORATORY TESTS

REQUIREMENT	TEST METHOD	PROPERTIES	UNIT	LIMITS			
				A1/B1-08	**A3/B3-08**	**A3/B4-08**	**A5/B5-08**
1.1 Viscosity grades		SAE J300 Latest active issue		No restriction except as defined by shear stability and HT/HS requirements. Manufacturers may indicate specific viscosity requirements related to ambient temperature.			
1.2 Shear stability	CEC-L-014--93 or ASTM D6278	100°C Viscosity after 30 cycles	mm^2/s	xW-20 stay in grade xW30 ≥9.3 xW40 ≥12.0	All grades to be stay in grade	All grades to be stay in grade	All grades to be stay in grade
1.3 Viscosity at high temp. & high shear rate	CEC-L-036-90 *(2nd edition)* *(Ravenfield)*	Viscosity at 150°C and 10^6 s^{-1} shear rate	mPa.s	≥2.9 and ≤ 3.5 Xw-20 2.6. min	≥3.5	≥3.5	≥2.9 and ≤ 3.5
1.4 Evaporative loss	CEC-L-040-93 (Noack)	Max. weight loss after 1 h at 250°C	%	≤15	≤13	≤13	≤13
1.5 TBN	ASTM D2896		mgKOH/g	≥8.0	≥8.0	≥8.0	≥8.0
1.6 Sulphated ash (2)	ASTM D874		% m/m	≤1.3	≤1.5	≤1.6	≤1.6
				Note: the following sections apply to all sequences			
1.7 Sulphur (1)	ASTM D5185		% m/m	Report			
1.8 Phosphorus (1)	ASTM D5185		% m/m	Report			
1.9 Chlorine	ASTM D6443		ppm m/m	Report			
1.10 Oil / elastomer compatibility (3)	CEC-L-039-96	Max. variation of characteristics after immersion for 7 days in fresh oil without pre-ageing		Elastomer type			
				RE1	RE2-99	RE3-04	RE4	AEM (VAMAC)
		Hardness DIDC	points	-1/+5	-5/+8	-22/+1	-5/+5	As per Daimler
		Tensile strength	%	-40/+10	-15/+18	-30/+10	-20/+10	
		Elongation at rupture	%	-50/+10	-35/+10	-20/+10	-50/+10	
		Volume variation	%	-1/+5	-7/+5	-1/+22	-5/+5	
1.11 Foaming tendency	ASTM D892 without option A	Tendency – stability	ml	Sequence I (24°C) 10 - nil Sequence II (94°C) 50 - nil Sequence III (24°C) 10 - nil			
1.12 High Temperature foaming tendency	ASTM D6082 High temperature foam test	Tendency – stability	ml	Sequence IV (150°C) 100 - nil			

