AMERICAN PETROLEUM INSTITUTE
ENGINE OIL LICENSING AND CERTIFICATION SYSTEM

Engine Oil Guide

Guidelines to help you get more from your engine oil.

Refer to your owner's manual for type of oil to use.

Follow manufacturer's oil change recommendations.

Use only the recommended API category: "**S**" for gasoline engines; "**C**" for diesel engines.

Select the proper SAE oil viscosity grade.

If you find it necessary to mix brands of oil, use the same viscosity grade and API service category to maintain performance.

Properly dispose of used oil. Learn more about recycling used oil on the web at www.recycleoil.org. Go to www.earth911.org for used oil collection center locations.

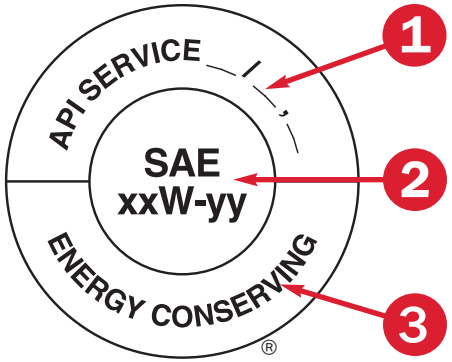
Look for the API Certification Marks every time you buy engine oil.

Ask for API-licensed oil whenever you have your oil changed.

The API Certification Mark, also known as the "Starburst"

An oil displaying this mark meets the current engine protection standard and fuel economy requirements of the International Lubricant Standardization and Approval Committee (ILSAC), a joint effort of U.S. and Japanese automobile manufacturers. Most automobile manufacturers recommend oils that carry the API Certification Mark.

API's Service Symbol and Certification Mark identify quality engine oils for gasoline- and diesel-powered vehicles. Oils displaying these marks meet performance requirements set by U.S. and international vehicle and engine manufacturers and the lubricant industry. More than 500 companies worldwide participate in this voluntary program, which is backed by a marketplace sampling and testing program.



The API Service Symbol, also known as the "Donut"

1. Performance Level: Gasoline engine oil categories (for cars, vans, and light trucks with gasoline engines): Oils designed for gasoline-engine service fall under API's "S" (**S**ervice) categories. See inside for descriptions of current and obsolete API service categories. **Diesel engine oil categories** (for heavy-duty trucks and vehicles with diesel engines): Oils designed for diesel-engine service fall under API's "C" (**C**ommercial) categories. See inside for descriptions of current and obsolete API service categories.

2. Viscosity Grade: The measure of an oil's thickness and ability to flow at certain temperatures. Vehicle requirements may vary. Follow your vehicle manufacturer's recommendations on SAE oil viscosity grade.

3. Energy Conserving: The "Energy Conserving" designation applies to oils intended for gasoline-engine cars, vans, and light trucks. Widespread use of "Energy Conserving" oils may result in an overall savings of fuel in the vehicle fleet as a whole.

The API Service Symbol "Donut" with CI-4 PLUS

Used in conjunction with API CI-4 and CJ-4, the "CI-4 PLUS" designation identifies oils formulated to provide a higher level of protection against soot-related viscosity increase and viscosity loss due to shear in diesel engines. Like Energy Conserving, CI-4 PLUS appears in the lower portion of the API Service Symbol "Donut."

For more information about API's Engine Oil Program, visit www.api.org/eolcs.

API Communications: 2010-029 | 03.10 | PDF

Which oil is right for you?

Note: API intentionally omitted "SI" and "SK" from the sequence of categories.

AMERICAN PETROLEUM INSTITUTE
FOR GASOLINE ENGINES
CERTIFIED ®

GUIDE TO SAE VISCOSITY GRADES OF ENGINE OIL FOR PASSENGER CARS	
Multigrade oils such as SAE 5W-30 and 10W-30 are widely used because, under all but extremely hot or cold conditions, they are thin enough to flow at low temperatures and thick enough to perform satisfactorily at high temperatures. Note that vehicle requirements may vary. **Follow your vehicle manufacturer's recommendations on SAE oil viscosity grade.**	
If lowest expected outdoor temperature is	**Typical SAE Viscosity Grades for Passenger Cars**
0°C (32°F)	5W-20, 5W-30, 10W-30, 10W-40, 20W-50
−18°C (0°F)	5W-20, 5W-30, 10W-30, 10W-40
Below −18°C (0°F)	5W-20, 5W-30

The current and previous API Service Categories are listed below. Vehicle owners should refer to their owner's manuals before consulting these charts. Oils may have more than one performance level.

For automotive gasoline engines, the latest engine oil service category includes the performance properties of each earlier category. If an automotive owner's manual calls for an API SJ or SL oil, an API SM oil will provide full protection. For diesel engines, the latest category usually – but not always – includes the performance properties of an earlier category.

GASOLINE ENGINES		
Category	**Status**	**Service**
SM	**Current**	For all automotive engines currently in use. Introduced in 2004, SM oils are designed to provide improved oxidation resistance, improved deposit protection, better wear protection, and better low-temperature performance over the life of the oil. Some SM oils may also meet the latest ILSAC specification and/or qualify as Energy Conserving.
SL	**Current**	For 2004 and older automotive engines.
SJ	**Current**	For 2001 and older automotive engines.
SH	**Obsolete**	For 1996 and older engines.
SG	**Obsolete**	For 1993 and older engines.
SF	**Obsolete**	For 1988 and older engines.
SE	**Obsolete**	**CAUTION:** Not suitable for use in gasoline-powered automotive engines built after 1979.
SD	**Obsolete**	**CAUTION:** Not suitable for use in gasoline-powered automotive engines built after 1971. Use in more modern engines may cause unsatisfactory performance or equipment harm.
SC	**Obsolete**	**CAUTION:** Not suitable for use in gasoline-powered automotive engines built after 1967. Use in more modern engines may cause unsatisfactory performance or equipment harm.
SB	**Obsolete**	**CAUTION:** Not suitable for use in gasoline-powered automotive engines built after 1951. Use in more modern engines may cause unsatisfactory performance or equipment harm.
SA	**Obsolete**	**CAUTION:** Contains no additives. Not suitable for use in gasoline-powered automotive engines built after 1930. Use in more modern engines may cause unsatisfactory performance or equipment harm.

For more information about API's Engine Oil Program, visit www.api.org/eolcs.

Interested in learning about the chemical additives in engine oil? Visit www.americanchemistry.com

API Communications: 2010-029 | 03.10 | PDF

DIESEL ENGINES		
Category	**Status**	**Service**
CJ-4	**Current**	Introduced in 2006. For high-speed, four-stroke engines designed to meet 2007 model year on-highway exhaust emission standards. CJ-4 oils are compounded for use in all applications with diesel fuels ranging in sulfur content up to 500 ppm (0.05% by weight). However, use of these oils with greater than 15 ppm (0.0015% by weight) sulfur fuel may impact exhaust aftertreatment system durability and/or oil drain interval. CJ-4 oils are effective at sustaining emission control system durability where particulate filters and other advanced aftertreatment systems are used. Optimum protection is provided for control of catalyst poisoning, particulate filter blocking, engine wear, piston deposits, low- and high-temperature stability, soot handling properties, oxidative thickening, foaming, and viscosity loss due to shear. API CJ-4 oils exceed the performance criteria of API CI-4 with CI-4 PLUS, CI-4, CH-4, CG-4 and CF-4 and can effectively lubricate engines calling for those API Service Categories. When using CJ-4 oil with higher than 15 ppm sulfur fuel, consult the engine manufacturer for service interval.
CI-4	**Current**	Introduced in 2002. For high-speed, four-stroke engines designed to meet 2004 exhaust emission standards implemented in 2002. CI-4 oils are formulated to sustain engine durability where exhaust gas recirculation (EGR) is used and are intended for use with diesel fuels ranging in sulfur content up to 0.5% weight. Can be used in place of CD, CE, CF-4, CG-4, and CH-4 oils. Some CI-4 oils may also qualify for the CI-4 PLUS designation.
CH-4	**Current**	Introduced in 1998. For high-speed, four-stroke engines designed to meet 1998 exhaust emission standards. CH-4 oils are specifically compounded for use with diesel fuels ranging in sulfur content up to 0.5% weight. Can be used in place of CD, CE, CF-4, and CG-4 oils.
CG-4	**Obsolete**	Introduced in 1995. For severe duty, high-speed, four-stroke engines using fuel with less than 0.5% weight sulfur. CG-4 oils are required for engines meeting 1994 emission standards. Can be used in place of CD, CE, and CF-4 oils.
CF-4	**Obsolete**	Introduced in 1990. For high-speed, four-stroke, naturally aspirated and turbocharged engines. Can be used in place of CD and CE oils.
CF-2	**Obsolete**	Introduced in 1994. For severe duty, two-stroke-cycle engines. Can be used in place of CD-II oils.
CF	**Obsolete**	Introduced in 1994. For off-road, indirect-injected and other diesel engines including those using fuel with over 0.5% weight sulfur. Can be used in place of CD oils.
CE	**Obsolete**	Introduced in 1985. For high-speed, four-stroke, naturally aspirated and turbocharged engines. Can be used in place of CC and CD oils.
CD-II	**Obsolete**	Introduced in 1985. For two-stroke cycle engines.
CD	**Obsolete**	Introduced in 1955. For certain naturally aspirated and turbocharged engines.
CC	**Obsolete**	**CAUTION:** Not suitable for use in diesel-powered engines built after 1990.
CB	**Obsolete**	**CAUTION:** Not suitable for use in diesel-powered engines built after 1961.
CA	**Obsolete**	**CAUTION:** Not suitable for use in diesel-powered engines built after 1959.

A C E A
European
Automobile
Manufacturers
Association

ACEA EUROPEAN OIL SEQUENCES

2007

SERVICE FILL OILS FOR
GASOLINE ENGINES
LIGHT DUTY DIESEL ENGINES
ENGINES WITH AFTER TREATMENT DEVICES and
HEAVY DUTY DIESEL ENGINES

Laboratory tests for gasoline and light duty diesel engine oils,
Engine tests for gasoline and light duty diesel engine oils,
Laboratory tests for oils for gasoline and light duty diesel engine with after treatment devices,
Engine tests for oils for gasoline and light duty diesel engine with after treatment devices.
Laboratory tests for heavy duty diesel engine oils,
Engine tests for heavy duty diesel engine oils,

ACEA
Avenue des Nerviens 85
B-1040 Bruxelles
Tel (32 2) 732 55 50
Fax (32 2) 738 73 10
(32 2) 738 73 11
www.acea.be
TVA BE 444 072 631
SGB 210-0069404-04

ACEA	ACEA 2007 EUROPEAN OIL SEQUENCES FOR SERVICE-FILL OILS	Feb. 2007

This document details the ACEA 2007 European Oil Sequences for Service-fill Oils for Gasoline engines, Light Duty Diesel engines, Gasoline & Diesel engines with after treatment devices and Heavy Duty Diesel engines. **These sequences define the minimum quality level of a product 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.

These sequences will replace the ACEA 2004 sequences as a means of defining engine lubricant quality from 28th of February 2007.

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.

