



# Lubrication

## OBJECT OF LUBRICATION

The lubrication method and the lubricant have a direct effect on the bearing life; the most suitable lubrication must therefore be selected for each application. Effects of lubrication are described as follows:

### (1) DECREASE OF FRICTION AND ABRASION

It decreases rolling friction between the raceway and the rolling elements, sliding friction between rolling element and cage and sliding friction of guide surface between the cage and the bearing ring.

### (2) REDUCTION OF HEAT GENERATION

It dissipates heat generated inside the bearing as well as heat conducted from the outside thus preventing overheating of the bearing and deterioration of the lubricant.

### (3) PROTECTION FROM CORROSION AND CONTAMINANTS

It prevents corrosion of rolling elements, bearing rings and cages and also prevents the ingress of contaminants and moisture into the bearing.

## REQUIRED CHARACTERISTICS OF THE LUBRICANT

- (1) LOW FRICTION AND ABRASION
- (2) HIGH STABILITY AGAINST HEAT, GOOD THERMAL CONDUCTIVITY
- (3) STRONG OIL FILM
- (4) NON-CORROSIVE
- (5) PROVIDE A GOOD BARRIER AGAINST DUST AND MOISTURE
- (6) MAINTAIN A STABLE VISCOSITY

## STANDARD LUBRICANT

Lubricant	Brand	EZO CODE	Manufacturer	MIL STANDARD	Operating Temperature(C)	specific gravity
STD.GREASE	MULTEMP SRL	SRL	Kyodo Yushi		-40~+150	0.93
	ALVANIA 2S	AV2	Shell OIL Co.		-25~+120	0.92
STD. OIL	AERO SHELL FLUID 12	AF2	Shell OIL Co.	MIL-PRF-6085D	-50~+205	0.93

## LUBRICATION METHOD

There are two types of lubricant: oil or grease. It is important to select the correct lubricant and lubrication method for each application and its conditions.

### ●LUBRICATING OIL AND GREASE

	LUBRICATING OIL	LUBRICATING GREASE
ROTATING SPEED	LOW · MEDIUM · HIGH SPEED	LOW · MEDIUM SPEED
LUBRICANT EFFICIENCY	EXCELLENT	GOOD
COOLING EFFECT	GOOD	NONE
TORQUE	COMPARATIVELY LOW	COMPARATIVELY HIGH
LUBRICANT LIFE	LONG	COMPARATIVELY SHORT
LUBRICANT REPLACEMENT	EASY	DIFFICULT
LUBRICANT LEAKAGE	SHOULD NOT BE USED WHERE OIL LEAKAGE IS UNACCEPTABLE	LITTLE GREASE LEAKAGE
IMPURITIES FILTRATION	EASY	DIFFICULT
SEALING EQUIPMENT	COMPLEX	SIMPLE

### ●GREASE FILLING VOLUME

SYMBOL	FILLING VOLUME(%)	OPERATING CONDITION	
		SPEED	LOAD
M	70±10	LOW	HEAVY
S	50±10	LOW	MEDIUM
G	40±10	MEDIUM	MEDIUM
L	30±10	MEDIUM	MEDIUM
Q	25±5	MEDIUM	MEDIUM
K	20±5	HIGH	LIGHT
X	10±5	HIGH	LIGHT

NOTE: LIGHT LOAD (  $\leq 0.06C_r$  )  
 STANDARD LOAD (  $\leq 0.12C_r$  )

●CRITERIA FOR LUBRICATING OIL SELECTION

OPERATING TEMPERATURE OF BEARING (°C)	dn	ISO VISCOSITY GRADE OF LUBRICATING OIL(VG)	
		MEDIUM LOAD	HEAVY LOAD/SHOCK LOAD
-30~0	UP TO PERMISSIBLE ROTATING SPEED	15,22,32	32,46
0~+60	UP TO 15000	32,46,68	100
	15000~80000	32,46	68
	80000~150000	22,32	32
	150000~500000	10	22,32
+60~+100	UP TO 15000	150	220
	15000~80000	100	150
	80000~150000	68	100,150
	150000~500000	32	68
+100~+150	UP TO PERMISSIBLE ROTATING SPEED	320	

NOTE: 1. IF HEAVY LOADS OCCUR AT LOW SPEEDS, A HIGHER VISCOSITY LUBRICATING OIL SHOULD BE USED.  
 2. THIS TABLE IS FOR OIL BATH LUBRICATION SYSTEM AND RECIRCULATING OIL SYSTEMS.  
 3. dn = BEARING BORE DIAMETER d(mm) X ROTATING SPEED n(r.p.m)

●COMMON OIL BRANDS AND EFFICIENCY

Manufacturer	Brand	Code	Lubricant Base	Flash Point (°C)	Viscosity (m <sup>2</sup> /s)	Operating Temperature (°C)	Approved Standard
Shell Oil Co.	Aero Shell Fluid 31	AF1	Diester	237	14.33 (40°C)	-40~+204	MIL-PRF-83282D
	Aero Shell Fluid 12	AF2	Diester	220	8.9 (54.4°C)	-50~+205	MIL-PRF-6085D
	Aero Shell Fluid 3	AF3	Mineral	155	10.0 (38°C)	-47~+115	MIL-PRF-7870C
Anderson Oil Co.	Windsor Lube L-245X	WL2	Diester	215	14.0 (38°C)	-55~+175	MIL-PRF-6085D
Dupont, E.I.	Krytox 143AZ	KAZ	Fluorinated	-	12.4 (40°C)	-54~+149	-
Kluber Lub.	Isoflex PDB38	PDB	Diester	210	12.0 (40°C)	-55~+100	-
Anderol Co.	Anderol 402	A42	Diester	227	12.4 (40°C)	-54~+177	MIL-PRF-6085D
Nippon Oil Corp.	Antitrust P2100	002	Mineral	166	13.0 (40°C)	-20~+115	VV-L-800c

