



International Fluids Consortium (IFC)

GEO-1™ Engine Oil Specification

1. Scope

This specification presents the IFC requirements for engine oils with viscosity grades of 0W-8, 0W-12, 0W-16, 0W-20, 0W-30, 5W-20, 5W-30, and 10W-30 used in passenger cars and light duty trucks with spark ignited internal combustion engines. Engine oils approved to this specification are GEO-1 certified by the IFC.

2. References

Only the latest approved version of the standards below is applicable unless otherwise specified.

ASTM D412	ASTM D5293	ASTM D7528
ASTM D445	ASTM D5800, proc B/D	ASTM D7563
ASTM D471	ASTM D6082	ASTM D8111
ASTM D874	ASTM D6278	ASTM D8114
ASTM D892	ASTM D6335	ASTM D8226
ASTM D2240	ASTM D6557	ASTM D8256
ASTM D2270	ASTM D6709	ASTM D8279
ASTM D2622	ASTM D6794	ASTM D8291
ASTM D4683	ASTM D6795	ASTM D8350
ASTM D4684	ASTM D6891	JASO M366
ASTM D4951	ASTM D6922	JASO M365
ASTM D5133	ASTM D7216	SAE J300

3. Standards

3.1 Fluids approved to carry the IFC GEO-1 certification mark must meet the specification test limits indicated in enclosed Tables 1, 2, and 3.

3.2 Specification test limits are considered critical unless indicated otherwise in the footnotes of Tables 1, 2, and 3.

4. Rules and Regulations

4.1. **Legal Regulations.** All IFC-certified products must satisfy applicable laws, rules, and regulations within the country of usage.

4.2. **Initial Source Approval.** No product shall receive IFC certification until a representative initial qualification sample has been approved by the Center for Quality Assurance (CQA) as meeting the requirements of this specification.

4.3. **Supply Approval.** All IFC-certified products manufactured to this specification must be equivalent in every respect to the initial qualification samples approved by CQA. There shall be no changes in formulation without prior notification and approval by CQA.

4.4. **Field Quality Audits.** IFC-certified products are subject to field quality audits. Licensees are responsible for ensuring audited sample test results meet specification requirements, or for developing a corrective action plan in the event of non-conformance.

4.5. **Safety Data Sheets.** A complete copy of the Safety Data Sheet (SDS) must accompany product submissions to CQA in compliance with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS) requirements.

5. Product Registration

5.1. **Registration.** Companies interested in receiving IFC certification for their products must follow the IFC licensing and product registration process defined in *Form IFC01 Licensing and Fluid Certification Program Policy and Procedures*. This document is available by contacting IFC@CenterForQA.com.

5.2. **Product Certification.** Licensed oil marketers may not claim products are IFC-certified or meet IFC specification requirements until formulation approval and product registration is completed by CQA.

5.3. **Contact.** The IFC Licensing and Fluid Certification Program is administered by the Center for Quality Assurance (CQA).

The Center for Quality Assurance
Attn: IFC Program
4800 James Savage Rd.
Midland, MI 48642 USA
Telephone: +1 989-496-2399
Email: IFC@CenterForQA.com