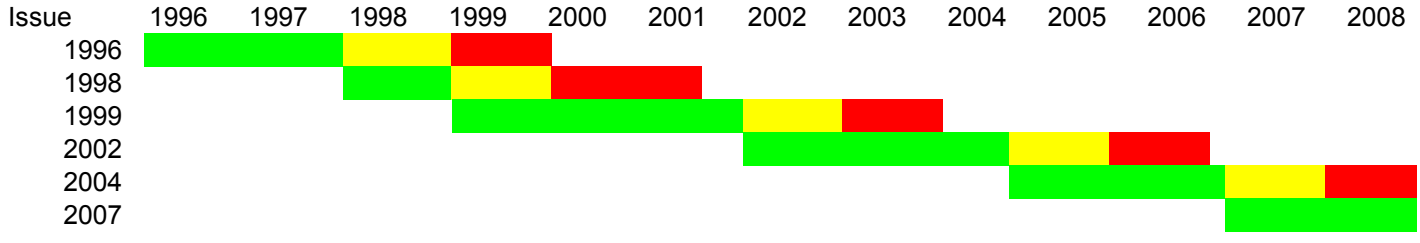
All engine performance testing used to support a claim of compliance with these ACEA sequences must be generated according to the European Engine Lubricants Quality Management System (EELQMS). This system, which is described in the ATIEL Code of Practice[1], addresses product development testing and 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 2007 issue of these ACEA sequences.

Issue year*	First allowable use	New claims by	Withdrawn
1996	1st March 1996	1st March 1999	1st March 2000
1998	1st March 1998	1st September 2000	1st March 2002
1999	1st September 1999	1st February 2003	1st February 2004
2002	1st February 2002	1st November 2005	1st November 2006
2004	1st November 2004	28th February 2008	31st December 2009
2007	28th February 2007		

*) Issue year of full document

First allowable use means that claims cannot be made against the specification before the date indicated.
New claims by means that from this date all claims for new oil formulations must be according to the latest ACEA release. (For example until 28th of February 2008, oil marketers can claim engine oils meeting the ACEA 2004 release even though the 2007 release is active. After 28th of February 2008, any new oil claims must be according to the ACEA 2007 sequences.)
Withdrawn means that no claims can be made against the issue after the date indicated

This chart below and the table above describe the correct usage of ACEA claims for those categories which appear in consecutive issues of the sequences.



New claims allowed during this period to this issue number
New issue in existence, but new claims can still be made to this issue number
No new claims to this issue number

[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.

The marketer of an oil claiming to meet 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).

The categories A2 and B2 are not included in this edition of the ACEA European Oil Sequences because they are unsuitable for some of the current engines and will be unsuitable for many future engines. Misuse may cause engine damage. However, the use of A2 and B2 oils for older engines (where owner's or workshop's literature recommends this use) is still appropriate and can be done according to the categories A2-96 Issue 3 and B2-98 Issue 2.

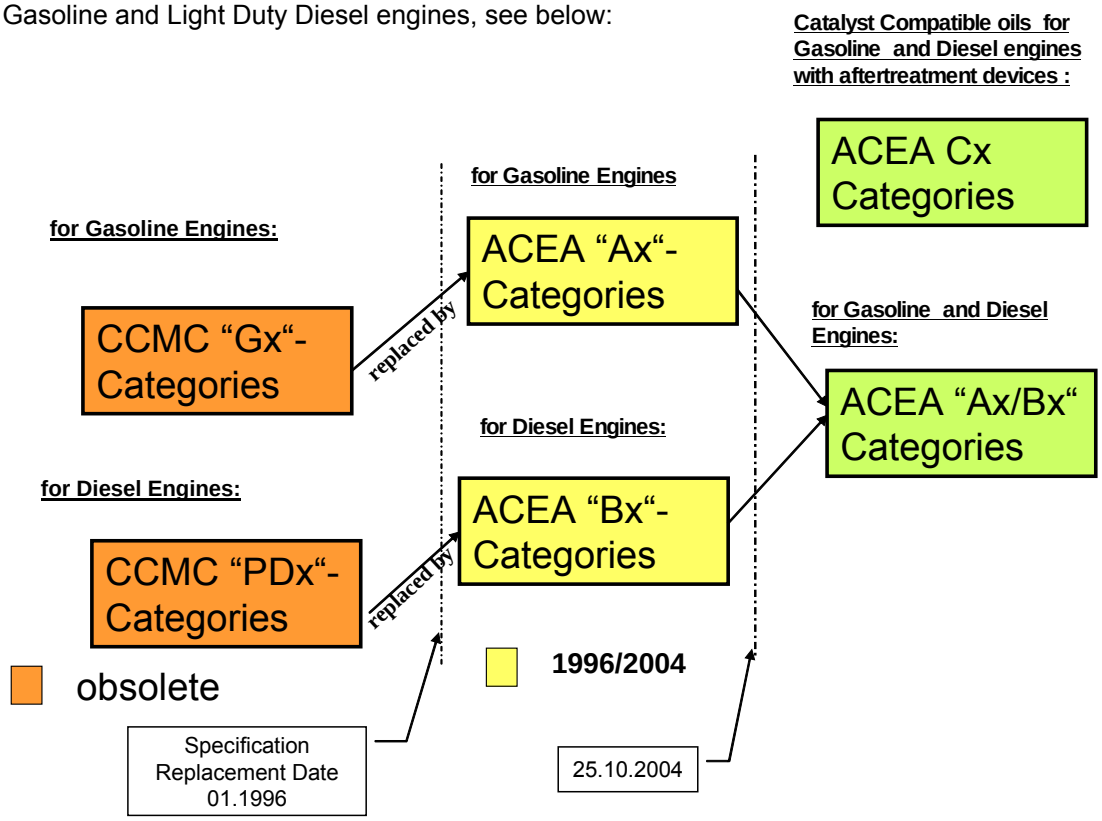
REPLACEMENT of CCMC sequences

The chart below shows the evolution of the engine oil specifications commonly developed by the European Automobile manufacturers. CCMC (Comité des Constructeurs du Marché Commun) was the forerunner organisation to ACEA.

In January 1996 the CCMC European Oil Sequences became obsolete and were replaced by the ACEA European Oil Sequences. This applies to light duty and heavy duty engine oils. CCMC European Oil Sequences are not supported anymore by ACEA.

With the 2004 release of the ACEA European Oil Sequences the A and B categories were combined to the respective A/B categories. At the same time, a new set of categories has been introduced with the intention to create specifications for engine oils being suitable for the latest and future aftertreatment systems for Gasoline and Diesel engines. These categories are designated as Cx-categories.

For Heavy Duty Diesel engines, the CCMC Dx categories were replaced by the ACEA Ex categories as of 1 January 1996. The CCMC Dx categories then became obsolete and are no longer supported by ACEA.
For Gasoline and Light Duty Diesel engines, see below:



X= 1, 2 ,3 or 4 or 5 depending on the classes

The ACEA 2007 European Oil Sequences for Service-fill Oils comprise 3 sets (classes) of sequences: one for Gasoline and Light Duty Diesel engines; one specifically for Gasoline and Light Duty Diesel engines with after treatment devices and one for Heavy Duty engines. Within each of these sets there are categories which reflect different performance requirements - four (A1/B1, A3/B3, A3/B4 & A5/B5) for gasoline and light duty diesel engines; four (C1, C2, C3, C4) specifically for engines with after treatment devices, and four heavy duty sequences (E2, E4, E6, E7). Typical applications for each sequence are described below for guidance only. Specific applications of each sequence are the responsibility of individual motor manufacturers for their own vehicles / engines.

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

NOMENCLATURE & ACEA PROCESS:

Each set of sequences is designated for consumer use by a 2 part code comprising a letter to define the CLASS (e.g. C), and a number to define the CATEGORY (e.g. C4).

In addition, for industry use, each sequence has a two-digit number to identify the YEAR of implementation of that severity level (e.g. A1 / B1-04).

The CLASS indicates oil intended for a general type of engine - currently A / B = gasoline and light duty diesel engines; C = catalyst compatible oils for specific gasoline and diesel engines with after treatment devices and E for Heavy Duty engines. Other classes may be added in future if, for example, Natural Gas engines prove to require oil characteristics which cannot readily be incorporated into existing classes.

The CATEGORY indicates oils for different purposes or applications within that general class, related to some aspect or aspects of the performance level of the oil. Typical applications for each sequence are described below for guidance only. Specific applications of each sequence are the responsibility of the individual motor manufacturer for his own vehicles and engines. Oils within a category may also meet the requirements of another category, but some engines may only be satisfied by oils of one category within a class.

The YEAR numbers are intended only for industry use and indicate the year of implementation of that severity level for the particular category. A new year number will indicate, for example, that a new test, parameter or limit has been incorporated for the category to meet new / upgraded performance requirements whilst remaining compatible with existing applications. An update must always satisfy the applications of the previous issue. If this is not the case, then a new category is required.

An administrative ISSUE Number is added for industry use where it is necessary to update the technical requirements of a sequence without the intention to increase severity (e.g. when a CEC test engine is updated to the latest version whilst maintaining equivalent severity; or where a severity shift in the test requires modification of the specified limits.).

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).

«Consumer Language»:

A/B : gasoline and diesel engine oils

A1/B1 Oil intended for use in gasoline 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 to 3.5 mPa.s. These oils may be 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 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 and car + light van diesel engines designed to be capable of using low friction low viscosity oils with a High temperature / High shear rate viscosity of 2.9 to 3.5 mPa.s. These oils may be 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 HTHS higher than 2.9 mPa.s. These oils will increase the DPF and TWC life and provide fuel economy benefit.

Warning: these oils have the lowest SAPS limits and may be 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 HTHS higher than 2.9 mPa.s. These oils will increase the DPF and TWC life and provide fuel economy benefit.

Warning: these oils may be 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. These oils will increase the DPF and TWC life.

Warning: these oils may be 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 HTHS higher than 3.5mPa.s. These oils will increase the DPF and TWC life.

Warning: these oils may be 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
EGR: Exhaust Gas Recirculation

E: Heavy Duty Diesel engine oils

E2 General purpose oil for naturally aspirated and turbocharged heavy duty diesel engines, medium to heavy duty cycles and mostly normal oil drain intervals.

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 1, Euro 2, Euro 3 and Euro 4 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 1, Euro 2, Euro 3 and Euro 4 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 (max 50 ppm). 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 and turbocharger deposit control, soot handling and lubricant stability. It is recommended for highly rated diesel engines meeting Euro 1, Euro 2, Euro 3 and Euro 4 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.

ACEA	ACEA 2007 EUROPEAN OIL SEQUENCE FOR SERVICE-FILL OILS FOR GASOLINE and DIESEL ENGINES	Feb. 2007

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.