●COMMON GREASE BRANDS AND EFFICIENCY

Manufacturer	Brand	Code	Thickening Agent	Lubricant Base	Drop Point (°C)	Cone Penetration: Worked (80 strokes)	Operating Temperature (°C)	Approved Standard
Shell Oil Co.	Alvania 1S	AV1	Lithium	Mineral	182	323	-35~+120	-
	Alvania 2S	AV2	Lithium	Mineral	185	275	-25~+120	-
	Alvania 3S	AV3	Lithium	Mineral	185	242	-20~+135	-
	Alvania RLQ	RLQ	Lithium	Mineral	195	275	-30~+120	-
	Aero Shell NO.7	AG7	Microgel	Diester	260	296	-73~+149	MIL-PRF-83282D
	Aero Shell NO.14	AG4	Calcium	Diester	148	273	-54~+93	MIL-G-25537C
	Aero Shell NO.15	AG5	Fluorotelomer	Silicone	260	290	-73~+232	MIL-G-25013E
	Aero Shell NO.16	AG6	Microgel	Polyester, Mineral	260	308	-54~+204	MIL-G-25760A
	Aero Shell NO.17	AG8	Microgel	Diester	260	295	-73~+149	MIL-G-21164D
	Aero Shell NO.22	AG2	Microgel	Synthetic Hydrocarbon	260	275	-65~+204	MIL-PRF-81322F
	Alvania EP2	AE2	Lithium	Mineral	184	284	-20~+110	-
	Retinax CL2	RXA	Lithium	Mineral	181	284	-15~+130	-
	Shell Cassida HDS2	HS2	Aluminum Complex	PAO	240	280	-30~+120	NSF(USDA)H1
	Shell Cassida RLS2	RL2	Aluminum Complex	PAO	240	275	-35~+120	NSF(USDA)H1
	Kyodo Yushi	Multemp PS NO.2	PS2	Lithium	Diester, Mineral	190	275	-55~+130
Multemp SRL		SRL	Lithium	Diester, Mineral	191	245	-40~+150	-
Kluber Lub.	Staburags NBU12	NB2	Barium	Mineral	220	270	-35~+150	NSF(USDA)H2
	Staburags NBU12/300KP	NB3	Barium	Mineral	220	300	-35~+150	-
	Staburags NBU8 EP	NB8	Barium	Mineral	220	280	-35~+150	NSF(USDA)H2
	Isoflex NBU15	NB5	Barium	Diester, Mineral	200	280	-40~+130	MIL-G-25760A
	Isoflex TOPAS NB52	B52	Barium	Synthetic Hydrocarbon	220	280	-60~+160	-
	Isoflex Alltime SL2	AS2	Lithium	Diester	180	280	-70~+150	-
	Isoflex LDS18 Special A	L8A	Lithium	Diester	190	280	-60~+130	MIL-G-23827B
	Isoflex Super LDS18	SL8	Lithium	Diester	190	280	-60~+130	MIL-G-7118A
	Isoflex PDB38 CX2000	PDC	Lithium	Synthetic	-	-	-70~+120	-
	Barielta IEL	IEL	PTFE	Fluorinated	-	280	-35~+220	-
	Barielta IEL/V	IEV	PTFE	Fluorinated	-	280	-65~+200	-
	Barielta IMI	IMI	PTFE	Fluorinated	-	280	-50~+220	-
	Barielta IMI/V	IMV	PTFE	Fluorinated	-	280	-50~+220	-
Barielta L55/2	L55	PTFE	Fluorinated	-	280	-35~+260	NSF(USDA)H2	
Barielta IS	BS1	PTFE	Fluorinated	-	280	-35~+260	-	
Dow Corning Co.	Molykote 33M	M3M	Lithium	Silicone	200	260	-70~+180	-
	Molykote 33L	M3L	Lithium	Silicone	200	300	-70~+180	-
	Molykote 44M	M4M	Lithium	Silicone	210	260	-40~+200	-
	Molykote BR2 Plus	BR2	Lithium	Mineral	180	280	-30~+150	-
	Molykote FS3451	F35	PTFE	Fluorinated	232	310	-40~+200	-
Dupont, E.I.	Krytox 240AC	K24	PFPE	Fluorinated	-	282	-35~+288	MIL-G-27617
	Krytox 240AZ	K2Z	PFPE	Fluorinated	-	285	-54~+149	MIL-G-27617
Esso Standard	Beacon325	B32	Lithium	Diester	190	274	-60~+120	-
	Templex N3	TX3	Lithium Complex	Mineral	260	230	-30~+160	-
Mobil Oil Co.	Mobil NO.28	MG2	Bentnrite	Synthetic Hydrocarbon	262	280	-62~+204	MIL-G-81322E
	Mobilux EP2	MGE	Lithium	Mineral	202	280	-30~+130	-
Caltex	Chevron RPM Grease SRI-2	SRI2	Lithium	Mineral	243	280	-30~+175	-
Nippon Grease Co.	Nig Ace W	NAW	Diurea	Synthetic	268	256	-30~+150	-
Shinetsu Chemical Co.	Silcolube G40M	G40	Lithium	Silicone	210	260	-30~+200	MIL-L-15719A