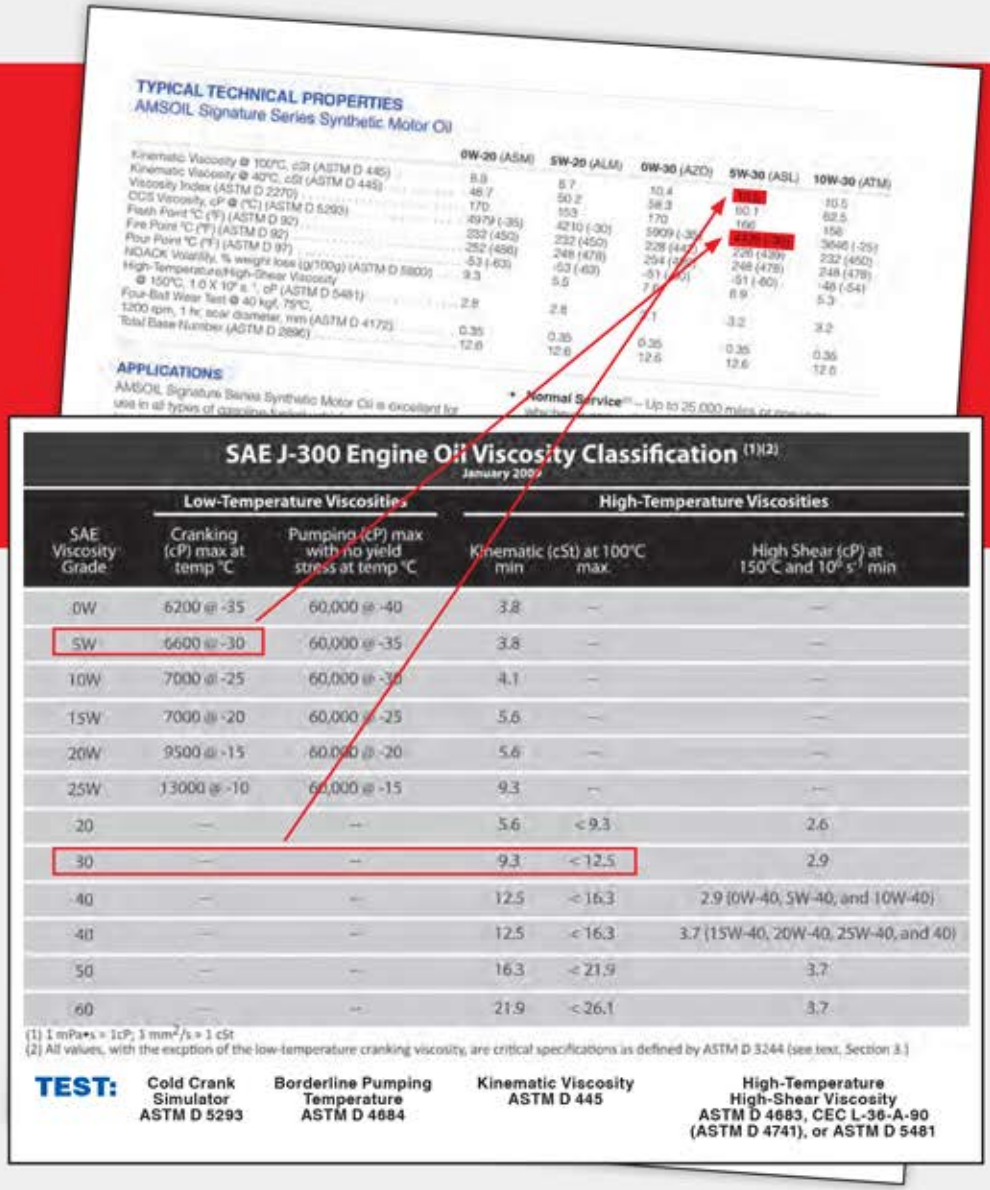
Reading a Product Data Bulletin: **Viscosity**



TYPICAL TECHNICAL PROPERTIES
AMSOIL Signature Series Synthetic Motor Oil

	0W-20 (ASM)	5W-20 (ALM)	0W-30 (AZO)	5W-30 (ASL)	10W-30 (ATM)
Kinematic Viscosity @ 100°C, cSt (ASTM D 445)	8.8	8.7	10.4		10.5
Kinematic Viscosity @ 40°C, cSt (ASTM D 445)	48.7	50.2	58.3	60.1	62.5
Viscosity Index (ASTM D 2270)	170	153	170	166	156
CCS Viscosity, cP @ (°C) (ASTM D 5293)	4979 (-35)	4210 (-30)	5909 (-35)		3646 (-25)
Flash Point °C (°F) (ASTM D 92)	232 (450)	232 (450)	228 (442)	226 (439)	232 (450)
Fire Point °C (°F) (ASTM D 92)	252 (486)	248 (478)	254 (489)	248 (478)	248 (478)
Pour Point °C (°F) (ASTM D 97)	-53 (-63)	-53 (-63)	-51 (-60)	-51 (-60)	-48 (-54)
NOACK Volatility, % weight loss (g/100g) (ASTM D 5800) @ 150°C, 1.0 X 10^6 s^{-1}, cP (ASTM D 5481)	9.3	5.5	7.0	8.9	5.3
High-Temperature/High-Shear Viscosity	2.8	2.8	3.1	3.2	3.2
Four-Ball Wear Test @ 40 kgf, 75°C, 1200 rpm, 1 hr, scar diameter, mm (ASTM D 4172)	0.35	0.35	0.35	0.35	0.35
Total Base Number (ASTM D 2896)	12.6	12.6	12.6	12.6	12.6