REQUIREMENT	TEST METHOD	PROPERTIES	UNIT	LIMITS			
				A1 / B1-04	**A3 / B3-04**	**A3 / B4-04**	**A5 / B5-04**
1. LABORATORY TESTS							
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-14-A-93 or ASTM D6278	100°C Viscosity after 30 cycles	mm^2/s	xW-20 stay in grade xW-30 ≥ 8.6 xW-40 ≥ 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-36-A-90 (2nd Edition) (Ravenfield)	Viscosity at 150°C and $10^6\ s^{-1}$ shear rate	mPa.s	max. 3.5. xW -20 2.6. min All others 2.9 min.	≥3.5	≥3.5	min 2.9 max. 3.5
1.4 Evaporative loss	CEC-L-40-A-93 (Noack)	Max. weight loss after 1 h at 250°C	%	≤ 15	≤ 13	≤ 13	≤ 13
				NOTE: the following sections apply to all sequences			
1.5 Sulphated ash	ASTM D874		% m/m	≤ 1.3 (see note 1)	≤ 1.5 (see note 1)	≤ 1.6 (see note 1)	≤ 1.6 (see note 1)
1.6 Sulphur	ASTM D5185	(see note 2)	% m/m	Report			
1.7 Phosphorus	ASTM D5185	(see note 2)	% m/m	Report			
1.8 Chlorine	ASTM D6443		ppm m/m	Report			
1.9 Oil / elastomer compatibility	CEC-L-39-T-96 (see note 3)	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
		Tensile strength	%	-40/+10	-15/+18	-30/+10	-20/+10	Daimler
		Elongation at rupture	%	-50/+10	-35/+10	-20/+10	-50/+10	Chrysler
		Volume variation	%	-1/+5	-7/+5	-1/ +22	-5/+5	
1.10 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			
1.11 High temperature foaming tendency	ASTM D6082 High temperature foam test	Tendency - stability	ml	Sequence IV (150°C) 100 - nil			

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Performance parameters other than those covered by the tests shown or more stringent limits may be indicated by individual member companies.

REQUIREMENT	TEST METHOD	PROPERTIES	UNIT	LIMITS			
				A1 / B1-04	**A3 / B3-04**	**A3 / B4-04**	**A5 / B5-04**
2. ENGINE TESTS							
2.1 High temperature deposits Ring sticking Oil thickening	CEC-L-88-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 and max values during test Oil consumption	Merit Merit mm2/s kg/test	≥ 9.0 ≥ RL 216 ≤ RL216 Report	≥ 9.0 ≥ RL 216 ≤ 0.8 x RL216 Report	≥ 9.0 ≥ RL 216 ≤ 0.8 x RL216 Report	≥ 9.0 ≥ RL 216 ≤ 0.8 x RL216 Report
2.2 Low temperature sludge	ASTM D6593-00 (Sequence VG) Under protocol & requirements for API (See Note 4)	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	≥ 7.8 ≥ 8.0 ≥ 7.5 ≥ 8.9 none ≤ 20	≥ 7.8 ≥ 8.0 ≥ 7.5 ≥ 8.9 none ≤ 20	≥ 7.8 ≥ 8.0 ≥ 7.5 ≥ 8.9 none ≤ 20
2.3 Valve train scuffing wear	CEC-L-38-A-94 (TU3M)	Cam wear, average Cam wear, max. Pad merit (Ave. of 8 pads)	µm µm merit	≤ 10 ≤ 15 ≥ 7.5	≤ 10 ≤ 15 ≥ 7.5	≤ 10 ≤ 15 ≥ 7.5	≤ 10 ≤ 15 ≥ 7.5
2.4 Black sludge	CEC-L-53-T-95 (M111)	Engine sludge, average	merit	≥ RL 140	≥ RL 140	≥ RL 140	≥ RL 140
2.5 Fuel economy See Note (5)	CEC-L-54-T-96 (M111)	Fuel economy improvement vs. Reference oil RL191 (15W-40)	%	≥ 2.5	–	–	≥ 2.5
2.6 Ring sticking and piston cleanliness	CEC-L-46-T-93 (VW 1.6 TC D) see note 6	Ring sticking Piston cleanliness	Merit Merit	≥ RL 148 ≥ RL 148	≥ RL 148 ≥ RL 148		
2.7 Medium temperature dispersivity	CEC-L-093 (DV4TD) (see note 7)	Absolute viscosity increase at 100°C and 6 % soot Piston merit (see note 8)	mm2/s merit	≤ 0.60 x RL223 result ≥ (RL223 – 2.5pts)	≤ 0.60 x RL223 result ≥ (RL223 – 2.5pts)	≤ 0.60 x RL223 result ≥ (RL223 – 2.5pts)	≤ 0.60 x RL223 result ≥ (RL223 – 2.5pts)

ACEA	ACEA 2007 EUROPEAN OIL SEQUENCE FOR SERVICE-FILL OILS FOR GASOLINE and DIESEL ENGINES	Feb. 2007

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.

REQUIREMENT	TEST METHOD	PROPERTIES	UNIT	LIMITS			
				A1 / B1-04	**A3 / B3-04**	**A3 / B4-04**	**A5 / B5-04**
2. ENGINE TESTS CONTINUED							
2.8 Wear, Viscosity stability & Oil consumption	OM602 A (see note 9)	Cam wear. Average (New tappet)	µm	≤ 50.0	≤ 50.0	≤ 50.0	≤ 50.0
		Viscosity increase at 40°C	%	≤ 90	≤ 90	≤ 90	≤ 90
		Bore polishing	%	≤ 7.0	≤ 7.0	≤ 7.0	≤ 7.0
		Cylinder wear. Average	µm	≤ 20.0	≤ 20.0	≤ 20.0	≤ 20.0
		Oil consumption	kg/test	≤ 10.0	≤ 10.0	≤ 10.0	≤ 10.0
2.9 DI diesel Piston cleanliness & Ring sticking	CEC-L-78-T-99 (VW DI)	Piston cleanliness	merit			≥ RL206 minus 3pts	≥ RL206
		Ring sticking (Rings 1 & 2)					
		Average of all 8 rings	ASF			≤ 1.2	≤ 1.2
		Max. for any 1st ring	ASF			≤ 2.5	≤ 2.5
		Max. for any 2nd ring	ASF			≤ 0.0	≤ 0.0

(1) Maximum limits, Values take into account method and production tolerances
(2) The internal standard method has to be used.
(3) Use either complete DaimlerChrysler requirements (VDA 675301, 7 days +/- 2h, 4 materials (NBR: NBR34 DIN 53538 T3 (100 ºC +/- 2°C); FPM: AK6 (150 ºC +/- 2°C); ACM: E7503 (150 ºC +/- 2°C); AEM: D 8948/200.1 (150 ºC +/- 2°C)) + RE3, or complete requirements according to 1.9 above + DC 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) The test according to CEC-L-78-T-99 may be run instead of CEC-L-46-T-93 for A1/B1 and A3/B3. The limits shall be as A3/B4.
(7) XUD11 BTE passing results obtained before the end of 2005 can be used instead of the DV4.
(8) Piston merit is not yet an official CEC parameter
(9) OM646LA results at an equivalent performance level can be used as soon as the test becomes available as a CEC test. In the event of OM602A and OM646 are not available, ACEA will define an alternative.

ACEA	ACEA 2007 EUROPEAN OIL SEQUENCE FOR SERVICE-FILL OILS FOR GASOLINE and DIESEL ENGINES WITH AFTER TREATMENT DEVICES	Feb. 2007

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.

REQUIREMENT	TEST METHOD	PROPERTIES	UNIT	LIMITS			
				C1-04	**C2-04**	**C3-07**	**C4-07**
1. LABORATORY TESTS							
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-14-A-93 or ASTM D6278	100°C Viscosity after 30 cycles	mm^2/s	All grades to be stay in grade	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-36-A-90 (2nd Edition) (Ravenfield)	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-40-A-93 (Noack)	Max. weight loss after 1 h at 250°C	%	≤ 13	≤ 13	≤ 13	≤ 11
1.5 Sulphur	ASTM D5185	(see note 1)	% m/m	≤ 0.2	≤ 0.3	≤ 0.3	≤ 0.2
1.6 Phosphorus	ASTM D5185	(see note 1)	% m/m	≤ 0.05 (2)	≥ 0.070 ≤0.090 (2)	≥ 0.070 ≤0.090 (2)	≤ 0.090 (2)
1.7 Sulphated ash	ASTM D874		% m/m	≤ 0.5 (see note 2)	≤ 0.8 (see note 2)	≤ 0.8 (see note 2)	≤ 0.5 (see note 2)
1.8 Chlorine	ASTM D6443		ppm m/m	Report	Report	Report	Report
1.9 TBN	ASTM D 2896		mg KOH / g			≥ 6	≥ 6
				NOTE: The following sections apply to all sequences			
1.10 Oil / elastomer compatibility	CEC-L-39-T-96 (see note 3)	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
		Tensile strength	%	-40/+10	-15/+18	-30/+10	-20/+10	Daimler
		Elongation at rupture	%	-50/+10	-35/+10	-20/+10	-50/+10	Chrysler
		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			

ACEA	ACEA 2007 EUROPEAN OIL SEQUENCE FOR SERVICE-FILL OILS FOR GASOLINE and DIESEL ENGINES WITH AFTER TREATMENT DEVICES	Feb. 2007

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.

REQUIREMENT	TEST METHOD	PROPERTIES	UNIT	LIMITS			
				C1-04	**C2-04**	**C3-07**	**C4-07**
2. ENGINE TESTS							
2.1	CEC-L-88-T-02	Ring sticking (each part)	Merit	≥ 9.0	≥ 9.0	≥ 9.0	≥ 9.0
High	(TU5JP-L4)	Piston varnish	Merit	≥ RL 216	≥ RL 216	≥ RL 216	≥ RL 216
temperature		(6 elements, average of 4 pistons)					
deposits	72 Hour test	Absolute viscosity increase at 40°C	mm2/s	≤ 0.8 x	≤ 0.8 x	≤ 0.8 x	≤ 0.8 x
Ring sticking		between min and max values during		RL216	RL216	RL216	RL216
Oil thickening		test					
		Oil consumption	kg/test	Report	Report	Report	Report
2.2	ASTM D6593-00	Average engine sludge	merit	≥ 7.8	≥ 7.8	≥ 7.8	≥ 7.8
Low	(Sequence VG)	Rocker cover sludge	merit	≥ 8.0	≥ 8.0	≥ 8.0	≥ 8.0
temperature	Under protocol &	Average Piston skirt varnish	merit	≥ 7.5	≥ 7.5	≥ 7.5	≥ 7.5
sludge	requirements for	Average engine varnish	merit	≥ 8.9	≥ 8.9	≥ 8.9	≥ 8.9
	API	Comp. ring (hot stuck)		none	none	none	none
	(See Note 4)	Oil screen clogging	%	≤ 20	≤ 20	≤ 20	≤ 20
2.3	CEC-L-38-A-94	Cam wear, average	µm	≤ 10	≤ 10	≤ 10	≤ 10
Valve train	(TU3M)	Cam wear, max.	µm	≤ 15	≤ 15	≤ 15	≤ 15
scuffing wear		Pad merit (Ave. of 8 pads)	merit	≥ 7.5	≥ 7.5	≥ 7.5	≥ 7.5
2.4	CEC-L-53-T-95	Engine sludge, average	merit	≥ RL 140	≥ RL 140	≥ RL 140	≥ RL 140 + 4σ or > 9.0
Black sludge	(M111)						
2.5	CEC-L-54-T-96	Fuel economy improvement vs.	%	≥ 2,5	≥ 2.5	≥ 1.0 for Xw-30 grade	≥ 1.0 for xW-30 grade
Fuel economy	(M111)	Reference oil RL191 (15W-40)					
See Note (5)							
2.6	CEC-L-093						
Medium	(DV4TD)	Absolute viscosity increase at	mm^2/s	≤ 0.60 x	≤ 0.60 x	≤ 0.60 x	≤ 0.60 x
temperature		100°C and 6 % soot		RL223 result	RL223 result	RL223 result	RL223 result
dispersivity		Piston merit (see note 6)		≥ (RL223 –	≥ (RL223 –	≥ (RL223 –	≥ (RL223 –
			merit	2.5pts)	2.5pts)	2.5pts)	2.5pts)
2.7	CEC-L-78-T-99	Piston cleanliness	merit	≥ RL206	≥ RL206	≥ RL206	≥ RL206
DI diesel	(VW DI)						
Piston		Ring sticking (Rings 1 & 2)					
cleanliness &		Average of all 8 rings	ASF	≤ 1.2	≤ 1.2	≤ 1.2	≤ 1.2
Ring sticking		Max. for any 1st ring	ASF	≤ 2.5	≤ 2.5	≤ 2.5	≤ 2.5
		Max. for any 2nd ring	ASF	≤ 0.0	≤ 0.0	≤ 0.0	≤ 0.0

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.

