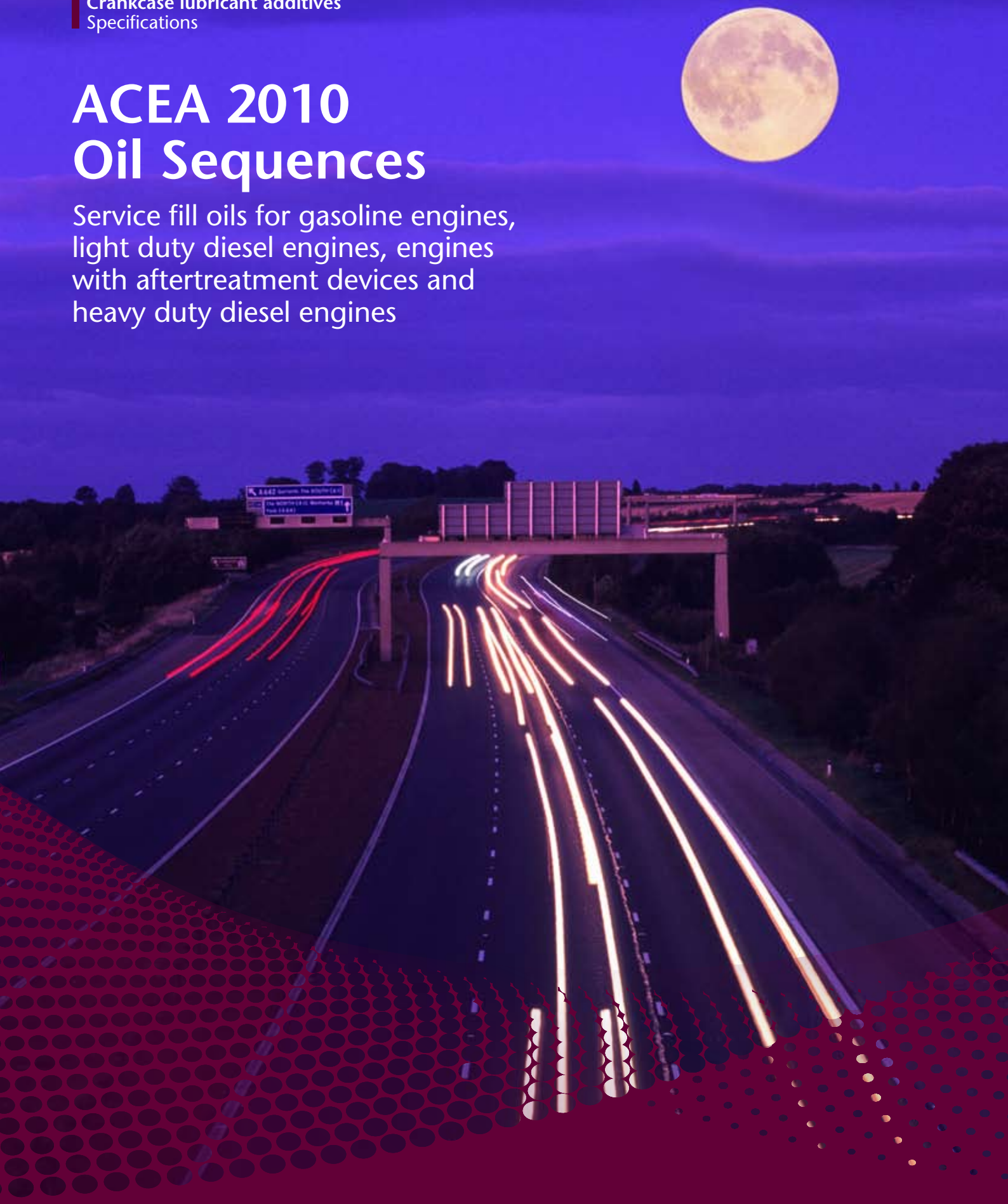
ACEA 2010 Oil Sequences

Service fill oils for gasoline engines, light duty diesel engines, engines with aftertreatment devices and heavy duty diesel engines



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The ACEA[1] 2010 Sequences – What's New?

In general, the ACEA 2010 sequences are a re-issue of the 2008 sequences with few significant changes. The structure of both the light duty and heavy duty sequences remains unchanged with no new or deleted categories. With the Daimler M111 black sludge test having reached the end of its life, ACEA have requested the use of the Daimler M271 sludge test in its place. Other than this replacement, the engine tests used to define performance are unchanged. The test limits, too, are unchanged with the exception of the black sludge performance of A1/B1-10 that is increased to align with other A/B categories.

