

6.6 Lubricating oil

Requisite for lubricating oil are:

1) **Coefficient of viscosity**, 2) **Wear resistance**, 3) **Coolness** and 4) **Stability**. Selection of proper lubricating oil from grades and usage of the gears are recommended.

(1) The Coefficient of viscosity of lubricating oil for gear

Table 9 shows Coefficient of viscosity and grades of industrial gear oil (JIS K 2219).

Table 9. Grades of Industrial gear oil and Coefficient of viscosity

Grades			Kinematic viscosity cSt {mm ² /s} (40°C)	Usage
For industrial use	Grade 1	ISO VG 32	28.8 < cSt ≤ 35.2	Used for sealed gearbox for general industries with light load.
		ISO VG 46	41.4 < cSt ≤ 50.6	
		ISO VG 68	61.2 < cSt ≤ 74.8	
		ISO VG100	90.0 < cSt ≤ 110	
		ISO VG150	135 < cSt ≤ 165	
		ISO VG220	198 < cSt ≤ 242	
		ISO VG320	288 < cSt ≤ 352	
		ISO VG460	414 < cSt ≤ 506	
	Grade 2	ISO VG 68	61.2 < cSt ≤ 74.8	Used for sealed gearbox for general and rolling mill industries with medium or heavy load.
		ISO VG100	90.0 < cSt ≤ 110	
		ISO VG150	135 < cSt ≤ 165	
		ISO VG220	198 < cSt ≤ 242	
		ISO VG320	288 < cSt ≤ 352	
		ISO VG460	414 < cSt ≤ 506	
		ISO VG680	612 < cSt ≤ 748	

(2) Coefficient of viscosity for gear lubricating oil from AGMA (American Gear Manufacturer Association)

Refer to Table 10. Shows the Coefficient of viscosity of lubricating oil for the gear from AGMA (American Gear Manufacturer Association).

Table 10. Lubricating gear oil No. and Coefficient of viscosity from AGMA

Lubricating oil number R&O ⁽¹⁾ from AGMA	Kinematic viscosity cSt {mm ² /s} (40°C)	ISO Coefficient of Viscosity grade	Lubricating oil No. EP ⁽²⁾ from AGMA
1	41.4 < cSt ≤ 50.6	46	
2	61.2 < cSt ≤ 74.8	68	2 EP
3	90 < cSt ≤ 110	100	3 EP
4	135 < cSt ≤ 165	150	4 EP
5	198 < cSt ≤ 242	220	5 EP
6	288 < cSt ≤ 352	320	6 EP
7 Comp ⁽³⁾	414 < cSt ≤ 506	460	7 EP
8 Comp	612 < cSt ≤ 748	680	8 EP
8A Comp	900 < cSt ≤ 1,100	1000	8A EP

Note (1) R&O is an abbreviation for Rust and Oxidation Inhibited Gear Oils.

(2) EP is an abbreviation for Extreme Pressure Gear Lubricants.

(3) Comp: 3 % - 10 % of oils and fats or synthetic oils and fats are mixed.

(3) Selection of lubricating oil {AGMA 250.04 (1981)}

The General guide for selection of lubricating gear oil from AGMA 250.04 (1981-9) for

Sealed gearbox. Table 11 is for Cylindrical and Bevel gears. Table 12 is for Worm gear pair.

Table 11. Recommended lubricating gear oil for sealed gearbox from AGMA (for Cylindrical and Bevel gears).

Types of train and axes condition	Capacity of gearbox		Surrounding temperature °C	
			-10 ~ 10	10 ~ 50
Parallel axis Reduction speed with single pair	Centre distance	Below 200mm	2-3	3-4
		200 mm - 500 mm	2-3	4-5
		Above 500mm	2-3	4-5
Parallel axis Speed reduction with 2 pairs		Below 200mm	2-3	3-4
		Above 200mm	3-4	4-5
Parallel axis Speed reduction with 3 pairs		Below 200mm	2-3	3-4
		200 mm - 500 mm	3-4	4-5
		Above 500mm	4-5	5-6
Planetary gearbox		Outer dimension of gearbox		
	Below 400 mm		2-3	3-4
	Above 400 mm		3-4	4-5
Straight and Spiral bevel gearboxes	Cone distance			
	Below 300 mm		2-3	4-5
	Above 300 mm		3-4	5-6
Geared motor			2-3	4-5
Gearbox for High speed			1	2

Table 12. Recommended lubricating gear oil for sealed gearbox from AGMA (Worm gear pair)

Types of Worm gear pair and Centre distance mm	Revolving velocity of Worm gear bellow (min ⁻¹)	Surrounding temperature °C		Revolving velocity of Worm gear exceeds (min ⁻¹)	Surrounding temperature °C	
		-10 ~ 10	10 ~ 50		-10 ~ 10	10 ~ 50
Cylindrical worm gear pair						
Below 150 mm	700	7 Comp, 7EP	8 Comp, 8EP	700	7 Comp, 7EP	8 Comp, 8EP
150mm - 300mm	450	"	"	450	"	7 Comp, 7EP
300mm - 450mm	300	"	"	300	"	"
450mm - 600mm	250	"	"	250	"	"
Above 600 mm	200	"	"	200	"	"
Enveloping worm gear pair						
Below 150 mm	700	8 Comp	8A Comp	700	8 Comp	8 Comp
150mm - 300mm	450	"	"	450	"	"
300mm - 450mm	300	"	"	300	"	"
450mm - 600mm	250	"	"	250	"	"
Above 600 mm	200	"	"	200	"	"