REQUIREMENT	TEST METHOD	PROPERTIES	UNIT	LIMITS			
				C1-04	**C2-04**	**C3-07**	**C4-07**
2. ENGINE TESTS CONTINUED							
2.8 Wear, Viscosity stability & Oil consumption	OM602A (see note 7)	Cam wear average	µm	≤ 50.0	≤ 50.0	≤ 45.0	≤ 45.0
		Viscosity increase @ 40°C	%	≤ 90	≤ 90	≤ 70.0	≤ 70.0
		Bore polishing	%	≤ 7.0	≤ 7.0	≤ 4,5	≤ 4,5
		Cylinder wear average	µm	≤ 20.0	≤ 20.0	≤ 15.0	≤ 15.0
		Oil consumption	kg/test	≤ 10.0	≤ 10.0	≤ 10.0	≤ 10.0

(1) The internal standard method has to be used.
(2) Maximum limits, Values take into account method and production tolerances
(3) Use either complete DaimlerChrysler requirements (VDA 675301, 7 days +/- 2h, 4 materials (NBR: NBR34 DIN 53538 T3 (100 ºC +/- 2°C); FPM: AK6 (150 ºC +/- 2°C); ACM: E7503 (150 ºC +/- 2°C); AEM: D 8948/200.1 (150 ºC +/- 2°C)) + RE3, or complete requirements according to 1.10 above + DC 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) Piston merit is not yet an official CEC parameter
(7) OM646LA results at an equivalent performance level can be used as soon as the test becomes available as CEC test. In the event of OM602A and OM646 are not available, ACEA will define an alternative.

ACEA	ACEA 2007 EUROPEAN OIL SEQUENCE FOR SERVICE-FILL OILS FOR HEAVY DUTY DIESEL ENGINES	Feb. 2007

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.

REQUIREMENTS	TEST METHOD	PROPERTIES	UNIT	LIMITS			
				E2-96 Issue 5	**E4-07**	**E6-04** Issue 2	**E7-04** Issue 2
1. LABORATORY TESTS							
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-14-A-93 or ASTM D6278	Viscosity after 30 cycles measured at 100°C.	mm^2/s	xW-30 ≥ 9.0 xW-40 ≥ 12.0 xW-50 ≥ 15.0 mono grades no req.	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-36-A-90 (2nd Edition) (Ravenfield)	Viscosity at 150°C and 10^6 s^{-1} Shear rate	mPa.s	≥ 3.5			
1.4 Evaporative Loss	CEC-L-40-A-93 (Noack)	Max. weight loss after 1 h at 250°C	%	≤ 13			
1.5 Sulphated Ash	ASTM D874		% m/m	≤ 2.0	≤ 2.0	≤ 1.0	≤ 2.0
1.6 Phosphorus	ASTM D5185[1]		% m/m			≤ 0.08	
1.7 Sulphur	ASTM D5185[1]		% m/m			≤ 0.3	
1.8 Oil Elastomer Compatibility See Note (2)	CEC-L-39-T-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	-25/+1	-5/+5	As per Daimler-Chrysler
		Tensile strength	%	-50/+10	-15/+18	-45/+10	-20/+10	
		Elongation rupture	%	-60/+10	-35/+10	-20/+10	-50/+10	
		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				
1.10 High temperature foaming tendency	ASTM D6082	Tendency - stability	ml	Sequence IV (150°C) 200-50			
1.11 Oxidation	CEC-L-85-T-99 (PDSC)	Oxidation induction time	min				≥ 35
1.12 Corrosion	ASTM D 6594	Lead increase	ppm				≤ 100
1.13 TBN	ASTM D2896				≥ 12		

ACEA	ACEA 2007 EUROPEAN OIL SEQUENCE FOR SERVICE-FILL OILS FOR HEAVY DUTY DIESEL ENGINES	Feb. 2007

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.

REQUIREMENTS	TEST METHOD	PROPERTIES	UNIT	LIMITS			
				E2-96 Issue 5	**E4-07**	**E6-04** Issue 2	**E7-04** Issue 2
2. ENGINE TESTS							
2.1 Bore polishing / Piston cleanliness See note (3)	CEC L-42-T-99 (OM364LA)	Bore polishing Piston cleanliness Average Cylinder wear Sludge Oil consumption	% merit µm merit kg/test	≤ 3.5 ≥ 40.0 ≤ 3.5 ≥ 9.4 ≤ 16.0			
2.2 Wear See note (4)	CEC L-51-A-97 (OM602A)	Cam wear Viscosity increase at 40°C Bore polishing Cylinder wear Oil consumption	µm % % µm kg/test	≤ 50.0	≤ 50.0 ≤ 90 ≤ 7.0 ≤ 20.0 ≤ 10	≤ 50.0 ≤ 90 ≤ 7.0 ≤ 20.0 ≤ 10	≤ 50.0 ≤ 90 ≤ 7.0 ≤ 20.0 ≤ 10
2.3 Soot in oil See note (5)	ASTM D 5967 (Mack T-8E) ASTM D4485 (Mack T-8)	Test duration: Relative viscosity at 1 test/2 test/3 test average Viscosity increase at 1 test/2 test/3 test average Filter plugging, Diff. pressure Oil consumption	Hours mm^2/s kPa g/kWh		300 4.8% soot ≤ 2.1/2.2/2.3 3.8% soot ≤11.5/12.5/13.0 ≤ 138 ≤ 0.304	300 4.8% soot ≤ 2.1/2.2/2.3 3.8% soot ≤11.5/12.5/13.0 ≤ 138 ≤ 0.304	300 4.8% soot ≤ 2.1/2.2/2.3 3.8% soot ≤11.5/12.5/13.0 ≤ 138 ≤ 0.304
2.4 Bore polishing Piston Cleanliness Turbocharger deposits See note (6)	CEC L-52-T-97 (OM441LA)	Bore polishing Piston Cleanliness Boost pressure loss at 400 hrs Oil consumption	% merit % kg/test		≤ 2.0 ≥ 40.0 ≤ 4 ≤ 40	≤ 2.0 ≥ 40.0 ≤ 4 ≤ 40	≤ 2.0 ≥ 25.0 ≤ 4 ≤ 40
2.5. Soot induced wear see note 7	Cummins ISM	Rocker pad average weight loss at 3.9 % soot 1 test/2 test/3 test average Oil filter diff. press @ EOT 1 test/ 2 test/3 test average Engine sludge 1 test/2 test/3 test average	 mg kPa merit				 ≤ 7.5/7.8/7.9 ≤ 55/67/74 ≥ 8.1/8.0/8.0
2.6. Wear (liner-ring-bearings) See note (8)	Mack T10 ASTM D6987 (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 ≤ 32 (26) ≤ 158 (117) ≤ 35 (42) ≤ 14 (18) ≤ 65 (95)	≥ 1000 ≤ 32 (26) ≤ 158 (117) ≤ 35 (42) ≤ 14 (18) ≤ 65 (95)

(1) The internal standard method has to be used.
(2) Use either the most recent complete Daimler-Chrysler requirements (VDA 675301, 7 days, 4 materials (NBR: NBR34 DIN 53538 T3 (100 ºC); FPM: AK6 (150 ºC); ACM: E7503 (150 ºC); AEM: D 8948/200.1 (150 ºC)) + RE3 according to requirement 1.8 above, or complete requirements according to 1.8 above + DC requirements for AEM.
(3) Results from a CEC-L-52-T-97 (OM441LA) test as part of a DaimlerChrysler sheet 228.1 approval can be used as an alternative. Only tests according to CEC-L-52-T-97 are acceptable.

(4) OM646LA results at an equivalent performance level can be used as soon as the test becomes available as a CEC test. In the event the OM602A and the OM646 are not available, then ACEA will define an alternative.
(5) Mack T11 (ASTM D7156) 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.
(6) OM501LA results at an equivalent performance level can be used as soon as the test becomes available as a CEC test.
(7) Results from Cummins a M11 HST (ASTM D6838) at API CH-4 or M11 EGR test (ASTM D6975) at API CI-4 or CI-4 Plus can be used in place of the Cummins ISM test.
(8) Mack T12 results can be used in place of Mack T10. In this case the merit scale for CI-4 Plus approvals must be applied to the Mack T12 results. Maximum allowable values for the Mack T12 test are given in parentheses.

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ACEA EUROPEAN OIL SEQUENCES

2008

SERVICE FILL OILS FOR GASOLINE ENGINES LIGHT DUTY DIESEL ENGINES ENGINES WITH AFTER TREATMENT DEVICES and HEAVY DUTY DIESEL ENGINES

Laboratory tests for gasoline and light duty diesel engine oils,
Engine tests for gasoline and light duty diesel engine oils,
Laboratory tests for engine with after treatment devices,
Engine tests for engine with after treatment devices.
Laboratory tests for heavy duty diesel engine oils,
Engine tests for heavy duty diesel engine oils,

ACEA
Avenue des Nerviens 85
B-1040 Bruxelles
Tel (32) 2 732 55 50
Fax (32) 2 738 73 10
(32) 2 738 73 11
info@acea.be;
communications@acea.be
www.ACEA.be
TVA BE 444 072 631
SGB 210-0069404-04

ACEA	ACEA 2008 EUROPEAN OIL SEQUENCES FOR SERVICE-FILL OILS	Dec. 2008

This document details the ACEA 2008 European Oil Sequences for Service-fill Oils for Gasoline engines, for Light Duty Diesel engines, for Gasoline & Diesel engines with after treatment devices and for Heavy Duty Diesel engines. These sequences define the minimum quality level of a product 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.

These sequences will replace the ACEA 2007 sequences as a means of defining engine lubricant quality from 22nd December 2008.

CONDITIONS FOR USE OF PERFORMANCE CLAIMS AGAINST THE ACEA OIL SEQUENCES

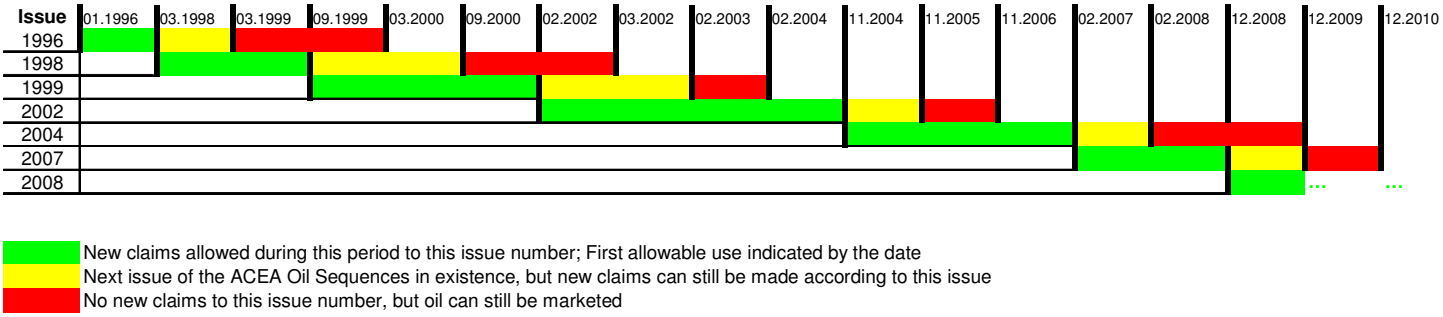
ACEA requires that any claims for Oil performance to meet these sequences must be based on credible data and controlled tests in accredited test laboratories.

