



Calidad del agua.

El agua es parte fundamental del LPU ya que el agua por naturaleza es el mejor refrigerante del mundo pero debe tener las siguientes propiedades.

TABLE X1.1 Suggested Water Quality Limits^A

Property	Specific Values	ASTM Test Method
Total solids, ppm (grains/gal)	340 (20) max	D 1888
Total hardness, ppm (grains/gal)	170 (10) max	D 1126
Chlorides, ppm (grains/gal)	40 (2.4) max	D 512, D 4327
Sulfate, ppm (grains/gal)	100 (5.9) max	D 516, D 4327
pH	5.5–9.0	D 1293

^A Adopted from a survey by the Committee D15 Water Quality Task Force.



Normas aprobadas

This coolant has met the requirements for:

- ASTM D 6210 – 98a (Chemistry 1)
- ASTM D 3306 – 2000 (Type 1 EG Concentrate)
- ASTM D 4985 - 98
- TMC RP-329 (Type 'A')
- United States MILITARY CID A-A-52624



Most vehicle manufacturers require fleet and / or other testing to fully comply with factory fill requirements, but this coolant would be appropriate for use where any of the following are specified. The specifications in bold are especially good matches.

CNH (Case, New Holland) JIC 501

Caterpillar (DEAC Type)

Chrysler MS7170, MS-9769

Cummins 85T8-2, 90T8-4

Detroit Diesel 7SE 298

EMD

Federal Motor Pool A-A-870

Ford Motor Company ESE-M97B44-A, ESE-M97B18-C, WSS-M97B51-A1

Freightliner

General Motors 6038, 6043, 1899 and 1825

John Deere H24A1, H24C1

Kenworth

Kia Motors

MACK

MANN

MTU

Mercedes Benz

Peterbilt

Superior

Volkswagen

Volvo (cars and Trucks)

Waukesha

The Japanese manufacturers (Toyota, Honda, Nissan, etc.) prefer silicate free coolants, so this formulation is not compliant with their recommendations. Of course, we would expect the coolant to perform very satisfactorily in Japanese cars.

Designation: D 3306 – 01

TABLE 2 Physical and Chemical Requirements

Property	Type I	Type II	Type III	Type IV	ASTM Test Method
Relative density 15.5/15.5°C (60/60°F)	1.110 to 1.145	1.030 to 1.065	1.065 min	1.025 min	D 1122, D 5931
Freezing point, °C (°F): 50 vol % in DI water Undiluted	-37 (-34) max	-32 (-26) max	-37 (-34) max	-32 (-26) max	D 1177
Boiling point, ^A °C (°F): 50 vol % in DI water Undiluted	108 (226) min 163 (325) min	104 (219) min 152 (305) min	108 (226) min	104 (219) min	D 1120
Ash content, mass %	5 max	5 max	2.5 max	2.5 max	D 1119
pH: 50 vol % in DI water Undiluted	7.5 to 11	7.5 to 11	7.5 to 11	7.5 to 11	D 1287
Chloride, ppm	25 max	25 max	25 max	25 max	D 3034, D 5827
Water, mass %	5 max	5 max	not applicable	not applicable	D 1123
Reserve alkalinity, mL	report ^B	report ^B	report ^B	report ^B	D 1121
Effect on automotive finish (use clear coat thermoset urethane or acrylic urethane finish)	no effect	no effect	no effect	no effect	D 1882 ^C

^A Some precipitate may be observed at the end of the test. This should not be cause for rejection.

^B Value as agreed upon between the supplier and the customer.

^C Currently, many vehicle manufacturers prepare test panels using the specific paint finishes employed on their actual products. Coolant suppliers and vehicle manufacturers should agree on the exact test procedures and acceptance criteria on an individual basis.