APPLICATIONS

AMSOIL Signature Series Synthetic Motor Oil is excellent for use in all types of gasoline

* Normal Service[SM] – Up to 25,000 miles or one

SAE J-300 Engine Oil Viscosity Classification [1][2]
January 2009

SAE Viscosity Grade	Low-Temperature Viscosities: Cranking (cP) max at temp °C	Low-Temperature Viscosities: Pumping (cP) max with no yield stress at temp °C	High-Temperature Viscosities: Kinematic (cSt) at 100°C min	High-Temperature Viscosities: Kinematic (cSt) at 100°C max	High-Temperature Viscosities: High Shear (cP) at 150°C and 10^6 s^{-1} min
0W	6200 @ -35	60,000 @ -40	3.8	—	—
5W	6600 @ -30	60,000 @ -35	3.8	—	—
10W	7000 @ -25	60,000 @ -30	4.1	—	—
15W	7000 @ -20	60,000 @ -25	5.6	—	—
20W	9500 @ -15	60,000 @ -20	5.6	—	—
25W	13000 @ -10	60,000 @ -15	9.3	—	—
20	—	—	5.6	<9.3	2.6
30	—	—	9.3	<12.5	2.9
40	—	—	12.5	<16.3	2.9 (0W-40, 5W-40, and 10W-40)
40	—	—	12.5	<16.3	3.7 (15W-40, 20W-40, 25W-40, and 40)
50	—	—	16.3	<21.9	3.7
60	—	—	21.9	<26.1	3.7

(1) 1 mPa•s = 1cP; 1 mm^2/s = 1 cSt
(2) All values, with the exception of the low-temperature cranking viscosity, are critical specifications as defined by ASTM D 3244 (see text, Section 3.)

TEST: Cold Crank Simulator ASTM D 5293 | Borderline Pumping Temperature ASTM D 4684 | Kinematic Viscosity ASTM D 445 | High-Temperature High-Shear Viscosity ASTM D 4683, CEC L-36-A-90 (ASTM D 4741), or ASTM D 5481

A lubricant's viscosity and how it changes under different temperatures and operating conditions is one of the most important properties determining performance and protection. Accordingly, Kinematic viscosity is generally the first property listed on an AMSOIL product data bulletin.

Kinematic viscosity, measured using ASTM D 445 methodology, determines an SAE oil's high-temperature viscosity grade (for example, the "30" in 5W-30), while its Cold Crank Simulator (CCS) viscosity, measured using ASTM D 5293 methodology, determines its low-temperature grade (the "5W" in 5W-30).

Why Two Different Test Methods?

Viscosity can be viewed in two ways. Kinematic viscosity is defined by the lubricant's resistance to flow and shear due to gravity. To illustrate, imagine pouring two containers, one filled with water and the other with honey. The rate at which each fluid flows is governed by its Kinematic viscosity. Since the Kinematic viscosity of water is lower, it flows faster.

Dynamic (or absolute) viscosity, measured by the CCS test, is defined as the lubricant's resistance to flow as indicated by its measured resistance, best thought of as the amount of energy required to move an object, such as a metal rod, through the fluid. It takes less energy to stir water compared to honey because the dynamic/absolute viscosity of water is lower.

Each test method is designed to replicate a specific operating condition, allowing formulators and end-users to determine the lubricant's characteristics when in use. The CCS viscosity test evaluates the amount of energy it takes to start an engine at a specified cold temperature; the lower the viscosity grade, the lower the temperature at which the test is performed. The test assigns a value in centipoise (cP), used to determine the viscosity grade. Using Signature Series 5W-30 as an example, its viscosity at -30°C (-22°F) can be no greater than 6600 cP to receive a 5W grade (see chart). Lower values reflect lighter-viscosity oils.

The Kinematic viscosity test attempts to simulate viscosity at normal operating conditions for a passenger car/light truck. The test is performed at 100°C (212°F) and/or 40°C (104°F), depending on the grading system being used. The value at 100°C is used to determine the SAE viscosity grade. The test measures how long the oil takes to completely flow from a viscometer device heated to 100°C. The elapsed time in seconds is converted to centistokes (cSt). Lower values reflect lighter-viscosity oils.

Viscosity Index

The viscosity index (VI) of a lubricating fluid refers to how much the viscosity of the fluid changes due to temperature. A high VI indicates the fluid undergoes little viscosity change due to temperature fluctuations, while a low VI indicates a relatively large viscosity change. The Viscosity Index Test (ASTM D 2270) is based on the Kinematic viscosity of the fluid at 40°C (104°F) and 100°C (212°F). A fluid whose viscosity does not change much between these two temperatures will have a higher VI than a fluid whose viscosity change is greater. Viscosity index numbers above 95 are considered high. Fluids with a high VI provide more protection to critical components over a wide range of temperatures by maintaining fluid thickness and the necessary fluid barrier between parts. ■