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 2008 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 underlying a 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 graph.

Issue year of full document	First allowable use	All new claims by	withdrawn
1996	1st January 1996	1st March 1997	1st March 2000
1998	1st March 1998	1st March 1999	1st March 2002
1999	1st September 1999	1st September 2000	1st February 2004
2002	1st February 2002	1st February 2003	1st November 2006
2004	1st November 2004	1st November 2005	31st December 2009
2007	1st February 2007	1st February 2008	22nd December 2010
2008	22nd December 2008	22nd December 2009	

First allowable use means that claims cannot be made against the specification before the date indicated.
All new claims by means that from this date onward all claims for new oil formulations must be according to the latest ACEA release. Until that date new claims can also be made according to the previous ACEA release. (For example until 1st February 2008, oil marketers can make claims against the ACEA 2004 release even though the 2007 release is active. After 1st February 2008, any new oil claims must be according to the ACEA 2007 sequences.)
Withdrawn means that no claims can be made against the issue after the date indicated.



[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.

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).

The categories A2 and B2 are not included in this edition of the ACEA European Oil Sequences because they are unsuitable for some of the current engines and will be unsuitable for many future engines. Misuse may cause engine damage. However, the use of A2/B2 oils for older engines (where owner's or workshop's literature recommends this use) is still appropriate and can be done according to the categories A2-96 Issue 3 and B2-98-Issue 2.

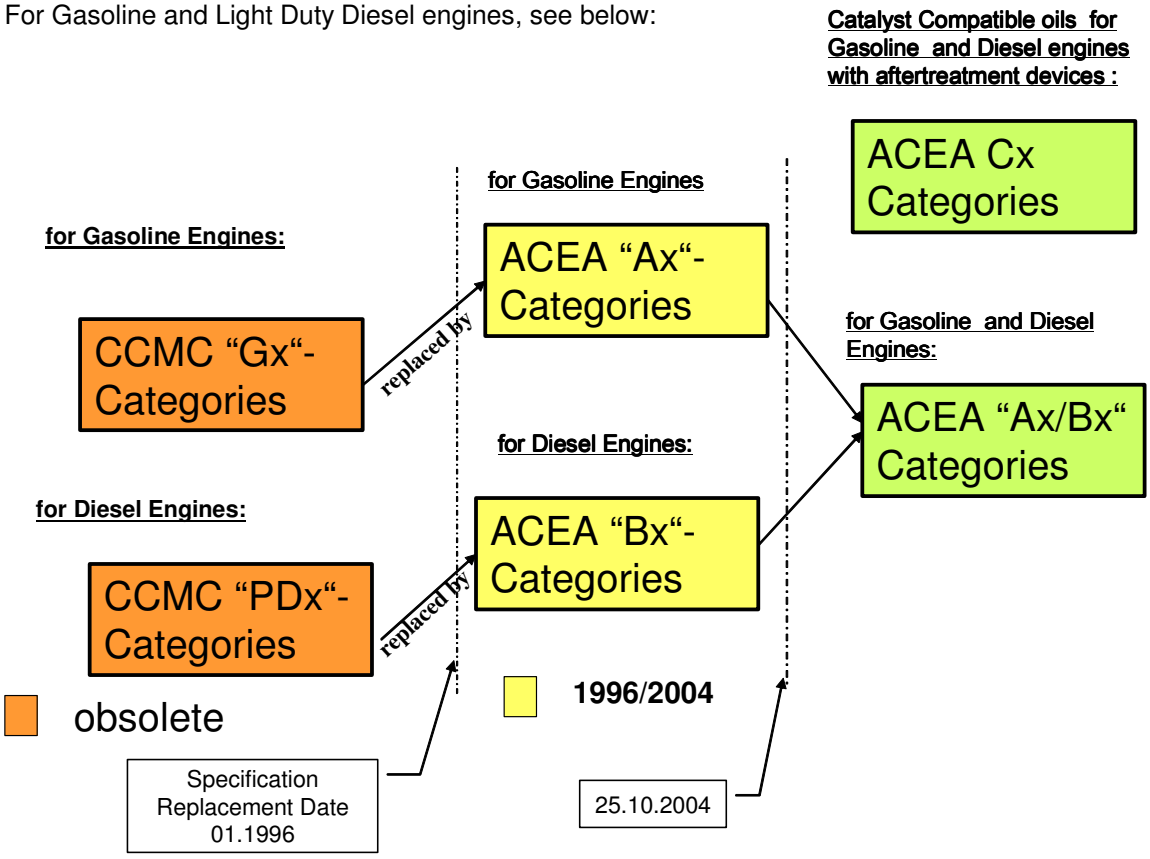
REPLACEMENT of CCMC sequences

The chart below shows the evolution of the engine oil specifications commonly developed by the European Automobile manufacturers. CCMC (Comité des Constructeurs du Marché Commun) was the forerunner organisation to ACEA.

In January 1996 the CCMC European Oil Sequences became obsolete and were replaced by the ACEA European Oil Sequences. This is true for light duty engine oils as well as heavy duty engine oils. CCMC European Oil Sequences are not supported any more by ACEA.

With the 2004 release of the ACEA European Oil Sequences the A and B categories have been combined to the respective A/B categories. At the same time, a new set of categories has been introduced with the intention to create specifications for engine oils being suitable for the latest and future aftertreatment systems for Gasoline and Diesel engines. These categories are designated as Cx-categories.

For Heavy Duty Diesel engines, the CCMC Dx categories were replaced by the ACEA Ex categories as of 1 January 1996. The CCMC Dx categories then became obsolete and are no longer supported by ACEA.
For Gasoline and Light Duty Diesel engines, see below:



X= 1, 2, 3, 4 or 5 depending of categories

ACEA	ACEA 2008 EUROPEAN OIL SEQUENCES FOR SERVICE-FILL OILS	Dec. 2008

The ACEA 2008 European Oil Sequences for Service-fill Oils comprise 3 sets (classes) of sequences: one for Gasoline and Light Duty Diesel engines; one specifically for Gasoline and Light Duty Diesel engines with after treatment devices and one for Heavy Duty Diesel engines. Within each of these sets there are categories which reflect different performance requirements - four (A1/B1, A3/B3, A3/B4 & A5/B5) for gasoline and light duty diesel engines; four (C1, C2, C3, C4) specifically for engines with after treatment devices, and four (E4, E6, E7, E9) for heavy duty diesel engines. Typical applications for each sequence are described below for guidance only. Specific applications of each sequence are the responsibility of individual engine manufacturers for their own vehicles / engines.

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

NOMENCLATURE & ACEA PROCESS:

Each set of sequences is designated for consumer use by a 2 part code comprising a letter to define the CLASS (e.g. C), and a number to define the CATEGORY (e.g. C1).

In addition, for industry use, each sequence has a two-digit number to identify the YEAR of implementation of that severity level (e.g. A1 / B1-04).

The CLASS indicates oil intended for a general type of engine - currently A / B = gasoline and light duty diesel engines; C = catalyst compatible oils for gasoline and diesel engines with after treatment devices. Other classes may be added in future if, for example, Natural Gas engines prove to require oil characteristics which cannot readily be incorporated into existing classes.

The CATEGORY indicates oils for different purposes or applications within that general class, related to some aspect or aspects of the performance level of the oil. Typical applications for each sequence are described below for guidance only. Specific applications of each sequence are the responsibility of the individual motor manufacturer for their own vehicles and engines. Oils within a category may also meet the requirements of another category, but some engines may only be satisfied by oils of one category within a class.

The YEAR numbers for ACEA Sequence is intended only for industry use and indicates the year of implementation of that severity level for the particular category. A new year number will indicate, for example, that a new test, parameter or limit has been incorporated in the category to meet new / upgraded performance requirements whilst remaining compatible with existing applications. An update must always satisfy the applications of the previous issue. If this is not the case, then a new category is required.

An administrative ISSUE Number is added for industry use where it is necessary to update the technical requirements of a sequence without the intention to increase severity (e.g. when a CEC test engine is updated to the latest version whilst maintaining equivalent severity; or where a severity shift in the test requires modification of the specified limits.).

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).

«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 NO_x 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 NO_x 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

ACEA	ACEA 2008 EUROPEAN OIL SEQUENCE FOR SERVICE-FILL OILS FOR GASOLINE and DIESEL ENGINES	Dec. 2008

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Performance parameters other than those covered by the tests shown or more stringent limits may be indicated by individual member companies.

REQUIREMENT	TEST METHOD	PROPERTIES	UNIT	LIMITS			
				A1 / B1-08	**A3 / B3-08**	**A3 / B4-08**	**A5 / B5-08**
1. LABORATORY TESTS							
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 D 2896		mgKOH/g	≥ 8.0	≥ 8.0	≥ 8.0	≥ 8.0
1.6 Sulphated ash	ASTM D874		% m/m	≤ 1.3 (see note 2)	≤ 1.5 (see note 2)	≤ 1.6 (see note 2)	≤ 1.6 (see note 2)
				NOTE: the following sections apply to all sequences			
1.7 Sulphur (see note 1)	ASTM D5185		% m/m	Report			
1.8 Phosphorus (see note 1)	ASTM D5185		% m/m	Report			
1.9 Chlorine	ASTM D6443		ppm m/m	Report			
1.10 Oil / elastomer compatibility	CEC L-039-96 (see note 3)	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	
		Tensile strength	%	-40/+10	-15/+18	-30/+10	-20/+10	As per
		Elongation at rupture	%	-50/+10	-35/+10	-20/+10	-50/+10	Daimler
		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			

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.

REQUIREMENT	TEST METHOD	PROPERTIES	UNIT	LIMITS			
				A1 / B1-08	**A3 / B3-08**	**A3 / B4-08**	**A5 / B5-08**
2. ENGINE TESTS							
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	≥ RL 216	≥ RL 216	≥ RL 216	≥ RL 216
		Absolute viscosity increase at 40°C between min and 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	ASTM D6593-00 (Sequence VG) Under protocol & requirements for API (See Note 4)	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	≥ RL 140	≥ RL 140 + 4σ or ≥ 9.0	≥ RL 140 + 4σ or ≥ 9.0	≥ RL 140 + 4σ or ≥ 9.0
2.5 Fuel economy See Note (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	mm2/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 – 2,5pts)	≥ (RL223 – 2,5pts)	≥ (RL223 – 2,5pts)	≥ (RL223 – 2,5pts)
2.7 Wear See notes (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 (13 mm) - max. value of 4 cylinders; 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 8cams)	µm	report	report	report	report
		Piston cleanliness (avg. 4 pistons)	merits	report	report	report	report
		Engine sludge avg.	merits	report	report	report	report

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REQUIREMENT	TEST METHOD	PROPERTIES	UNIT	LIMITS			
				A1 / B1-08	**A3 / B3-08**	**A3 / B4-08**	**A5 / B5-08**
2. ENGINE TESTS CONTINUED							
2.8	CEC L-078-99	Piston cleanliness	merit	≥ RL206	≥ RL206	≥ RL206	≥ RL206
DI diesel	(VW TDI)			minus	minus		
Piston				4 points	4 points		
cleanliness &		Ring sticking (Rings 1 & 2)					
Ring sticking		Average of all 8 rings	ASF	≤ 1.2	≤ 1.2	≤ 1.0	≤ 1.0
See notes (9)		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 (ISO 3771); s. note (7 & 8)	mgKOH /g	≥ 4.0	≥ 4.0	≥ 4.0	≥ 4.0
		EOT TAN (ASTM D 664); s. note (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 ºC +/- 2°C); FPM: AK6 (150 ºC +/- 2°C); ACM: E7503 (150 ºC +/- 2°C); AEM: D 8948/200.1 (150 ºC +/- 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 and reporting EOT TAN values.