A new feature in the 2010 release is the request from ACEA for oil marketers to register their claims in a system to be set up on the ACEA website (www.acea.be) Details of the system are under discussion; it is anticipated that this will be set up during the lifetime of the ACEA 2010 sequences.

Light Duty Engine Sequences

The most significant changes are in the chemical limits in some of the light duty engine sequences. Compared with the ACEA 2008 requirements, the changes are:

- Oils claiming ACEA A3/B3-10 must now meet a sulphated ash minimum of 0.9%.
- ACEA A3/B4-10 oils must now meet a sulphated ash minimum of 1.0% in addition to a TBN minimum of 10.0 mgKOH/g.
- The end of test TBN requirement for the VW TDI test (CEC-L-078-99) is increased in ACEA A3/B4-10 to 6.0 mgKOH/g.
- The minimum phosphorus requirement for ACEA C2-10 oils has been removed.

Heavy Duty Engine Sequences

There are no significant changes to the ACEA heavy duty sequences, which are designated ACEA Ex-08 Issue 2.

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ACEA 2010 European oil sequence for service-fill oils for gasoline and diesel engines

ACEA | Dec 2010

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/B1-10	A3/B3-10	A3/B4-10	A5/B5-10
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 xW-30 ≥ 9.3 xW-40 ≥ 12.0	All grades to be stay in grade		
1.3 Viscosity at high temp. & high shear rate	CEC-L-036-90	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	≥ 10.0	≥ 8.0
1.6 Sulphated ash (2)	ASTM D874		% m/m	≤1.3	≥0.9 and ≤1.5	≥ 1.0 and ≤1.6	≤1.6
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			
				Note: the following section applies to all sequences			
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/B1-10	A3/B3-10	A3/B4-10	A5/B5-10
2.1 High temperature deposits Ring sticking Oil thickening	CEC-L-088-02 (TU5JP-L4) 72 Hour test	Ring sticking (each part) Piston varnish (6 elements, average of 4 pistons) Absolute viscosity increase at 40°C between min & max values during test Oil consumption	Merit Merit mm^2/s kg/test	≥ 9.0 ≥ RL216 ≤ 0.8 x RL216 Report			
2.2 Low temperature sludge (4)	ASTM D6593-00 (Sequence VG) Under protocol & requirements for API	Average engine sludge Rocker cover sludge Average piston skirt varnish Average engine varnish Comp. ring (hot stuck) Oil screen clogging	Merit Merit Merit Merit %	≥ 7.8 ≥ 8.0 ≥ 7.5 ≥ 8.9 none ≤20			
2.3 Valve train scuffing wear	CEC-L-038-94 (TU3M)	Cam wear, average Cam wear, max. Pad merit (Ave. of 8 pads)	µm µm Merit	≤10 ≤15 ≥ 7.5			
2.4 Black sludge	(10,11)	Engine sludge, average	Merit	≥ RL140 + 4σ			
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 Piston merit	mm^2/s	≤ 0.60 x RL223 result ≥ (RL223 – 2.5 pts)			
2.7 Wear (6)	CEC-L-099-08 (OM646LA)	Cam wear outlet (avg. max. wear 8 cams) Cam wear inlet (avg. max. wear 8 c.); (8) Cylinder wear (avg. 4. cyl.); s. note (8) Bore polishing (13mm) - max. of 4 cyl.; s. note (8) Tappet wear inlet (avg. max. wear 8 cams) Tappet wear outlet (avg. max. wear 8 cams) Piston cleanliness (avg. 4 pistons) Engine sludge avg.	µm µm µm % µm µm Merit Merit	≤140 ≤110 ≤5.0 ≤3.5 report report report report		≤120 ≤100 ≤5.0 ≤3.0 report report report report	
2.8 DI diesel Piston cleanliness & Ring sticking (9)	CEC-L-078-99 (VW TDI)	Piston cleanliness Ring sticking (Rings 1&2) Average of all 8 rings Max. for any 1st ring Max. for any 2nd ring EOT TBN (7,8) EOT TAN (7)	Merit ASF ASF ASF mgKOH/g mgKOH/g	≥ RL206 minus 4 pts ≤1.2 ≤2.5 0.0 ≥ 4.0 Report	≥ RL206 minus 4 pts ≤1.2 ≤2.5 0.0 ≥ 4.0 Report	≥ RL206 ≤1.0 ≤1.0 0.0 ≥ 6.0 Report	≥ RL206 ≤1.0 ≤1.0 0.0 ≥ 4.0 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 and after the test, all measurements to be taken in the same lab. Note: TAN is considered to become a future performance criteria. (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 and reporting EOT TAN values. (10) Until a new CEC Test Method is developed, the gasoline sludge protection performance of engine oil formulations must be proofed by the M 271 sludge test procedure as described by Daimler AG. Test results obtained by the M 271 procedure will be accepted under the condition that they come from test rigs being referenced and quality controlled by Daimler AG. Limits are based on the same reference oil as with the old M111 sludge test. (11) Existing results from tests with CEC-L-053 may be used where applicable. In this case limits for all ACEA A/B categories (including A1/B1) are: ≥ RL 140 + 4σ or ≥ 9.0.