TABLE 3 Performance Requirements^A

Property	Specific Values	ASTM Test Method	Test Solution Concentration, vol % Glycol
Corrosion in glassware		D 1384 ^B	33
Weight loss, mg/specimen			
copper	10 max		
solder	30 max		
brass	10 max		
steel	10 max		
cast iron	10 max		
aluminum	30 max		
Simulated service test		D 2570 ^C	44
Weight loss, mg/specimen			
copper	20 max		
solder	60 max		
brass	20 max		
steel	20 max		
cast iron	20 max		
aluminum	60 max		
Corrosion of Cast Aluminum Alloys at Heat-Rejecting Surfaces, mg/cm ² /week	1.0 max	D 4340 ^D	25
Foaming		D 1881 ^E	33
Volume, mL	150 max		
Break time, s	5 max		
Cavitation-Erosion	8 min	D 2809 ^F	17
Rating for pitting, cavitation, and erosion of the water pump			

TABLE X1.1 Suggested Water Quality Limits^A

Property	Specific Values	ASTM Test Method
Total solids, ppm (grains/gal)	340 (20) max	D 1888
Total hardness, ppm (grains/gal)	170 (10) max	D 1128
Chlorides, ppm (grains/gal)	40 (2.4) max	D 512, D 4327
Sulfate, ppm (grains/gal)	100 (5.9) max	D 516, D 4327
pH	5.5–9.0	D 1293

^A Adopted from a survey by the Committee D15 Water Quality Task Force.

TABLE X2.1 Methods for Determining Freeze Points

Method	Base Glycol		
	Ethylene	Propylene	Mixture
Refractometer	yes	yes ^A	yes ^B
Hydrometer	yes ^C	yes ^D	no
Test Strips	yes	yes	yes

^A Must be a refractometer with either a PG freeze point scale or a dual scale with both PG and EG.

^B Approximate freeze point determinations can be made for mixtures of EG and PG base coolants by calculating the average of readings on each scale. The freeze point determined by this method will be within $\pm 4^{\circ}\text{C}$ (7°F), regardless of whether the coolant is all EG, PG, or a mixture of both.

^C Conventional field service hydrometers calibrated for use with ethylene glycol base coolants.

^D Hydrometer shall be specifically calibrated for use with PG base coolants.

^A For engine coolant concentrates, test solutions shall be prepared in accordance with the directions provided in the individual ASTM test methods noted. For prediluted engine coolants, prepare test solutions using the directions provided in Footnotes B through F.

^B For prediluted coolants, prepare the test solution by mixing 87 volume % of the adjusted (see 4.6) prediluted product with 33 volume % ASTM Type IV reagent water. Add 99 mg of sodium sulfate, 110 mg of sodium chloride, and 92 mg of sodium bicarbonate per litre of test solution.

^C For prediluted coolants, prepare the test solution by mixing 88 volume % of the adjusted (see 4.6) prediluted product with 12 volume % ASTM Type IV reagent water. Add 83 mg of sodium sulfate, 92 mg of sodium chloride, and 77 mg of sodium bicarbonate per litre of test solution.

^D For prediluted coolants, prepare the test solution by mixing 50 volume % of the adjusted (see 4.6) prediluted product with 50 volume % ASTM Type IV reagent water. Add 165 mg of sodium chloride per litre of test solution.

^E For prediluted coolants, prepare the test solution by mixing 87 volume % of the adjusted (see 4.6) prediluted product with 33 volume % ASTM Type IV reagent water.

^F For prediluted coolants, prepare the test solution by mixing 33 volume % of the adjusted (see 4.6) prediluted product with 67 volume % ASTM Type IV reagent water. Add 123 mg of sodium sulfate, 137 mg of sodium chloride, and 115 mg of sodium bicarbonate per litre of test solution.