ACEA	ACEA 2008 EUROPEAN OIL SEQUENCE FOR SERVICE-FILL OILS FOR GASOLINE and DIESEL ENGINES WITH AFTER TREATMENT DEVICES	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.

REQUIREMENT	TEST METHOD	PROPERTIES	UNIT	LIMITS			
				C1-08	**C2-08**	**C3-08**	**C4-08**
1. LABORATORY TESTS							
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	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	≥ 2.9	≥ 3.5	≥ 3.5
1.4 Evaporative loss	CEC L-040-93 (Noack)	Max. weight loss after 1 h at 250°C	%	≤ 13	≤ 13	≤ 13	≤ 11
1.5 Sulphur	ASTM D5185	(see note 1)	% m/m	≤ 0.2	≤ 0.3	≤ 0.3	≤ 0.2
1.6 Phosphorus	ASTM D5185	(see note 1)	% m/m	≤ 0.05 (2)	≥ 0.070 ≤0.090 (2)	≥ 0.070 ≤0.090 (2)	≤ 0.090 (2)
1.7 Sulphated ash	ASTM D874		% m/m	≤ 0.5 (see note 2)	≤ 0.8 (see note 2)	≤ 0.8 (see note 2)	≤ 0.5 (see note 2)
1.8 Chlorine	ASTM D6443		ppm m/m	Report	Report	Report	Report
1.9 TBN	ASTM D 2896		mg KOH / g			≥ 6.0	≥ 6.0
				NOTE: The following sections apply to all sequences			
1.10 Oil / elastomer compatibility	CEC L-039-96 (see note 3)	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			

ACEA	ACEA 2008 EUROPEAN OIL SEQUENCE FOR SERVICE-FILL OILS FOR GASOLINE and DIESEL ENGINES WITH AFTER TREATMENT DEVICES	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.

REQUIREMENT	TEST METHOD	PROPERTIES	UNIT	LIMITS			
				C1-08	**C2-08**	**C3-08**	**C4-08**
2. ENGINE TESTS							
2.1 High temperature deposits Ring sticking Oil thickening	CEC L-088-T-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	≥ RL 216	≥ RL 216	≥ RL 216	≥ RL 216
		Absolute viscosity increase at 40°C between min and 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	ASTM D6593-00 (Sequence VG) Under protocol & requirements for API (See Note 4)	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-53-95 (M111)	Engine sludge, average	merit	≥ RL 140 + 4σ or ≥ 9.0	≥ RL 140 + 4σ or ≥ 9.0	≥ RL 140 + 4σ or ≥ 9.0	≥ RL 140 + 4σ or ≥ 9.0
2.5 Fuel economy See Note (5)	CEC L-54-96 (M111)	Fuel economy improvement vs. Reference oil RL191 (15W-40)	%	≥ 3.0	≥ 2.5	≥ 1.0 (for Xw30 grades)	≥ 1.0 (for Xw30 grades)
2.6 Medium temperature dispersivity	CEC L-093-04 (DV4TD)	Absolute viscosity increase at 100°C and 6 % soot	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 – 2,5pts)	≥ (RL223 – 2,5pts)	≥ (RL223 – 2,5pts)	≥ (RL223 – 2,5pts)
2.7 Wear See notes (6)	CEC L-099-08 (OM646LA)	Cam wear outlet (avg. max. wear 8 cams)	µm	≤ 120	≤ 120	≤ 120	≤ 120
		Cam wear inlet (avg. max. wear 8 c.); (9)	µm	≤ 100	report, note(8)	≤ 100	≤ 100
		Cylinder wear (avg. 4 cyl.); s. note (9)	µm	≤ 5.0	≤ 5.0	≤ 5.0	≤ 5.0
		Bore polishing (13 mm) - max. value of 4 cylinders; s. note (9)	%	≤ 3.0	≤ 3.0	≤ 3.0	≤ 3.0
		Tappet wear inlet (avg. max. wear 8cams)	µm	report	report	report	report
		Tappet wear outlet (avg. max. wear 8cams)	µm	report	report	report	report
		Piston cleanliness (avg. 4 pistons)	merits	report	report	report	report
		Engine sludge avg.	merits	report	report	report	report

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Performance parameters other than those covered by the tests shown or more stringent limits may be indicated by individual member companies.

REQUIREMENT	TEST METHOD	PROPERTIES	UNIT	LIMITS			
				C1-08	**C2-08**	**C3-08**	**C4-08**
2. ENGINE TESTS CONTINUED							
2.8	CEC L-078-99	Piston cleanliness	merit	≥ RL206	≥ RL206	≥ RL206	≥ RL206
DI diesel	(VW TDI)						
Piston		Ring sticking (Rings 1 & 2)					
cleanliness &		Average of all 8 rings	ASF	≤ 1.0	≤ 1.2	≤ 1.0	≤ 1.0
Ring sticking		Max. for any 1st ring	ASF	≤ 1.0	≤ 2.5	≤ 1.0	≤ 1.0
See notes (10)		Max. for any 2nd ring	ASF	0.0	0.0	0.0	0.0
		EOT TBN (ISO 3771) and EOT TAN (ASTM D 664); s. note (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 ºC +/- 2ºC); FPM: AK6 (150 ºC +/- 2ºC); ACM: E7503 (150 ºC +/- 2ºC); AEM: D 8948/200.1 (150 ºC +/- 2ºC)) + 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 & 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 & TAN.

ACEA	ACEA 2008 EUROPEAN OIL SEQUENCE FOR SERVICE-FILL OILS FOR HEAVY DUTY 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.

REQUIREMENTS	TEST METHOD	PROPERTIES	UNIT	LIMITS			
				E4-08	**E6-08**	**E7-08**	**E9-08**
1. LABORATORY TESTS							
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 (2nd Edition) (Ravenfield)	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 1 h at 250°C	%	≤ 13			
1.5 Sulphated Ash	ASTM D874		% m/m	≤ 2.0	≤ 1.0	≤ 2.0	≤ 1.0
1.6 Phosphorus (Note 1)	ASTM D5185+		% m/m		≤ 0.08		≤ 0.12
1.7 Sulphur (Note 1)	ASTM D5185+		% m/m		≤ 0.3		≤ 0.4
1.8 Oil Elastomer Compatibility (Note 2)	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	-25/+1	-5/+5	As per Daimler
		Tensile strength	%	-50/+10	-15/+18	-45/+10	-20/+10	
		Elongation rupture	%	-60/+10	-35/+10	-20/+10	-50/+10	
		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	R&R	R&R	≥ 65	≥ 65
1.12 Corrosion	ASTM D 6594	Copper increase Lead increase Copper strip rating	ppm ppm max	R&R R&R R&R	R&R R&R R&R	R&R ≤ 100 R&R	≤ 20 ≤ 100 3
1.13 Turbocharger performance (Note 3)							
1.14 TBN	ASTM D2896		mg KOH/g	≥12	≥ 7	≥ 9 (Note 4)	≥7

ACEA	ACEA 2008 EUROPEAN OIL SEQUENCE FOR SERVICE-FILL OILS FOR HEAVY DUTY 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.

REQUIREMENTS	TEST METHOD	PROPERTIES	UNIT	LIMITS			
				E4-08	**E6-08**	**E7-08**	**E9-08**
2. ENGINE TESTS							
2.1 Wear	CEC L-099-08 (OM646LA)	Cam wear outlet (avg. max. wear 8 cams)	µm	≤ 140 (Notes 5, 6)	≤ 140 (Notes 5, 6)	≤ 155 (Notes 5, 6)	≤ 155 (Notes 5, 6)
2.2 Soot in oil (Note 7)	ASTM D 5967 (Mack T-8E)	Test duration 300 h Relative viscosity at 4.8% soot 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**	CEC L-101-08 (OM501LA)	Bore polishing, average Piston Cleanliness, average Oil consumption Engine sludge, average (Note 8)	% merit kg/test Merit	≤ 1.0 ≥ 26 ≤ 9 R&R (Notes 9,10)	≤ 1.0 ≥ 26 ≤ 9 R&R (Notes 9,10)	≤ 2.0 ≥ 17 ≤ 9 R&R (Notes 9,10)	≤ 2.0 ≥ 17 ≤ 9 R&R (Notes 9,10)
2.5. Soot induced wear	Cummins ISM	Merit Rocker pad average weight loss at 3.9 % soot 1 test/2 test/3 test average Oil filter diff.press @ 150h 1 test/ 2 test/3 test average Engine sludge 1 test/2 test/3 test average Adj. screw weight loss	 mg kPa merit mg			≤ 7.5/7.8/7.9 ≤55/67/74 ≥ 8.1/8.0/8.0 (Note 11)	≥1000 ≤ 7.1 ≤ 19 ≥ 8.7 ≤ 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 (Notes 12, 13)	≥ 1000 ≤ 26 ≤ 117 ≤ 42 ≤ 18 ≤ 95 (Notes 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 ºC); FPM: AK6 (150 ºC); ACM: E7503 (150 ºC); AEM: D 8948/200.1 (150 ºC)) + 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.

TOTAL

Imprimer | Fermer

DÉFINITIONS - NORMES

Norme A.P.I. (American Petroleum Institute)

Le niveau de performance A.P.I. est représenté par un code formé en général de deux lettres :

- la première désigne le type de moteur (S=essence et C=diesel)
- la seconde lettre désigne le niveau de performance.(Pour les moteurs essence,...)

Pour obtenir cette norme, un lubrifiant doit passer avec succès quatre tests moteurs qui tiennent compte de :

- l'élévation de la température des huiles moteurs en service,
- l'allongement des intervalles de vidanges préconisé par les constructeurs,
- la recherche des performances moteurs,
- la sévérisation des normes de protection de l'environnement,

et pour certaines huiles :

- la réduction de la consommation de carburant grâce à une faible viscosité (catégorie "Energie Conserving").

Il existe 3 sortes de classification :

Classification API Transmission
Classification API Moteur Essence
Classification API Moteur Diesel

Classification API transmission

API-GL-1
Pour transmissions d'essieux à denture hélicoïdale et à vis sans fin et certaines transmissions manuelles. Peuvent contenir des additifs: antirouille, antioxydant, antimousse et agent abaissant le point de solidification.

API-GL-2
Pour transmissions à vis sans fin auxquelles une huile GL-1 ne suffit pas.

API-GL-3
Pour transmissions d'essieux à denture hélicoïdale fonctionnant à vitesse modérée et service moyen auxquelles une huile GL-1 ne suffit pas.