ACEA 2010 European oil sequence for service-fill oils for gasoline and diesel engines with after treatment devices

ACEA | Dec 2010

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			
				C1-10	C2-10	C3-10	C4-10
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	All grades to be stay in grade			
1.3 Viscosity at high temp. & high shear rate	CEC-L-036-90	Viscosity at 150°C and 10^6 s^{-1} shear rate	mPa.s	≥2.9	≥2.9	≥3.5	≥3.5
1.4 Evaporative loss	CEC-L-040-93 (Noack)	Max. weight loss after 1h at 250°C	%	≤13	≤13	≤13	≤11
1.5 TBN	ASTM D2896		mgKOH/g			≥6.0	≥6.0
1.6 Sulphur (1)	ASTM D5185		% m/m	≤0.2	≤0.3	≤0.3	≤0.2
1.7 Phosphorus (1)	ASTM D5185		% m/m	≤ 0.05 (2)	≤ 0.090 (2)	≥0.070 ≤ 0.090 (2)	≤ 0.090 (2)
1.8 Sulphated ash (2)	ASTM D874		% m/m	≤0.5	≤0.8	≤0.8	≤0.5
1.9 Chlorine	ASTM D6443		ppm m/m	Report			
				Note: the following section applies to all sequences			
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			
				C1-10	C2-10	C3-10	C4-10
2.1 High temperature deposits Ring sticking Oil thickening	CEC-L-088-T-02 (TU5JP-L4) 72 Hour test	Ring sticking (each part) Piston varnish (6 elements, average of 4 pistons) Absolute viscosity increase at 40°C between min & max values during test Oil consumption	Merit Merit mm^2/s kg/test	≥9.0 ≥RL216 ≤0.8 x RL216 Report			
2.2 Low temperature sludge (4)	ASTM D6593-00 (Sequence VG) Under protocol & requirements for API	Average engine sludge Rocker cover sludge Average piston skirt varnish Average engine varnish Comp. ring (hot stuck) Oil screen clogging	Merit Merit Merit Merit %	≥7.8 ≥8.0 ≥7.5 ≥8.9 none ≤20			
2.3 Valve train scuffing wear	CEC-L-038-94 (TU3M)	Cam wear, average Cam wear, max. Pad merit (Average of 8 pads)	µm µm Merit	≤10 ≤15 ≥7.5			
2.4 Black sludge	(11,12)	Engine sludge, average	Merit	≥RL140 + 4σ			
2.5 Fuel economy (5)	CEC-L-54-96 (M111)	Fuel economy improvement vs. Reference oil RL191 (15W-40)	%	≥3.0	≥2.5	≥1.0 (for Xw30 grades)	
2.6 Medium temperature dispersivity	CEC-L-093-04 (DV4TD)	Absolute viscosity increase at 100°C and 6% soot Piston merit	mm^2/s Merit	≤ 0.60 x RL223 result ≥(RL223 -2.5 pts)			
2.7 Wear (6)	CEC-L-099-08 (OM646LA)	Cam wear outlet (avg. max. wear 8 cams) Cam wear inlet (avg. max. wear 8 c.); (9) Cylinder wear (avg. 4. cyl.); s. note (9) Bore polishing (13mm) - max. of 4 cyl.; s. note (9) Tappet wear inlet (avg. max. wear 8 cams) Tappet wear outlet (avg. max. wear 8 cams) Piston cleanliness (avg. 4 pistons) Engine sludge avg.	µm µm µm % µm µm Merit Merit	≤ 120 ≤ 100 ≤ 5.0 ≤ 3.0 report report report report	≤ 120 report (8) ≤ 5.0 ≤ 3.0 report report report report	≤ 120 ≤ 100 ≤ 5.0 ≤ 3.0 report report report report	
2.8 DI diesel Piston cleanliness & Ring sticking (10)	CEC-L-78-99 (VW TDI)	Piston cleanliness Ring sticking (Rings 1&2) Average of all 8 rings Max. for any 1st ring Max. for any 2nd ring EOT TBN (ISO 3771) and EOT TAN (ASTM D664) (7)	Merit ASF ASF ASF mgKOH/g	≥RL206 ≤1.0 ≤1.0 0.0 Report	≥RL206 ≤1.2 ≤2.5 0.0 Report	≥RL206 ≤1.0 ≤1.0 0.0 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) Limits for C1 might be revised if needed. For C1 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 and after the test, all measurements to be taken in the same lab. (8) Limit under definition. (9) These parameters are not yet official CEC parameters. (10) Test results from tests performed before the publishing of the 2008 ACEA oil sequences are allowed to be used without reporting EOT TBN and TAN. (11) Until a new CEC Test Method is developed, the gasoline sludge protection performance of engine oil formulations must be proofed by the M 271 sludge test procedure as described by Daimler AG. Test results obtained by the M 271 procedure will be accepted under the condition that they come from test rigs being referenced and quality controlled by Daimler AG. Limits are based on the same reference oil as with the old M111 sludge test. (12) Existing results from tests with CEC-L-053 may be used where applicable. In this case limits for all ACEA C categories are: ≥ RL 140 + 4σ or ≥ 9.0.