Designation: D 4985 – 00a

TABLE 1 Physical and Chemical Requirements

Property	Specific Values		ASTM Test Method
	Concentrate	Predilute	
Relative density, 15.5/15.5°C (60/60°F)	1.110 to 1.145	1.065 min	D 1122, D 5931
Freezing point, °C (°F): 50 vol % in DI water Undiluted	-37 (-34) max	-37 (-34) max	D 1177
Boiling point, ⁴ °C (°F): Undiluted 50 vol % in DI water	163 (325) min 108 (226) min	108 (226) min	D 1120
Ash content, mass %	5 max	2.5 max	D 1119
pH: 50 vol % in DI water Undiluted	7.5 to 11	7.5 to 11	D 1287
Reserve alkalinity, mL	report ^B	report ^B	D 1121
Water, mass %	5 max	not applicable	D 1123
Chloride ion, ppm	25 max	25 max	D 3634, D 5827
Silicon, ppm	250 max	125 max	D 6129, D 6130
Effect on engine or vehicle finish	no effect	no effect	D 1882 ^C

TABLE 3 Performance Requirements^A

Property	Specific Values	ASTM Test Method	Test Solution Concentration, vol % Glycol
Corrosion in glassware		D 1384 ^B	33
Weight loss, mg/specimen:			
copper	10 max		
solder	30 max		
brass	10 max		
steel	10 max		
cast iron	10 max		
aluminum	30 max		
Simulated service test		D 2570 ^C	44
weight loss, mg/specimen:			
copper	20 max		
solder	60 max		
brass	20 max		
steel	20 max		
cast iron	20 max		
aluminum	60 max		
Foaming:		D 1881 ^D	33
Volume, mL	150 max		
Break time, s	5 max		
Cavitation-Erosion	8 min	D 2809 ^E	17
Rating for pitting, cavitation, and erosion of the water pump			



Designation: D 6210 – 03

ANNEX

(Mandatory Information)

A1. CHEMICAL REQUIREMENTS FOR FULLY FORMULATED HEAVY DUTY ENGINE COOLANT

A1.1 Laboratory data or in-service experience demonstrating a positive influence on reducing cavitation corrosion in an operating engine is required.

A1.1.1 In-service qualification tests may consist of single or multiple-cylinder engine tests. At the option of the engine or vehicle manufacturer, such testing may be conducted in “loose engines” or in engines fully integrated into an application, such as a vehicle, a power boat, or a stationary power source. One such test has been developed.⁴

A1.2 Several chemical compositions have been tested extensively by producers and users and satisfactorily minimize cylinder liner cavitation in actual test engines. Coolants meeting either of the following compositions are regarded as passing the requirements of A1.1:

A1.2.1 A minimum concentration of nitrite (as NO₂-) of 1200 ppm in the 50 volume % predilute coolant, or A1.2.2 A minimum combined concentration of nitrite (as NO₂) plus molybdate (as MoO₄-2) in the 50 volume % predilute coolant of 780 ppm. At least 300 ppm each of NO₂ and MoO₄-2 must be present.

A1.2.3 The above concentrations are doubled for coolant concentrates.

A1.3 Chemical composition requirements for cavitation corrosion protection will be removed from this specification and replaced with an ASTM test method when a test method is developed and adopted.

A1.4 Both concentrated and prediluted coolants under this specification must contain additives to minimize hot surface scaling deposits. Certain additives (polyacrylate and other types) minimize the deposition of calcium and magnesium compounds on heat rejecting surfaces. No specific chemical requirements for hot surface scaling and deposits resistance have been established at this time. A test procedure is under development and will be incorporated into the specification when a procedure is approved by ASTM.

A1.5 Lack of compatibility between the coolant and SCA product’s chemistry results in chemical ingredient dropout from solution, with potential adverse effects in the vehicle or engine cooling system. A test procedure for compatibility (Test Method D 5828) has been approved and will be incorporated into the specification when limits are determined.