6. Release and Revisions

Issue #	Publication Date	Revision Description
1	2024 August	Initial publication

Table 1 Physical & Chemical Tests

Physical & Chemical Tests	Parameter	Test Method	Unit of Measure	Specification Limits		
				0W-8, 0W-12	0W-16	0W-20, 0W-30 5W-20, 5W-30, 10W-30
Viscosity Grade	SAE Viscosity Classification by Grade	SAE J300	SAE Grade	Meet SAE J300 Requirements	Meet SAE J300 Requirements	Meet SAE J300 Requirements
Low Temperature Startability	CCS Viscosity	ASTM D5293	mPa·s	≤ 6,200 at -35°C	≤ 6,200 at -35°C	0W-XX: ≤ 6,200 at -35°C 5W-XX: ≤ 6,600 at -30°C 10W-30: ≤ 7,000 at -25°C
Low Temperature Pumpability	MRV TP-1 Viscosity (with No Yield Stress)	ASTM D4684	mPa·s	≤ 60,000 at -40°C	≤ 60,000 at -40°C	0W-XX: ≤ 60,000 at -40°C 5W-XX: ≤ 60,000 at -35°C 10W-30: ≤ 60,000 at -30°C
Gelation Tendency	Gelation Index, Temperature Scan from -5°C to -40°C	ASTM D5133	index value	≤ 12	≤ 12	≤ 12
High Temperature High Shear Dynamic Viscosity	HTHS Viscosity at 150°C	ASTM D4683	mPa·s	0W-8: ≥ 1.7 0W-12: ≥ 2.0	≥ 2.3	XXW-20: ≥ 2.6 XXW-30: ≥ 2.9
Low Shear Kinematic Viscosity	KV at 40°C	ASTM D445	mm ² /s	Report	Report	Report
	KV at 100°C	ASTM D445	mm ² /s	0W-8: 4.0 to 6.1 0W-12: 5.0 to 7.1	6.1 to 8.2	XXW-20: 6.9 to 9.3 XXW-30: 9.3 to 12.5
Viscosity Index	Viscosity Index	ASTM D2270	index value	Report	Report	Report
Shear Stability	Low Shear Kinematic Viscosity at 100°C (ASTM D445) after 30 cycle shear	ASTM D6278	mm ² /s	0W-8: 4.0 to 6.1 0W-12: 5.0 to 7.1	≥ 5.8	NA
Volatility	Evaporative Loss after 1 hour at 250°C	ASTM D5800B/D	weight %	≤ 15.0	≤ 15.0	≤ 15.0
Sulfated Ash ¹	Ash Content ¹	ASTM D874	mass %	≤ 1.1	≤ 1.1	≤ 1.1
Elemental Analysis ¹	Phosphorus Content ¹	ASTM D4951	mass %	0.06 to 0.08	0.06 to 0.08	0.06 to 0.08
	Sulfur Content ¹	ASTM D2622 or ASTM D4951	mass %	≤ 0.5	≤ 0.5	0W-XX: ≤ 0.5 5W-XX: ≤ 0.5 10W-30: ≤ 0.6
Foaming Tendency / Foaming Stability (after 1 minute settling)	Sequence I at 24°C with Option A	ASTM D892	mL	≤ 10 / 0	≤ 10 / 0	≤ 10 / 0
	Sequence II at 94°C with Option A			≤ 50 / 0	≤ 50 / 0	≤ 50 / 0
	Sequence III at 24°C with Option A			≤ 10 / 0	≤ 10 / 0	≤ 10 / 0
	Sequence IV High Temperature at 150°C	ASTM D6082	mL	≤ 100 / 0	≤ 100 / 0	≤ 100 / 0
High Temperature Turbocharger Deposits ²	Total Deposit Weight ²	ASTM D6335	mg	NA	NA	≤ 30
Filterability & Water Tolerance	Maximum flow reduction	ASTM D6795	%	≤ 50	≤ 50	≤ 50
	Maximum flow reduction with 0.6% H ₂ O	ASTM D6794	%	≤ 50	≤ 50	≤ 50
	Maximum flow reduction with 1.0% H ₂ O			≤ 50	≤ 50	≤ 50
	Maximum flow reduction with 2.0% H ₂ O			≤ 50	≤ 50	≤ 50
	Maximum flow reduction with 3.0% H ₂ O			≤ 50	≤ 50	≤ 50
Emulsion Retention	Water Separation after 24 Hours at 0°C	ASTM D7563	No/Yes	No	No	No
	Water Separation after 24 Hours at 25°C			No	No	No
Engine Rusting	Ball Rust Test	ASTM D6557	avg. grey value	≥ 100	≥ 100	≥ 100
Homogeneity & Miscibility	Remain homogeneous and miscible	ASTM D6922	No/Yes	Yes	Yes	Yes

Table 2 Elastomer Tests

Elastomer Tests (ASTM D7216 A2)	Parameter	Test Method	Unit of Measure	Specification Limits		
				0W-8, 0W-12	0W-16	0W-20, 0W-30 5W-20, 5W-30, 10W-30
ACM-1 (Polyacrylate Rubber)	Volume	ASTM D471	%	-5 to +9	-5 to +9	-5 to +9
	Hardness	ASTM D2240	Point	-10 to +10	-10 to +10	-10 to +10
	Tensile Strength	ASTM D412	%	-40 to +40	-40 to +40	-40 to +40
HNBR-1 (Hydrogenated Nitrile Rubber)	Volume	ASTM D471	%	-5 to +10	-5 to +10	-5 to +10
	Hardness	ASTM D2240	Point	-10 to +5	-10 to +5	-10 to +5
	Tensile Strength	ASTM D412	%	-20 to +15	-20 to +15	-20 to +15
VMQ-1 (Silicone Rubber)	Volume	ASTM D471	%	-5 to +40	-5 to +40	-5 to +40
	Hardness	ASTM D2240	Point	-30 to +10	-30 to +10	-30 to +10
	Tensile Strength	ASTM D412	%	-50 to +5	-50 to +5	-50 to +5
FKM-1 (Fluorocarbon Rubber)	Volume	ASTM D471	%	-2 to +3	-2 to +3	-2 to +3
	Hardness	ASTM D2240	Point	-6 to +6	-6 to +6	-6 to +6
	Tensile Strength	ASTM D412	%	-65 to +10	-65 to +10	-65 to +10
AEM-1 (Ethylene Acrylic Rubber)	Volume	ASTM D471	%	-5 to +30	-5 to +30	-5 to +30
	Hardness	ASTM D2240	Point	-20 to +10	-20 to +10	-20 to +10
	Tensile Strength	ASTM D412	%	-30 to +30	-30 to +30	-30 to +30

