

conventional types of lubrication cannot be used.

### 1.9 Lubrication and Surface Finishes

Rolling contact bearings have to be lubricated in addition to having exceedingly good surface finishes.

The life of a rolling element bearing depends to a large extent on the smoothness of the contacting surfaces – the balls, rollers, and races. Typical surface roughness dimensions for production bearings are as follows:

Balls	2– 3 $\mu\text{in rms}$
Ball races	6–10 $\mu\text{in rms}$
Rollers	8–12 $\mu\text{in rms}$
Roller races	10–20 $\mu\text{in rms}$

These are in terms of microinches or millionths of an inch, usually written  $\mu\text{in}$ .

The unit of measurement of the surface roughness is rms which stands for “root-mean-square height”. This value is obtained by drawing a diamond point instrument over the surface with a magnified readout. These measurements are taken at equidistant points on the profile, squaring these values, adding them, dividing the sum by the number of readings taken and taking the square root of this average.

There are calibrated specimens available and surface roughness can be established by comparison to the specimen.

Surface finishes of bearings vary considerably from manufacturer to manufacturer. They are usually not given specifically for each product.

As far as lubrication is concerned, in general, the application environment will usually dictate the proper lube required. Today’s lubrication selection has varied greatly over the past few years. Modern methods of mixing, compounding and blending various additives and bases has become a very exact science, a far cry from late 1940 when almost all lubricants were a refined petroleum product.

Operational conditions such as temperature, loads, speed, environment and torque available, will determine what type should be used – oil, grease or dry films. Oil fluid is the base lubricant for nearly all bearings, whereas grease is an oil that has been thickened. The use of lubrication will reduce friction and wear, prevent corrosion or oxidation and help to prevent heat buildup within the bearing. Other benefits that result from proper lubrication are quietness, lower torque and extended life. Lubrication selection is very important to good bearing performance. The following tables of lubrications shown are the most widely used by bearing users today. Due to the constant change of product demand and scientific technology, we recommend that a QBC engineer be consulted if you cannot locate a suitable lubrication in the following charts.

Unless otherwise specified by the customer, QBC will supply bearings with an oil lubrication meeting military specifications (MIL-L-6085A) or grease meeting (MIL-G-23827A).

The numbering system developed by QBC incorporates a lubrication code. This gives the user an opportunity to specify the lubricant required as per **Table 1-10**. In case the code numbers assigned do not cover the lubricant required, **Tables 1-11** thru **1-13** list the lubricants available on special orders.

**Table 1-10 Available Lubricants**

Lubricant Code	Brand Name	Basic Type Oil	Operating Temp. °F	Uses
01	*Windsor L245X (MIL-L-6085A)	Synthetic oil	-65 to +300	Light general purpose instrument oil
15	DuPont Krytox 143 AC	Fluorinated oil	-30 to +550	High temperature stability with good lubricity properties
49	AeroShell #7 (MIL-G-23827A)	Diester	-100 to +300	Wide temperature range; good general purpose grease
54	Texaco Low Temp EP (MIL-G-23827A)	Synthetic Ester	-65 to +250	Low torque at cold temperature
20	*Exxon Beacon 325	Synthetic grease	-65 to +250	General purpose grease
39	*Exxon Andok C	Channeling petroleum grease	-20 to +250	Smooth running, long life with minimum migration
13	Toray SH44M	Silicone grease	-25 to +350	Higher temperature stability
48	*Mobil 28 (MIL-G-81322)	Synthetic hydrocarbon	-65 to +350	Wide temperature range, good low temperature torque, general purpose
72	Multemp PS No. 2	Petroleum grease	-60 to +250	Low torque, general purpose grease
75	Chevron SRI-2	Mineral grease	-20 to +350	High speed, high load grease
83	*Shell Alvania X2	Mineral grease	-30 to +250	Long life
10	DuPont Krytox 240AC (MIL-G-27617)	Fluorinated grease	-30 to +550	High temperature stability with good lubricity properties
12	KYODO SRL	Synthetic grease	-40 to +300	Low noise and low torque applications
25	NIG-ACE W	Synthetic grease	0 to +300	Low noise and low torque applications
40	Isoflex JL 032R	Synthetic grease	-60 to +250	High speed, low torque grease
04	U-1494	Synthetic grease	-40 to +350	High speed, high load applications

\*Most popular and readily available lubrication.