4 “A Comparison of Engine Coolant in an Accelerated Heavy-Duty Engine Cavitation Test,” SAE Technical Paper 960883, SAE international, 400 Commonwealth Drive, Warrendale, PA 15096-0



Mercedes-Benz

DBL 7700

Versiones (Modelos)			Requerimientos				Tolerancia de entrega permisible del valor de muestra	Reglamento de prueba
			00	10	20	30		
4.1*)	Densidad d ₂₀	g/ml	1.11 hasta 1.14				±0.002	DIN 51 757
4.2	Valor pH solución acuosa (KFM/agua destilada 1:2)		7.0 hasta 9.0				±0.2	ASTM D 1287
4.3*)	Índice de refracción nD 20 °C		1.425 hasta 1.440				±0.002	DIN 51 423
4.4	Alcalinidad de reserva y curva de titración	ml, 0.1 m, HCl	se debe indicar				±0.4	ASTM D 1121
4.5	Punto de inflamación	min. °C	115				±5	EN 22719
4.6	Punto de ebullición	min. °C	160				±2	ASTM D 1120
4.7	Contenido de silicato (como SiO ₂)	mg/kg	se debe indicar		máx. 10	±30	DB-Reglamento analítico No. B004**)	
4.8	Punto de congelamiento	máx.						ASTM D 1177
4.8.1*)	Mezcla del anticongelante-agua 1:2	°C	-16				±1	
4.8.2*)	Mezcla del anticongelante-agua 1:1	°C	-35				±1	
4.9	Contenido de agua	máx. g/100 g	4				±0.5	DIN 51 777
4.10*)	Contenido de glicol etilénico	mín. g/100 g	90				±2	-
4.11	Miscibilidad y estabilidad en almacén							
4.11.1	Miscibilidad con agua dura Precipitación	máx. mg/100 ml	10				-	vea el Punto 5.1.1
4.11.2	Miscibilidad con agente corrosivo/anticongelante liberado Precipitación	máx. mg/100 ml	10				-	vea el Punto 5.1.2
4.11.3	Estabilidad en almacén a 40 °C Precipitación	máx. mg/100 ml	10				-	vea el Punto 5.2
4.12	Tendencia a espumar inmediatamente después de la prueba después de 1 minuto	máx. ml máx. ml	20 5					vea el Punto 5.3
4.13	Color		no rojo no naranja		rojo naranja			

*) modificado para productos a base de glicol propilénico

**) realizado por DC

se debe indicar

INDUSTRIA AUTOMOTRIZ – ANTICONGELANTE / REFRIGERANTE-ESPECIFICACIONES

Tabla 1.- Especificaciones.

Característica de	Especificación	Metodo prueba
Densidad relativa	1.105 a 1.150	NMX-D-249
Punto de ebullición mínimo a 760 mm de Hg	422 K(149°C)	NMX-D-67
- sin diluir		
- diluido en agua al 50% - en volumen	380 K (107° C)	NMX-D-67
Reserva alcalina 0.1N HC1 en cm3 (ml) mínima.	10	NMX-D-
241		
Punto de congelación de la - mezcla anticoagelante-refri-	abajo de 240K (-33°C)	NMX-D-
250		
gerante-agua 1:1, en volumen		



Perdida de masa en mg / cm²

máxima (laminilla)		
- hierro de fundición	0.4 (10)	NMX-D-
244		
- ,aluminio	1.0 (30)	NMX-D-
244		
- acero	0.4 (10)	NMX-D-
244		
- cobre	0. 4 (10)	NMX-D-
244		
- bronce	0.4 (10)	NMX-D-
244		
- soldadura	0.7 (20)	NMX-D-
244		
pH de la dilución al 33% o al 50% en volumen con agua descalcada .	7.5 a 8.5	NMX-D-243
Formación de espuma, en cm ³ (ml) máxima	150	NMX-D-245
Tiempo de desintegración de - espuma máximo.	5 s	NMX-D-245
A taque a pinturas y lacas	ninguno	NMX-D-248
Miscibilidad con agua común - en proporción de 1:1, 1:2 v 2:3 en volumen.	Sin opalescencia	visual

Nota 1.- El anticongelante/refrigerante debe contener básicamente:

Monoetilenglicol	85% en masa máximo
Otros glicoles	10% en masa máximo
Agua	5% en masa máxima