ACEA 2010 European oil sequence for service-fill oils for heavy duty diesel engines

ACEA | Dec 2010

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1. LABORATORY TESTS

REQUIREMENT	TEST METHOD	PROPERTIES	UNIT	LIMITS			
				E4-08 Issue 2	**E6**-08 Issue 2	**E7**-08 Issue 2	**E9**-08 Issue 2
1.1 Viscosity		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	Viscosity after 30 cycles measured at 100°C	mm^2/s	Stay in grade			
	ASTM D6278	Viscosity after 90 cycles measured at 100°C	mm^2/s		Stay in grade		
1.3 Viscosity High Temperature High Shear Rate	CEC-L-036-90	Viscosity at 150°C and 10^6 s^{-1} shear rate	mPa.s	≥3.5			
1.4 Evaporative Loss	CEC-L-040-93 (Noack)	Max. weight loss after 1h at 250°C	%	≤13			
1.5 Sulphated Ash	ASTM D874		% m/m	≤2.0	≤1.0	≤2.0	≤1.0
1.6 Phosphorus (1)	ASTM D5185		% m/m	–	≤0.08	–	≤0.12
1.7 Sulphur (1)	ASTM D5185		% m/m	–	≤0.3	–	≤0.4
				Note: the following section applies to all sequences			
1.8 Oil Elastomer Compatibility (2)	CEC-L-039-96	Max. variation of characteristics after immersion for 7 days in fresh oil without pre-aging		Elastomer type			
				RE1	RE2-99	RE3-04	RE4	AEM
		Hardness DIDC	points	-1/+5	-5/+8	-25/+1	-5/+5	(VAMAC)
		Tensile strength	%	-50/+10	-15/+18	-45/+10	-20/+10	As per
		Elongation rupture	%	-60/+10	-35/+10	-20/+10	-50/+10	Daimler
		Volume variation	%	-1/+5	-7/+5	-1/+30	-5/+5	
1.9 Foaming Tendency	ASTM D892 without option A	Tendency – stability	ml ml ml	Sequence I (24°C) 10 - nil Sequence II (94°C) 50 - nil Sequence III (24°C) 10 - nil			Seq I 10/0 Seq II 20/0 Seq III 10/0
1.10 High temperature foaming tendency	ASTM D6082	Tendency – stability	ml	Sequence IV (150°C) 200 - 50			–
1.11 Oxidation	CEC-L-085-99 (PDSC)	Oxidation Induction time	min	Report	Report	≥65	≥65
1.12 Corrosion	ASTM D6594	Copper increase Lead increase Copper strip	ppm ppm Rating	Report Report Report	Report Report Report	Report ≤100 Report	≤20 ≤100 ≤3
1.13 Turbocharger performance (3)							
1.14 TBN	ASTM D2896		mgKOH/g	≥12	≥7	≥9 (4)	≥7