Industrial gear oil (For Extreme pressure type)

ISO viscosity grade ISO VG cst (40°C)	COSMO	NISSEKI (Shin Nippon Oil)	IDEMITSU	mitsubishi	JOMO	SHOWA SHELL	ESSO	MOBIL
Below 68	COSMO Gear SE68	BON NOCK AX68 BON NOCK M68	Daphne Super Gear Oil 68 Daphne Super Gear Oil LW 68 Daphne Alpha Gear 68	DIAMOND SUPER GEARLUBE SP 68	REDUCTUS 68 ES GEAR G68	OMALA OIL 68 G-C OIL 68SE	SPARTAN EP68	MOBILGEAR 626
100	COSMO Gear SE100 COSMO Gear MO68	BON NOCK AX100 BON NOCK M100	Daphne Super Gear Oil 100 Daphne Super Gear Oil LW 100 Daphne Alpha Gear 100	DIAMOND SUPER GEARLUBE SP 100	REDUCTUS 100 ES GEAR G100	OMALA OIL 100 G-C OIL 100SE	SPARTAN EP100	MOBILGEAR 627
150	COSMO Gear SE150 COSMO Gear MO150	BON NOCK AX150 BON NOCK M150	Daphne Super Gear Oil 150 Daphne Super Gear Oil LW 150 Daphne Alpha Gear 150	DIAMOND SUPER GEARLUBE SP 150	REDUCTUS 150 ES GEAR G150	OMALA OIL 150 G-C OIL 150SE	SPARTAN EP150	MOBILGEAR 629 MOBIL GLYGOYLE 22
220	COSMO Gear SE220 COSMO Gear MO220	BON NOCK AX220 BON NOCK M220	Daphne Super Gear Oil 220 Daphne Super Gear Oil LW 220 Daphne Alpha Gear 220	DIAMOND SUPER GEARLUBE SP 220	REDUCTUS 220 ES GEAR G220	OMALA OIL 220 G-C OIL 220SE	SPARTAN EP220	MOBILGEAR 630 SHC220 MOBIL GLYGOYLE 30
320	COSMO Gear SE320 COSMO Gear MO320	BON NOCK AX320 BON NOCK M320	Daphne Super Gear Oil 320 Daphne Alpha Gear 220	DIAMOND SUPER GEARLUBE SP 320	REDUCTUS 320 ES GEAR G320	OMALA OIL 320 G-C OIL 320SE	SPARTAN EP320	MOBILGEAR SHC320
460	COSMO Gear SE460	BON NOCK AX460 BON NOCK M460	Daphne Super Gear Oil 460	DIAMOND SUPER GEARLUBE SP 460	REDUCTUS 460 ES GEAR G460	OMALA OIL 460 G-C OIL 460SE	SPARTAN EP460	MOBILGEAR SHC460 MOBIL GLYGOYLE 80
600	COSMO Gear SE680	BON NOCK AX680 BON NOCK M680	Daphne Super Gear Oil 680	DIAMOND SUPER GEARLUBE SP 680	REDUCTUS 680 ES GEAR G680	OMALA OIL 680	SPARTAN EP680	MOBILGEAR 636 MOBILGEAR SHC680
Above 1000	COSMO Gear SE4600	BON NOCK M1800 BON NOCK M3800	Daphne Super Gear Oil 1500 Daphne Super Gear Oil 4600	DIAMOND SUPER GEARLUBE SP 1800				

Industrial gear oil (For Worm gear)

ISO viscosity grade ISO VG cst (40°C)	COSMO	NISSEKI (Shin Nippon Oil)	IDEMITSU	mitsubishi	JOMO	SHOWA SHELL	ESSO	MOBIL
220	COSMO Gear W220	BON NOCK EX220 BON NOCK M220	Super Gear Oil 220	DIAMOND WORM GEARLUBE 220 (N)	REDUCTUS 220	TIVELA OIL SB220EP VITREA OIL220	SPARTAN EP220	MOBILGEAR 630
320	COSMO Gear W320	BON NOCK EX320 BON NOCK M320	Super Gear Oil 320	DIAMOND WORM GEARLUBE 380 (N)	REDUCTUS 320	VITREA OIL320	SPARTAN EP320	MOBILGEAR 632
460	COSMO Gear W460	BON NOCK EX460 BON NOCK M460	Daphne Worm Gear Oil 460 Super Gear Oil 460		REDUCTUS 460	TIVELA OIL SD460EP VITREA OIL460	SPARTAN EP460 CYLESSO TK460	MOBILGEAR 600W MOBILGEAR 634 SUPER CYLINDER OIL