

# VISCOSITY GRADES – ISO, ASTM, AGMA

## Viscosity Ranges for ISO & ASTM Systems

ISO Viscosity Grade	Mid-Point Kinematic Viscosity	Kinematic Viscosity Limits cSt at 40°C (104°F)		ASTM, Saybolt Viscosity Number	Saybolt Viscosity SUS 100°F (37.8°C)	
		Min.	Max.		Min.	Max.
2	2.2	1.98	2.42	32	34.0	35.5
3	3.2	2.88	3.52	36	36.5	38.2
5	4.6	4.14	5.06	40	39.9	42.7
7	6.8	6.12	7.48	50	45.7	50.3
10	10	9.00	11.0	60	55.5	62.8
15	15	13.5	16.5	75	72	83
22	22	19.8	24.2	105	96	115
32	32	28.8	35.2	150	135	164
46	46	41.4	50.6	215	191	234
68	68	61.2	74.8	315	280	345
100	100	90.0	110	465	410	500
150	150	135	165	700	615	750
220	220	198	242	1000	900	1110
320	320	288	352	1500	1310	1600
460	460	414	506	2150	1880	2300
680	680	612	748	3150	2800	3400
1000	1000	900	1100	4650	4100	5000
1500	1500	1350	1650	7000	6100	7500

## Viscosity Ranges for AGMA Lubricants

Rust- and Oxidation-Inhibited Gear Oils AGMA Lubricant No.	Viscosity range <sup>1)</sup> mm <sup>2</sup> /s (cSt) at 40°C	Equivalent ISO grade <sup>1)</sup>	Extreme Pressure gear lubricants <sup>2)</sup> AGMA Lubricant No.	Synthetic gear oils <sup>3)</sup> AGMA Lubricant No.
0	28.8 to 35.2	32		0 S
1	41.4 to 50.6	46		1 S
2	61.2 to 74.8	68	2 EP	2 S
3	90 to 110	100	3 EP	3 S
4	135 to 165	150	4 EP	4 S
5	198 to 242	220	5 EP	5 S
6	288 to 352	320	6 EP	6 S
7, 7 Comp <sup>4)</sup>	414 to 506	460	7 EP	7 S
8, 8 Comp <sup>4)</sup>	612 to 748	680	8 EP	8 S
8A Comp <sup>4)</sup>	900 to 1100	1000	8A EP	-
9	1350 to 1650	1500	9 EP	9 S
10	2880 to 3520	-	10 EP	10 S
11	4140 to 5060	-	11 EP	11 S
12	6120 to 7480	-	12 EP	12 S
13	190 to 220 cSt at 100°C (212°F) <sup>5)</sup>	-	13 EP	13 S
<b>Residual compounds<sup>6)</sup> AGMA Lubricant No.</b>	<b>Viscosity ranges<sup>5)</sup> cSt at 100°C (212°F)</b>			
14R	428.5 to 857.0			
15R	857.0 to 1714.0			

**Notes:**

<sup>1)</sup>per ISO 3448, *Industrial Liquid Lubricants – ISO Viscosity Classification*, Also ASTM D 2422 and British Standards Institution B.S. 4231.

<sup>2)</sup>Extreme pressure lubricants should be used only when recommended by the gear manufacturer.

<sup>3)</sup>Synthetic gear oils 9S – 13S are available but not yet in wide use.

<sup>4)</sup>Oils marked Comp are compounded with 3% to 10% fatty or synthetic fatty oils.

<sup>5)</sup>Viscosities of AGMA Lubricant Number 13 and above are specified at 100°C (210°F) as measurement of viscosities of these heavy lubricants at 40°C (100°F) would not be practical.

<sup>6)</sup>Residual compounds-diluent type, commonly known as solvent cutbacks, are heavy oils containing a volatile, non-flammable diluent for ease of application. The diluent evaporates leaving a thick film of lubricant on the gear teeth. Viscosities listed are for the base compound without diluent.

**CAUTION:** These lubricants may require special handling and storage procedures. Diluent can be toxic or irritating to the skin. Do not use these lubricants without proper ventilation. Consult lubricant supplier's instructions.

Courtesy of American Gear Manufacturer's Assoc.

# VISCOSITY GRADES – SAE

## SAE VISCOSITY GRADES FOR ENGINE OILS<sup>1,2</sup> (SAE J-300 APR 97)

SAE Viscosity Grade	Low-Temperature (°C) Cranking Viscosity, <sup>3</sup> cP Max.	Low-Temperature (°C) Pumping Viscosity, <sup>4</sup> cP Max. With No Yield Stress	Low-Shear-Rate Kinematic Viscosity <sup>5</sup> (cSt) at 100°C Min.	Low-Shear-Rate Kinematic Viscosity <sup>5</sup> (cSt) at 100°C Max.	High-Shear-Rate Viscosity <sup>6</sup> (cP) at 150°C Min.
0W	3250 at -30	60,000 at -40	3.8	—	—
5W	3500 at -25	60,000 at -35	3.8	—	—
10W	3500 at -20	60,000 at -30	4.1	—	—
15W	3500 at -15	60,000 at -25	5.6	—	—
20W	4500 at -10	60,000 at -20	5.6	—	—
25W	6000 at -5	60,000 at -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 grades)
40	—	—	12.5	<16.3	3.7 (15W-40, 20W-40, 25W-40, 40 grades)
50	—	—	16.3	<21.9	3.7
60	—	—	21.9	<26.1	3.7

<sup>1</sup>Note: 1 cP = 1 mPa·s; 1 cSt = 1 mm<sup>2</sup>/s

<sup>2</sup>All values are critical specifications as defined by ASTM D-3244 (see text, Section 3).

<sup>3</sup>ASTM D-5293.

<sup>4</sup>ASTM D-4684 (see also Appendix B and text, Section 4.1). Note that the presence of any yield stress detectable by this method constitutes a failure regardless of viscosity.

<sup>5</sup>ASTM D-445.

<sup>6</sup>ASTM D-4683, CEC L-38-A-90 (ASTM D-4741), or ASTM D 5481.

## SAE AXLE AND MANUAL TRANSMISSION LUBRICANT VISCOSITY CLASSIFICATION (SAE J-306 OCT 91)

SAE Viscosity Grade	Maximum Temperature for Viscosity of 150,000 cP <sup>1</sup> °C	Viscosity at 100°C cSt <sup>2</sup> Minimum	Viscosity at 100°C cSt <sup>2</sup> Maximum
70W	-55 <sup>3</sup>	4.1	—
75W	-40	4.1	—
80W	-28	7.0	—
85W	-12	11.0	—
90	—	13.5	<24.0
140	—	24.0	<41.0
250	—	41.0	—

<sup>1</sup>Centipoise (cP) is the customary absolute viscosity unit and is numerically equal to the corresponding SI unit of millipascal-second (mPa·s).

<sup>2</sup>Centistokes (cSt) is the customary kinematic viscosity unit and is numerically equal to the corresponding SI unit of square millimeter per second (mm<sup>2</sup>/s).

<sup>3</sup>The precision of ASTM Method D-2983 has not been established for determinations made at temperatures below -40°C; consequently, this fact should be realized in any producer-consumer relationship. It is expected that ASTM will shortly undertake work in the range down to -53°C for ASTM D-2983.