2. ENGINE TESTS

REQUIREMENT	TEST METHOD	PROPERTIES	UNIT	LIMITS			
				E4-08 Issue 2	**E6**-08 Issue 2	**E7**-08 Issue 2	**E9**-08 Issue 2
2.1 Wear (5, 6)	CEC L-099-08 (OM646LA)	Outlet cam wear (Avg. max. wear 8 cams)	µm	≤140	≤140	≤155	≤155
2.2 Soot in oil (7)	ASTM D5967 (Mack T-8E)	Test duration 300 h Relative viscosity at 4.8% soot and 50% shear loss 1 test/2 test/3 test average		≤2.1/2.2/2.3	≤2.1/2.2/2.3	≤2.1/2.2/2.3	–
2.3 Soot in oil	Mack T11	Min TGA soot @ 4.0 cSt (100°C) Min TGA soot @ 12.0 cSt (100°C) Min TGA soot @ 15.0 cSt (100°C)	%	–	–	–	3.5/3.4/3.3 6.0/5.9/5.9 6.7/6.6/6.5
2.4 Bore polishing Piston cleanliness (8-10)	CEC L-101-08 (OM501LA)	Bore polishing, average Piston cleanliness, average Oil consumption Engine sludge, average	% Merit kg/test Merit	≤1.0 ≥26 ≤9 Report	≤1.0 ≥26 ≤9 Report	≤2.0 ≥17 ≤9 Report	≤2.0 ≥17 ≤9 Report
2.5 Soot induced wear	Cummins ISM	Merit		–	–	(11)	≥1000
		Rocker pad average weight loss at 3.9% soot	mg			≤7.5/7.8/7.9	≤7.1
		1 test/ 2 test/ 3 test average Oil filter diff.press @ 150h	kPa			≤55/67/74	≤19
		1 test/ 2 test/ 3 test average Engine sludge	Merit			≥8.1/8.0/8.0	≥8.7
		1 test/2 test/ 3 test average Adj. screw weight loss	mg				≤49
2.6 Wear (liner-ring-bearings)	Mack T12	Merit Avg. liner wear Average top ring weight loss End of test lead Delta lead 250-300 hrs Oil consumption (Phase II)	 µm mg ppm ppm g/hr	–	≥1000 ≤26 ≤117 ≤42 ≤18 ≤95 (12,13)	≥1000 ≤26 ≤117 ≤42 ≤18 ≤95 (12,13)	≥1000 ≤24 ≤105 ≤35 ≤15 ≤85

(1) The internal standard method has to be used. (2) Use either the most recent complete Daimler requirements (VDA 675301, 7 days, 4 materials (NBR: NBR34 DIN 53538 T3 (100 °C); FPM: AK6 (150 °C); ACM: E7503 (150 °C); AEM: D 8948/200.1 (150 °C)) + RE3 according to requirement 1.8 above, or complete requirements according to 1.8 above + Daimler requirements for AEM. (3) Should a test become available before the next document update, ACEA reserves the right to set performance limits providing adequate data is available. (4) Values < 9.00 are not accepted. (5) OM602A data can be used instead of OM646LA data providing it meets the requirements as specified in the 2007 ACEA sequences. (6) Additional parameters may be included once approved by CEC. (7) Mack T11 results obtained as part of an API CI-4, CI-4 plus or API CJ-4 approval program, can be used in place of Mack T8E. (8) Bore polish, oil consumption and engine sludge are non-approved CEC parameters. (9) OM441LA data can be used instead of OM501LA data providing it meets the requirements as specified in the 2007 ACEA sequences. (10) Limits for the sludge parameter may be reconsidered when more data becomes available. (11) Results from M11HST (ASTM D6838), at API CH-4, or M11EGR (ASTM D6975), at API CI-4 or CI-4 Plus, can be used in place of Cummins ISM. (12) Merit number shall be calculated according to the API CI-4 specification (13) Mack T10 results obtained as part of an API CI-4 or CI-4 plus approval program, can be used in place of Mack T12.