If no lubrication is called out, QBC will ship bearings with one of these general purpose lubricants.

**Table 1-11 Oil Lubricants Available on Special Order**

Manufacturer & Trade Name	Mil. Spec	Oper. Range, °F	Type	Pouring Point, °F	Flash Point, °F	Viscosity CS 75°F/210°F
<b>Anderson Oil Co.</b> LS252	MIL-17353A	-65/250	Diester	-75	340	7.6/1.9
<b>Bendix Corp.</b> P10	MIL-L-6085A	-70/350	Diester	-80	420	23.4/3.8
<b>Bray Oil Co.</b> NPT3A 885 NPT9	MIL-L-6085	-65/175 -50/400 -30/350	Diester Diester Ester	-90 -85 -50	400 410 495	19/3.5 1875/9 710/55
<b>Dow Corning</b> DC200 DC510 DC550 FS1265	VVL1078 MIL-L-27694	-40/550 -70/500 -40/450 -50/300	Silicone Silicone Silicone Silicone	-50 -80 -50 -30	600 600 600 500	Various Various 125/20 Various
<b>DuPont, E.I.</b> Krytox 143 AB		-45/450	Perfluor	-45	500	85/10.3
<b>Exxon Corp.</b> P15A Aviation Inst. Oil Univis P12 Univis P38	MIL-L-7808 MIL-L-7870 MIL-L-6085A MIL-L-6085	-65/300 -65/290 -75/300 -65/300	Diester Petroleum Diester Diester	-75 -70 -90 -70	450 300 410 415	22/3.5 17/2.6 30/3.6 72/37
<b>General Electric</b> Versilube F44 Versilube F50 Versilube SF81 Versilube SF96	MIL-S-81087	-100/500 -100/400 -40/400 -40/400	Silicone Silicone Silicone Silicone	-100 -100 -55 -50	550 550 600 600	70/15 75/22 Various 40/16.5
<b>Gulf Oil Co.</b> Synthetic Fluid#6		-50/275	Mineral	-90	295	3200/12
<b>Houghton Oil</b> Cosmolube 270A	MIL-L-6085A	-65/250	Diester	-70	365	15/3.5
<b>Mobil Oil</b> SHC824 XRL743A		-50/350 -50/350	Synthetic Synthetic	-65 -65	455 520	100/6.5 100/6.5
<b>MPS Corp.</b> MO119		-30/250	Synthetic	-80	455	119 @ 100°F
<b>Shell Oil Co.</b> Aeroshell #3 Aeroshell #12 Aeroshell #4	MIL-L-7870 MIL-L-6085A MIL-H-5606	-70/240 -70/300 -70/500	Petroleum Diester Petroleum	-75 -70 -85	275 365 215	16.5/2.3 21.5/3.5 859/10.4
<b>Tenneco Chemical</b> Anderol L401D Anderol L423	MIL-L-6085A	-75/260 -80/350	Diester Synthetic	-80 -100	430 370	19.7/3.4 200/5.1