Table 3 Engine Tests

Engine Tests	Parameter	Test Method	Unit of Measure	Specification Limits		
				0W-8, 0W-12	0W-16	0W-20, 0W-30 5W-20, 5W-30, 10W-30
Firing Fuel Economy Test ³	Fuel Economy Improvement ³	JASO M366	%	≥ 1.1	NA	NA
Motored Fuel Economy Test ³	Fuel Economy Improvement ³	JASO M365	%	0W-8: ≥ 2.0 0W-12: ≥ 1.7	NA	NA
Sequence VIF (Fuel Economy Improvement)	Fuel Economy Improvement (FEI) Sum	ASTM D8226	%	NA	≥ 4.1	NA
	FEI 2 after 125 hours aging			NA	≥ 1.9	NA
Sequence VIE (Fuel Economy Improvement)	Fuel Economy Improvement (FEI) Sum	ASTM D8114	%	NA	NA	XXW-20: ≥ 3.8 XXW-30: ≥ 3.1 10W-30: ≥ 2.8
	FEI 2 after 125 hours aging			NA	NA	XXW-20: ≥ 1.8 XXW-30: ≥ 1.5 10W-30: ≥ 1.3
Sequence IIIH (High Temperature Oxidation Stability / Oil Thickening)	Kinematic Viscosity Increase at 40°C (ASTM D445)	ASTM D8111	%	≤ 150	≤ 100	≤ 100
	Average Weighted Piston Deposits		merit	≥ 3.7	≥ 4.2	≥ 4.2
	Hot Stuck Rings		#	None	None	None
Sequence IIIHA ⁴ (Aged Oil Low Temperature Viscosity)	CCS at original J300 temperature (ASTM D5293)	ASTM D8111	mPa·s	Report	Report	Report
	MRV TP-1 at original J300 temperature or 5° higher per CCS value (ASTM D4684)		mPa·s	≤ 60,000 No Yield Stress	≤ 60,000 No Yield Stress	≤ 60,000 No Yield Stress
ROBO ⁴ (Aged Oil Low Temperature Viscosity)	CCS at original J300 temperature (ASTM D5293)	ASTM D7528	mPa·s	Report	Report	Report
	MRV TP-1 at original J300 temperature or 5° higher per CCS value (ASTM D4684)		mPa·s	≤ 60,000 No Yield Stress	≤ 60,000 No Yield Stress	≤ 60,000 No Yield Stress
Sequence IIIHB (Catalyst Compatibility / Phosphorus Volatility)	Phosphorus Retention	ASTM D8111	%	≥ 81	≥ 81	≥ 81
Sequence IVA ⁵ (Low Temperature Valvetrain Wear Protection)	Average Cam Wear	ASTM D6891	µm	≤ 90	NA	NA
Sequence IVB ⁵ (Low Temperature Valvetrain Wear Protection)	Average Intake Lifter Volume Loss	ASTM D8350	mm ³	≤ 2.7	≤ 2.7	≤ 2.7
	End-of-Test Iron (After Ca Adjustment)		ppm	≤ 400	≤ 400	≤ 400
Sequence VH (Low Temperature Sludge & Varnish Protection)	Average Engine Sludge	ASTM D8256	merit	≥ 7.6	≥ 7.6	≥ 7.6
	Average Rocker Cover Sludge		merit	≥ 7.7	≥ 7.7	≥ 7.7
	Average Engine Varnish		merit	≥ 8.6	≥ 8.6	≥ 8.6
	Average Piston Skirt Varnish		merit	≥ 7.6	≥ 7.6	≥ 7.6
	Oil Screen Sludge		%	Report	Report	Report
	Oil Screen Debris		%	Report	Report	Report
	Hot Stuck Compression Rings		#	None	None	None
	Cold Stuck Rings		#	Report	Report	Report
	Oil Ring Clogging		%	Report	Report	Report

Table 3 Engine Tests (cont.)

Sequence VIII (Bearing Corrosion and Shear Stability)	Bearing Weight Loss	ASTM D6709	mg	NA	NA	≤ 26
	Low Shear Kinematic Viscosity at 100°C (ASTM D445) 10 hour stripped		mm ² /s	NA	NA	Stay in grade
Sequence IX (Low Speed Pre-ignition Prevention)	Average number of events for 4 iterations	ASTM D8291	#	NA	≤ 5	≤ 5
	Number of events per iteration		#	NA	≤ 8	≤ 8
Sequence X (Chain Wear Protection)	Chain Stretch Increase	ASTM D8279	%	≤ 0.085	≤ 0.085	≤ 0.085

Footnotes

- ¹ Non-Critical specification limit. Test method precision will be applied when determining acceptability.
- ² TEOST 33C (ASTM D6335) not required for 0W-20.
- ³ Must pass either Firing Fuel Economy Test (JASO M366) or Motored Fuel Economy Test (JASO M365).
- ⁴ Must pass either Sequence IIIHA (ASTM D8111) or ROBO (ASTM D7528).
- ⁵ Must pass either Sequence IVA (ASTM D6891) or Sequence IVB (ASTM D8350).