Consumer Language

A/B: gasoline and diesel engine oils

A1/B1 Stable, stay-in-grade oil intended for use at extended drain intervals in gasoline engines and car & light van diesel engines specifically designed to be capable of using low friction low viscosity oils with a high temperature / high shear rate viscosity of 2.6 mPa*s for xW/20 and 2.9 to 3.5 mPa.s for all other viscosity grades. These oils are unsuitable for use in some engines. Consult owner manual or handbook if in doubt.

A3/B3 Stable, stay-in-grade oil intended for use in high performance gasoline engines and car & light van diesel engines and/or for extended drain intervals where specified by the engine manufacturer, and/or for year-round use of low viscosity oils, and/or for severe operating conditions as defined by the engine manufacturer.

A3/B4 Stable, stay-in-grade oil intended for use in high performance gasoline and direct injection diesel engines, but also suitable for applications described under A3/B3.

A5/B5 Stable, stay-in-grade oil intended for use at extended drain intervals in high performance gasoline engines and car & light van diesel engines designed to be capable of using low friction low viscosity oils with a High temperature / High shear rate (HTHS) viscosity of 2.9 to 3.5 mPa.s. These oils are unsuitable for use in some engines. Consult owner manual or handbook if in doubt.

C: Catalyst compatibility oils

C1 Stable, stay-in-grade oil intended for use as catalyst compatible oil in vehicles with DPF and TWC in high performance car and light van diesel and gasoline engines requiring low friction, low viscosity, low SAPS oils with a minimum HTHS viscosity of 2.9 mPa.s. These oils will increase the DPF and TWC life and maintain the vehicles fuel economy.

Warning: these oils have the lowest SAPS limits and are unsuitable for use in some engines. Consult owner manual or handbook if in doubt.

C2 Stable, stay-in-grade oil intended for use as catalyst compatible oil in vehicles with DPF and TWC in high performance car and light van diesel and gasoline engines designed to be capable of using low friction, low viscosity oils with a minimum HTHS viscosity of 2.9mPa.s. These oils will increase the DPF and TWC life and maintain the vehicles fuel economy.

Warning: these oils are unsuitable for use in some engines. Consult owner manual or handbook if in doubt.

C3 Stable, stay-in-grade oil intended for use as catalyst compatible oil in vehicles with DPF and TWC in high performance car and light van diesel and gasoline engines, with a minimum HTHS viscosity of 3.5mPa.s. These oils will increase the DPF and TWC life.

Warning: these oils are unsuitable for use in some engines. Consult owner manual or handbook if in doubt.

C4 Stable, stay-in-grade oil intended for use as catalyst compatible oil in vehicles with DPF and TWC in high performance car and light van diesel and gasoline engines requiring low SAPS oil with a minimum HTHS viscosity of 3.5mPa.s. These oils will increase the DPF and TWC life.

Warning: these oils are unsuitable for use in some engines. Consult owner manual or handbook if in doubt.

SAPS: Sulphated Ash, Phosphorus, Sulphur

DPF: Diesel Particulate Filter

TWC: Three way catalyst

HTHS: High temperature / High shear rate viscosity

E: Heavy Duty Diesel engine oils

E4 Stable, stay-in-grade oil providing excellent control of piston cleanliness, wear, soot handling and lubricant stability. It is recommended for highly rated diesel engines meeting Euro I, Euro II, Euro III, Euro IV and Euro V emission requirements and running under very severe conditions, e.g. significantly extended oil drain intervals according to the manufacturer's recommendations. It is suitable for engines without particulate filters, and for some EGR engines and some engines fitted with SCR NOx reduction systems. However, recommendations may differ between engine manufacturers so Driver Manuals and/or Dealers shall be consulted if in doubt.

E6 Stable, stay-in-grade oil providing excellent control of piston cleanliness, wear, soot handling and lubricant stability. It is recommended for highly rated diesel engines meeting Euro I, Euro II, Euro III, Euro IV and Euro V emission requirements and running under very severe conditions, e.g. significantly extended oil drain intervals according to the manufacturer's recommendations. It is suitable for EGR engines, with or without particulate filters, and for engines fitted with SCR NOx reduction systems. E6 quality is strongly recommended for engines fitted with particulate filters and is designed for use in combination with low sulphur diesel fuel. However, recommendations may differ between engine manufacturers so Driver Manuals and/or Dealers shall be consulted if in doubt.