API-GL-4
Pour transmissions à denture hélicoïdale et transmissions hypoïdes spéciales appliquées à des véhicules qui fonctionnent dans des conditions de vitesse élevée et de faible couple ou de vitesse réduite et de couple élevé. Des additifs anti-usure et extrême-pression sont assez souvent ajoutés.

API-GL-5
Voir point précédent mais dans des conditions de vitesse élevée sollicitation extrême-faible couple et vitesse réduite couple élevé. Des additifs anti-usure et extrême-pression sont très souvent ajoutés.

Classification API Moteur Essence

SD : Pour les moteurs essence de voitures de tourisme et de camions de 1968 à 1970. Une huile SC doit offrir une protection contre la formation de dépôts à haute (détergence) et à basse température (dispersivité). Une protection supplémentaire est également requise contre l'usure et la formation de rouille.

SE : Pour les moteurs essence de voiture de tourisme et de camions depuis 1971. Les huiles SE peuvent remplacer les huiles SC. Par rapport à la catégorie précédente, l'huile SC offre une meilleure résistance contre l'oxydation et contre la formation de "cold sludge" à basse température. En outre, le moteur est mieux protégé contre la formation de rouille.

SG : Pour les moteurs essence des voitures de tourisme et de certains camions depuis 1989. Les huiles SG peuvent remplacer les huiles SF, SG, CC, SE ou SE/CC. Les huiles SG ont de meilleures performances que les huiles SF sur le plan de la résistance à la formation de dépôts, de la protection contre l'usure et de la résistance contre la corrosion.

SH : Idem à SG mais conditions de tests plus strictes.

SJ : Huile moteur de niveau SH, mais développée en accord avec les systèmes de certification API suivant des critères d'essais multiples.

Classification API Moteur Diesel

CC : Pour les moteurs diesel avec une description de service normale (moteur diesel légèrement suralimenté) et moteur essence. Les huiles CC sont très détergentes et dispersives et protègent suffisamment les moteurs contre l'usure et la corrosion.

CD : Pour les moteurs diesel fortement sollicités, à haut régime et soumis à des pressions effectives moyennes élevées, produites par turbocompression. Les huiles CD sont très détergentes et dispergentes et protègent suffisamment les moteurs contre l'usure et la corrosion.

CDII : Pour les moteurs diesel deux temps conçus pour des services sévères. Limitation stricte de la formation de dépôts et de l'usure. Les huiles CDII répondent aux exigences de la classe CD présentée ci-avant mais satisfont par ailleurs aux tests de moteur GM deux temps normalisés effectués sur un Detroit 6V53T.

CE : Pour les moteurs diesel très sollicités avec turbocompression en circulation depuis 1983. Sont visés les moteurs de puissance élevée à régime élevé mais également les moteurs lents qui développent aussi une puissance élevée. Les huiles CE peuvent remplacer les huiles CD sur tous les moteurs. Outre les exigences de la catégorie CD, ces huiles ont de meilleures propriétés en matière de limitation de la consommation d'huile, de formation de dépôts, d'usure et d'épaississement de l'huile.

CF : Voir CE avec addition d'un test de microoxydation. La protection des pistons et des gorges de segment est particulièrement renforcée.

CG : Pour les moteurs diesel fortement sollicités. Réduction des dépôts sur les pistons, de l'usure, de la corrosion, du moussage, de l'oxydation et de l'accumulation de suies à haute température. Ces huiles répondent aux besoins des moteurs adaptés aux normes d'émission 1994.

CH : Pour les moteurs diesel adaptés aux normes d'émision 1998. Ces huiles sont destinées à garantir la durée de vie des moteurs dans les conditions les plus sévères. Elles permettent une extension des intervalles de vidange.

Classification ACEA moteur (Association des Constructeurs Européens d'Automobile)

La classification API est surtout importante pour les moteurs américains. Les moteurs d'origine européenne exigent d'autres critères.

Par conséquent, les constructeurs de moteurs européens ont développé leur propre système de classification. Elle est établie par l'ACEA,anciennement CCMC ou "Comité des Constructeurs du Marché Commun" et reste donc employée sous le vocable de normes CCMC. Le principe est de renvoyer la classification API et d'y ajouter des exigences. De plus, une distinction est établie entre les moteurs diesel et les moteurs essence. La classification pour les moteurs diesel est exprimée par la lettre D (Diesel) suivie d'un chiffre et pour les moteurs essence par la lettre G (Gasoline) suivie d'un chiffre.

Les normes ACEA se distinguent en trois groupes :

- A pour les moteurs essence,
- B pour les moteurs diesel de tourisme,
- E pour les moteurs diesel de véhicules utilitaires et poids lourds.

Chaque groupe de spécification comprend plusieurs niveaux de performance indiqués par un chiffre (1,2,3, ...), suivi des deux derniers chiffres de l'année d'introduction de la version la plus récente.

On trouve ainsi pour les moteurs essence les normes suivantes :

- A1-96: huiles économisant l'énergie,
- A2-96: huiles pour usage normal,
- A3-96: huiles pour service sévère.

Norme S.A.E.

La norme SAE J 300 définit pour chaque lubrifiant ce que l'on appelle un "Grade de viscosité". Ex : S.A.E. 40 (grade de viscosité pour l'été) Plus le nombre est élevé et plus l'huile conserve une bonne viscosité à chaud. Dans le cas d'une conduite urbaine ou sportive, où lorsque la température de l'air est élevée, le moteur subit des hautes températures qui vont accentuer le phénomène. Aussi est-il important d'utiliser une huile qui reste suffisamment visqueuse à chaud pour protéger le moteur.

A froid au contraire, l'huile à tendance à épaissir. Or, il est important qu'elle demeure bien fluide, même à basses températures, pour bien se répartir dans le moteur et protéger les pièces mécaniques en mouvement mais également pour faciliter le démarrage. La viscosité à froid est caractérisée selon la norme S.A.E. par un "Grade de viscosité hiver".
Ex : S.A.E.10W Le nombre indiquant le grade de viscosité hiver est toujours suivi de la lettre W (pour "winter" qui signifie hiver en anglais).

Plus le nombre est petit, plus l'huile restera fluide par temps froid ou au démarrage du véhicule.

Les huiles monogrades sont généralement utilisées lorsque la température de fonctionnement varie peu (ou pour des applications spécifiques).

Les huiles multigrades répondent à la fois à un grade hiver et à un grade été.
Ex : S.A.E. 10W 40.
Où : 10W = Grade hiver
40 = Grade été

Une huile multigrade est moins sensible à la température. Concrètement, cela signifie qu'elle permet un démarrage aisé en hiver grâce à une faible viscosité tandis que la viscosité.

Why not to use cheap oil in your 8V

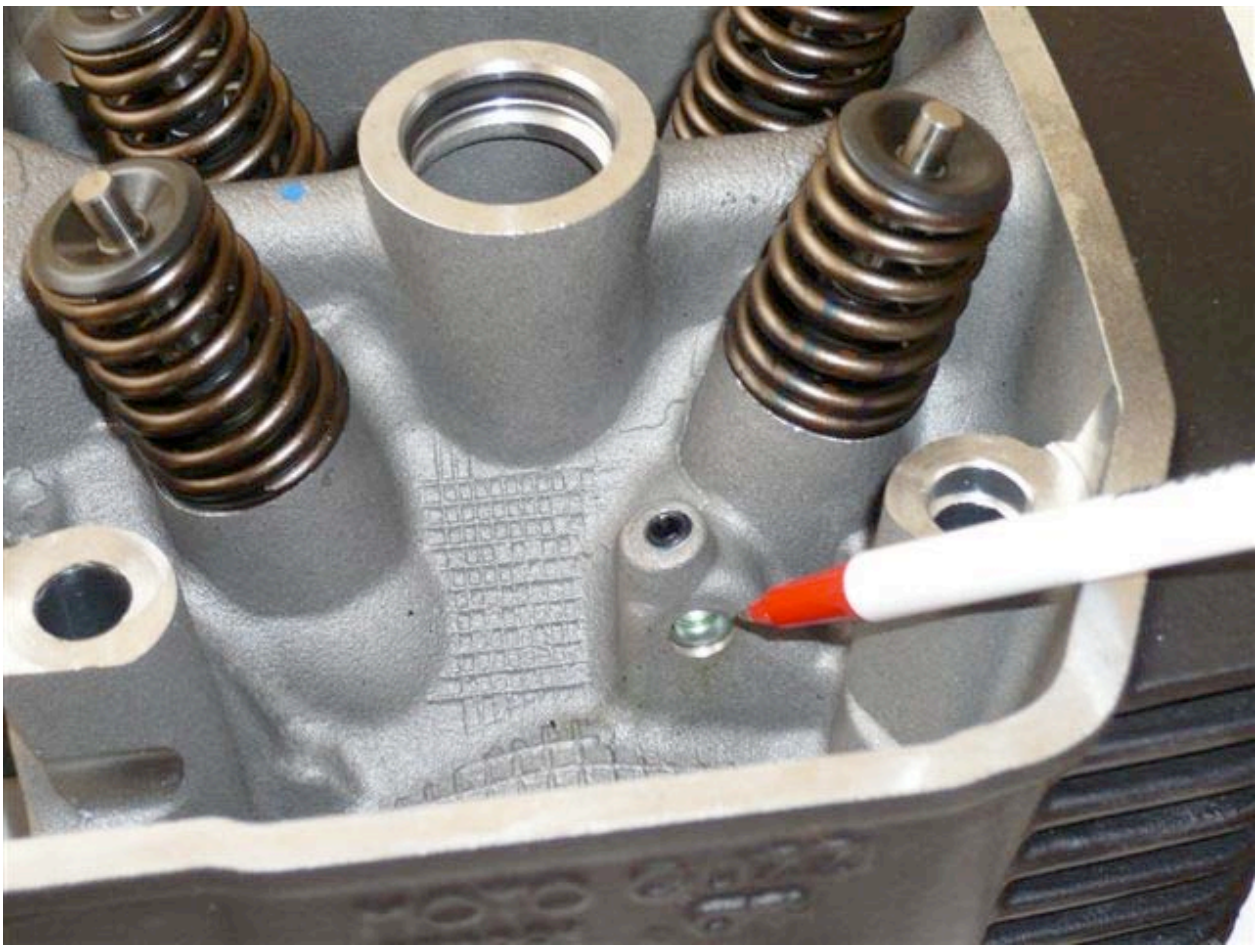
pete roper

Posted 12 February 2010 - 04:13 AM

OK, so I've got a warranty job coming in . A bloke with an 8V Griso with a pinhole pourosity in the head casting so it's a new head for him. This actually arrived within a fortnight, I was very impressed. while I had a new, clean, head in my grubby little mits I tought it would be a good time to have a squizz at it and find out what's what.