2. ENGINE TESTS

REQUIREMENT	TEST METHOD	PROPERTIES	UNIT	LIMITS			
				A1/B1-08	**A3/B3-08**	**A3/B4-08**	**A5/B5-08**
2.1 High temperature deposits Ring sticking Oil thickening	CEC-L-088-02 (TU5JP-L4) 72 Hour test	Ring sticking (each part)	Merit	≥9.0	≥9.0	≥9.0	≥9.0
		Piston varnish (6 elements, average of 4 pistons)	Merit	≥RL216	≥RL216	≥RL216	≥RL216
		Absolute viscosity increase at 40°C between min & max values during test	mm^2/s	≤0.8 x RL216	≤0.8 x RL216	≤0.8 x RL216	≤0.8 x RL216
		Oil consumption	kg/test	Report	Report	Report	Report
2.2 Low temperature sludge (4)	ASTM D6593-00 (Sequence VG) Under protocol & requirements for API	Average engine sludge	Merit	≥7.8	≥7.8	≥7.8	≥7.8
		Rocker cover sludge	Merit	≥8.0	≥8.0	≥8.0	≥8.0
		Average piston skirt varnish	Merit	≥7.5	≥7.5	≥7.5	≥7.5
		Average engine varnish	Merit	≥8.9	≥8.9	≥8.9	≥8.9
		Comp. ring (hot stuck)		none	none	none	none
		Oil screen clogging	%	≤20	≤20	≤20	≤20
2.3 Valve train scuffing wear	CEC-L-038-94 (TU3M)	Cam wear, average	µm	≤10	≤10	≤10	≤10
		Cam wear, max.	µm	≤15	≤15	≤15	≤15
		Pad merit (Ave. of 8 pads)	Merit	≥7.5	≥7.5	≥7.5	≥7.5
2.4 Black sludge	CEC-L-053-95 (M111)	Engine sludge, average	Merit	≥RL140	≥RL140 + 4σ or ≥ 9.0	≥RL140 + 4σ or ≥ 9.0	≥RL140 + 4σ or ≥ 9.0
2.5 Fuel economy (5)	CEC-L-054-96 (M111)	Fuel economy improvement vs. Reference oil RL191 (15W-40)	%	≥2.5	-	-	≥2.5
2.6 Medium temperature dispersivity	CEC-L-093-04 (DV4TD)	Absolute viscosity increase at 100°C and 6% soot	mm^2/s	≤0.60 x RL223 result	≤0.60 x RL223 result	≤0.60 x RL223 result	≤0.60 x RL223 result
		Piston merit	Merit	≥(RL223 – 2.5 pts)	≥(RL223 – 2.5 pts)	≥(RL223 – 2.5 pts)	≥(RL223 – 2.5 pts)
2.7 Wear (6)	CEC-L-099-08 (OM646LA)	Cam wear outlet (avg. max. wear 8 cams)	µm	≤140	≤140	≤120	≤120
		Cam wear inlet (avg. max. wear 8 c.); (8)	µm	≤110	≤110	≤100	≤100
		Cylinder wear (avg. 4. cyl.); s. note (8)	µm	≤5.0	≤5.0	≤5.0	≤5.0
		Bore polishing (13mm) - max. of 4 cyl.; s. note (8)	%	≤3.5	≤3.5	≤3.0	≤3.0
		Tappet wear inlet (avg. max. wear 8 cams)	µm	report	report	report	report
		Tappet wear outlet (avg. max. wear 8 cams)	µm	report	report	report	report
		Piston cleanliness (avg. 4 pistons)	merits	report	report	report	report
		Engine sludge avg.	merits	report	report	report	report
2.8 DI diesel Piston cleanliness & Ring sticking (9)	CEC-L-078-99 (VW TDI)	Piston cleanliness	Merit	≥RL206	≥RL206	≥RL206	≥RL206
		Ring sticking (Rings 1&2)		minus 4 pts.	minus 4 pts.		
		Average of all 8 rings	ASF	≤1.2	≤1.2	≤1.0	≤1.0
		Max. for any 1st ring	ASF	≤2.5	≤2.5	≤1.0	≤1.0
		Max. for any 2nd ring	ASF	0.0	0.0	0.0	0.0
		EOT TBN (7,8)	mgKOH/g	≥4.0	≥4.0	≥4.0	≥4.0
		EOT TAN (7)	mgKOH/g	Report	Report	Report	Report

(1) The internal standard method has to be used. (2) Maximum limits, Values take into account method and production's tolerances. (3) Use either complete Daimler requirements (VDA 675301, 7 days +/- 2h, 4 materials (NBR: NBR34 DIN 53538 T3 (100 °C +/- 2°C); FPM: AK6 (150 °C +/- 2°C); ACM: E7503 (150 °C +/- 2°C); AEM: D 8948/200.1 (150 °C +/- 2°C)) + RE3, or complete requirements according to 1.10 above + Daimler requirements for AEM. (4) The limits shown are based upon those applied in U.S. market requirements. ACEA will continuously review the situation to ensure that these limits are appropriate for European vehicles and lubricants. (5) ACEA considers the CEC L-54-T-96 test the only valid comparator against which claims of lubricant fuel economy improvement should be made. (6) For A1/B1 claims OM 602A passing results obtained before the end of 2008 can be used instead of OM 646LA results. (7) Test report has to give measured values before & after the test, all measurements to be taken in the same lab. (8) These parameters are not yet official CEC parameters. (9) Test results from tests performed before the publishing of the 2008 ACEA oil sequences are allowed to be used without passing the EOT TBN criteria EOT TAN values.