E7 Stable, stay-in-grade oil providing effective control with respect to piston cleanliness and bore polishing. It further provides excellent wear control, soot handling and lubricant stability. It is recommended for highly rated diesel engines meeting Euro I, Euro II, Euro III, Euro IV and Euro V emission requirements and running under severe conditions, e.g. extended oil drain intervals according to the manufacturer's recommendations. It is suitable for engines without particulate filters, and for most EGR engines and most engines fitted with SCR NOx reduction systems. However, recommendations may differ between engine manufacturers so Driver Manuals and/or Dealers shall be consulted if in doubt.

E9 Stable, stay-in-grade oil providing effective control with respect to piston cleanliness and bore polishing. It further provides excellent wear control, soot handling and lubricant stability. It is recommended for highly rated diesel engines meeting Euro I, Euro II, Euro III, Euro IV and Euro V emission requirements and running under severe conditions, e.g. extended oil drain intervals according to the manufacturer's recommendations. It is suitable for engines with or without particulate filters, and for most EGR engines and for most engines fitted with SCR NOx reduction systems. E9 is strongly recommended for engines fitted with particulate filters and is designed for use in combination with low sulphur diesel fuel. However, recommendations may differ between engine manufacturers so Drivers Manuals and/or Dealers should be consulted if in doubt.

Conditions for use of performance claims against the ACEA oil sequences

ACEA requires that any claims for oil performance to meet these sequences must be based on credible data and controlled tests in accredited test laboratories.

ACEA requires that engine performance testing used to support a claim of compliance with these ACEA sequences should be generated according to the European Engine Lubricants Quality Management System (EELQMS), but ACEA reserves the right to define alternatives in exceptional cases.

EELQMS which is described in the ATIEL Code of Practice[1], addresses product development testing and product performance documentation, and involves the registration of all candidate and reference oil testing and defines the compliance process. Compliance with the ATIEL Code of Practice is mandatory for any claim to meet the requirements of the 2010 issue of the ACEA sequences. Therefore ACEA requires that claims against the ACEA oil sequences can only be made by oil companies or oil distributors who have signed the EELQMS oil marketers' Letter of Conformance (for details: www.atiel.org).

The ACEA Oil Sequences are undergoing constant development. Replacement tests and other changes required by the European automobile manufacturers are integrated and new issues are published on a regular basis. As new editions are published older editions have to be withdrawn. Validities of new and old editions are overlapping for limited periods of time as shown in the following table and the accompanying text below. When a new ACEA sequence is introduced, oils with claims against the previous can be marketed only for another two years.

Sequence Issue	First allowable use	Mandatory for new claims	Oils with this claim may be marketed until
2004	1st November 2004	1st November 2005	31st December 2009
2007	1st February 2007	1st February 2008	23rd December 2010
2008	22nd December 2008	22nd December 2009	22nd December 2012
2010	22nd December 2010	22nd December 2011	

Table: For the 2010 issue of the ACEA Oil Sequences: First claims can be made from 22nd December 2010. For another year (until 22nd December 2011), oil marketers can still make new claims against ACEA 2008. Starting with 22nd December 2011 every new claim has to be made against the 2010 ACEA Oil Sequences. All engine oils using claims against the 2008 ACEA Sequences can continue to be marketed until 22nd December 2012.

First allowable use means that claims cannot be made against the specification before the date indicated.

Mandatory for new claims means that from this date onward all claims for new oil formulations must be made according to the latest ACEA Sequence Issue. Up to that date new claims can also be made according to the previous ACEA Sequence Issue. After the date indicated no new claims to the previous ACEA sequence can be made. Then all oil formulations must be developed according to the latest ACEA release.

Oils with this claim may be marketed until means that no further marketing of oils with claims to this issue is allowed after the date indicated.

The marketer of an oil claiming ACEA performance requirements is responsible for all aspects of product liability.

Where limits are shown relative to a reference oil, then these must be compared to the last valid reference result on that test stand prior to the candidate and using the same hardware. Further details will be in the ATIEL Code of Practice.

Where claims are made that oil performance meets the requirements of the ACEA sequences (e.g. product literature, packaging, labels) they must specify the ACEA Class and Category (see Nomenclature & ACEA Process for definitions).

[1] The ATIEL Code of Practice is the sole property of ATIEL and is available from ATIEL (Association Technique de l'Industrie Européenne des Lubrifiants), Boulevard du Souverain 165, B-1160 Brussels, Belgium.

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 Printed in England E201123