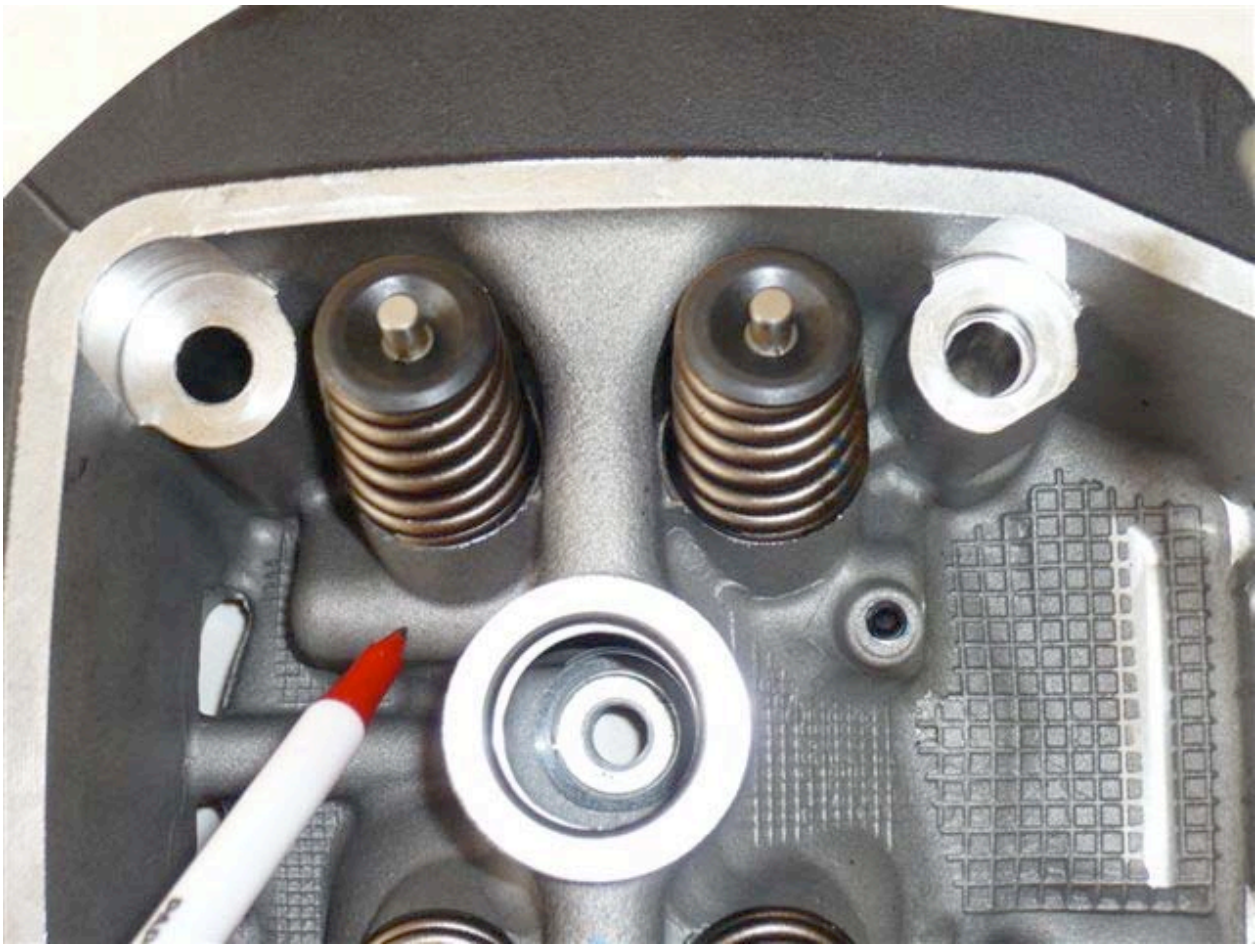
Now we know from the publicity blurb that the engine is Air/Oil cooled and has two oil pumps, one for lubrication and one for cooling. Certainly when the motor is running large amounts of oil gush out of the camboxes and rockers and flow down overe the head to cool it. Run an 8V with the rocker cover off and you'll be drenched in oil in seconds!

Having the head off the bike and clean though allows you to see some other much more important things.



As you can see there is a gallery drilled through the casing by the exhaust valves. There is another one that comes in from the port side of the valves as well.

Here you can see the two plugged drillings in the casting for the lower gallery in the bottom LH corner of the pic.



You can see here the boss the gallery is drilled through in the casting.

Looking at the underside, (Combustion side.) of the head you can see on the exhaust side, (Bottom of the picture.) the two drillings, presumably one a delivery and one a return, in the head. They are the two smaller holes adjacent to the stud holes. The longer slots are part of the oil return for the lubricant that gets flung around and pumped out of the cam boxes/rocker gear above the head.

Another pic looking at the exhaust port showing the second drilling for the cooling oil feed.

Looking at the valley side of the head you can see the lubrication oil feed. That is the hole at the front of the head in line with the exhaust stud. This feeds oil into the upper forward stud hole.

bottom right in this pic, where it is fed up the stud and into the cam bearings in the cam box.

as you can see from the pic that stud is doweled to the barrel to ensure that there is room for the oil to flow up to the bearings through the stud hole when the stud is centralised by the cam box casting.

The important thing here though is that the exhaust valve seats and the head immediately surrounding them is being cooled by a high volume of oil that will be being pumped through the galleries surrounding the seats. The temperatures in tat area are going to be the highest in the motor and using an inferior oil is going to lead to all sorts of horrible varnishes and deposits building up in those, quite small, galleries. when the factory recommends a very expensive, high quality full ester synthetic for the 8V it's not so much for the tappets, (Although protection there is a bonus.) it is because of the oil's ability not to degrade at much higher temperatures than a 'Free Grandfather Clock with Every 4 Quarts' mineral oil from Wallyworld.

Ignore the spec at your peril, and yes, any half way decent mechanic will be able to see the deposits and know what they are if the galleries do clog up and you drop the head off a valve. (BFG. This is particularly relevant to you as the 'tard who has been working on your bike has been swearing by Yak Fat. I'd drop it out yesterday, if not sooner, and put something better in!!!!) If I got one in with that sort of problem I'd be sending an oil sample off for analysis and if it wasn't the 'Good Oil'? Bye-Bye warranty!

Pete

belfastguzzi

Posted 12 February 2010 - 11:52 AM

(http://www.v11lemans.com/forums/index.php?app=forums&module=forums&section=findpost&pid=167611) pete roper, on Feb 12 2010, 03:13 AM, said:

and if it wasn't the 'Good Oil'? Bye-Bye warranty!

Great bit of photo exploration/explanation.

Now, that's an interesting question. Where does the warranty stand in a situation like this?

The handbook says to 'use 10-60 synthetic'.

The MG Authorised Service Guy says: "10-40 semi is perfect for everything" and that's all that he uses.

The importer, Piaggio UK Aftercare say: "your Dealer Guy will look after the bike. Full Stop. What do you know? And internet forum chat is all rubbish talk by fools."

So the upshot is that 10-40 semi-synth is 'authorised' by the Guzzi system and my bike has been running it for the past year.

What would they say / could they say regarding Warranty cover?
'Guzzi Things go better with CARC' but not necessarily
and possibly with water-cooling

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pete roper

Posted 12 February 2010 - 12:24 PM

(http://www.v11lemans.com/forums/index.php?app=forums&module=forums&section=findpost&pid=167624) belfastguzzi, on Feb 12 2010, 12:52 PM, said:

Great bit of photo exploration/explanation.

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So the upshot is that 10-40 semi-synth is 'authorised' by the Guzzi system and my bike has been running it for the past year.

What would they say / could they say regarding Warranty cover?

If your importer says 10/40 semi synth is fine then maybe it is. The factory spec is a 10/60 full ester synth. When I see what the oil has to put up with, (Exhaust gasses exiting the port will be in excess of 1000*C if memory serves me right.) I'm not going to experiment. I'll stick with a full ester synth 10/70 that meets or exceeds the factory spec because I know that one of its most important characteristics is its ability to resist heat induced breakdown that occurs in mineral oils when they are over-taxed.

Pete

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belfastguzzi

Posted 12 February 2010 - 06:51 PM

(http://www.v11lemans.com/forums/index.php?app=forums&module=forums&section=findpost&pid=167625) pete roper, on Feb 12 2010, 11:24 AM, said:

If your importer says 10/40 semi synth is fine then maybe it is. The factory spec is a 10/60 full ester synth. When I see what the oil has to put up with, (Exhaust gasses exiting the port will be in excess of 1000*C if memory serves me right.) I'm not going to experiment. I'll stick with a full ester synth 10/70 that meets or exceeds the factory spec because I know that one of its most important characteristics is its ability to resist heat induced breakdown that occurs in mineral oils when they are over-taxed.

Pete

Well no, the importer hasn't said that 10/40 semi is ok. However I'm arguing that the effect of their attitude

is that they have authorised it, even if they are wrong.

The Dealer uses it, perhaps because he is careless and he just uses the one barrel for everything that passes through the workshop.
The Importer endorses whatever the Dealer does, perhaps because he is just careless too.
It doesn't make them right. It doesn't mean that the bike is being looked after properly.
But it's not my choice to use that oil and if the MG guys don't listen to me, then they can't refuse Warranty on the basis that the wrong oil has been used?
'Guzzi Things go better with CARC' but not necessarily
and possibly with water-cooling

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pete roper

Posted 12 February 2010 - 08:10 PM

(http://www.v11lemans.com/forums/index.php?app=forums&module=forums&section=findpost&pid=167637) belfastguzzi, on Feb 12 2010, 06:51 PM, said:

Well no, the importer hasn't said that 10/40 semi is ok. However I'm arguing that the effect of their attitude is that they have authorised it, even if they are wrong.

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It doesn't make them right. It doesn't mean that the bike is being looked after properly.
But it's not my choice to use that oil and if the MG guys don't listen to me, then they can't refuse Warranty on the basis that the wrong oil has been used?

Yup, your logic is impecable, doesn't mean they are right, but what woiuld I know, I'm just some bloke on the innerneck....

Pete

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dlaing

Posted 12 February 2010 - 09:52 PM

(http://www.v11lemans.com/forums/index.php?app=forums&module=forums&section=findpost&pid=167639) pete roper, on Feb 12 2010, 11:10 AM, said:

Yup, your logic is impecable, doesn't mean they are right, but what woiuld I know, I'm just some bloke on the innerneck....

Pete

Just a bloke on the innerneck? Dude, you are Pete Roper! and you just pointed out how close the oil runs to the exhaust valve.
I'll take it you won't run Yak Fat in those engines?
There is no way I would run that engine with anything that was not designed to handle that heat.
Note that Full Synthetic is not necessarily a full ester synthetic.
The difference between a 10W-50 and a 10W-60 is only ten degrees, but the flash point differences increase dramatically as you go from dino, to semisynth to cheap synth to full ester synth. And Brands do make a difference.
This chart can give you an idea, although these are not the ideal oils:
http://micapeak.com/info/oiled.html (http://micapeak.com/info/oiled.html)
(note, for all I know, that could be Amsoil propaganda, I did not get my friends at FBI to look deeply into this matter. I am just posting to show that there are significant differences)
Silver Y2K V11S
Ohlins forks from Cafe Sport, Penske shock, Mistral carbons, BMC filter, ElectroSport regulator, GEI relays 和, Odyssey battery, Corbin saddle, Buell footpegs, ConvertiBARS, Pro Grip 737, Napoleon mirrors, Pazzo levers, Brembo 7850 Calipers, Galfer brake lines, Moto Moda inspired shloppage sheet, PCIII serial, AND TuneBoy!

V11 Six-Speed Web Site at webring.com (http://webspace.webring.com/people/ur/rcdlaing/)

belfastguzzi

Posted 12 February 2010 - 11:12 PM

DL, I think that PR was being facetious, ironic, 
'Guzzi Things go better with CARC' but not necessarily
and possibly with water-cooling

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