**Table 1-12 Greases Available on Special Order**

Manufacturer & Trade Name	Mil. Spec	Oper. Range, °F	Base Oil	Thickener	Color
<b>American Oil Co.</b>					
Rykon Premium #2		-10/200	Mineral	Arylurea	Reddish Pink
Rykon Premium #3		-20/250	Mineral	Arylurea	Lavender
Supermil ASU31052	MIL-G-25013	-100/450	Silicone	Arylurea	Amber
Supermil ASU72832	MIL-G-23827A	-100/250	Diester	Lithium	
<b>Bray Oil Co.</b>					
Braycote 627S	MIL-G-23827	-100/300	Ester	Organic	Lt. Brown
Braycote 637S	MIL-G-25537	-65/260	Mineral	Calcium Soap	Lt. Brown
601		-100/390	Polyether	Tetrafluor	Off White
<b>Chevron Oil Co.</b>					
BRB-2	MIL-G-3545C	-20/350	Mineral	Polyurea	Blue Green
OHT		+20/300	Mineral	Sodium	Greenish
NRR335		-65/300	Synthetic Aeromatic	Sodium	Maroon
<b>Dow Corning</b>					
Molykote BR2 Plus		-20/300	Mineral	Lithium	Black
Molykote 33		-100/350	Silicone	Lithium	Gray
Molykote 41		-0/550	Silicone	Lithium	Black
Molykote 44	MIL-G-46886A	-100/400	Silicone	Lithium	Dark Amber
Molykote 55M	MIL-G-4343	-65/350	Silicone	Lithium	Tan
<b>DuPont, E.I.</b>					
Krytox 240AA	MIL-G-27617	-30/450	Fluor Carbon	Vidax	White
Krytox 240AB	MIL-G-27617	-30/450	Fluor Carbon	Vidax	White
Krytox 240AZ	MIL-G-27617	-65/300	Fluor Carbon	Vidax	White
Krytox 240AC	MIL-G-27617	-30/550	Perfluor	Tetrafluor	White
<b>Exxon Corp.</b>					
Andok B	MIL-G-18709A	-20/250	Mineral	Sodium	Brown
Andok 260	MIL-G-3545C	-20/250	Mineral	Sodium	Amber
<b>General Electric</b>					
Versilube G351	MIL-L-15719A	-40/400	Silicone	Lithium	Cream
<b>Houghton E.F.</b>					
Cosmolube 615	MIL-L-4343	-65/375	Silicone	Lithium	Lt. Brown
<b>Kyodo Yushi</b>					
PS #2		-60/230	Diester	Lithium	White
<b>Mobil Oil</b>					
BRB #23	MIL-L-7711	-0/250	Petroleum	Sodium	Tan
Mobil 24	MIL-G-25013	-100/550	Silicone	Organic	Reddish
Mobil 27	MIL-G-23827	-65/325	Carbon	Non Soap	Tan

**Table 1-13 Greases Available on Special Order**

Manufacturer & Trade Name	Mil. Spec	Oper. Range, °F	Base Oil	Thickener	Color
<b>NYE Rheolube</b>					
703A		-30/250	Mineral	Sodium	Tan
716B		-60/300	Polyol Ester	Lithium	Tan
781D		-95/390	Silicone	Lithium	Off White
899RP		-130/480	Fluorether	PTFE	White
2000		-60/260	Hydrocarbon	Organic	Red
Rheo Temp 500	MIL-G-3278A	-65/350	Diester	Sodium	Blue
<b>Shell Oil</b>					
Aeroshell #5	MIL-G-3545C	-20/300	Petroleum	Microgel	Dark Brown
Aeroshell #6	MIL-G-24139	-40/250	Mineral	Microgel	Amber
Aeroshell #7	MIL-G-23827A	-100/300	Diester	Microgel	Amber
Aeroshell #14	MIL-G-23827	-65/250	Mineral	Calcium Soap	Tan
Aeroshell #17	MIL-G-21164	-100/300	Diester	Microgel	Dark Grey
Aeroshell #22	MIL-G-81322A	-80/350	Diester	Microgel	Dark Grey
Alvania #3	MIL-G-81322C	-30/275	Mineral	Lithium	Amber
Cyprina #3	MIL-G-18709	-0/250	Mineral	Lithium	Lt. Tan
Dolium R #2		-30/300	Mineral	Ashless	Amber
Darina	MIL-G-18709	-0/300	Mineral	Microgel	Amber
<b>Royal Lubricant</b>					
Royco 13D	MIL-G-25013	-100/450	Silicone	PTFE	Lavender
Royco 21	MIL-G-7421	-100/250	Diester	Lithium	Brownish
Royco 22MS	MIL-G-81827	-80/360	Diester	Clay	Black
Royco 27A	MIL-G-23827	-100/300	Diester	Lithium	Brownish
Royco 37	MIL-G-25537	-65/250	Mineral	Calcium Soap	Tan
Royco 64C	MIL-G-21164	-65/250	Diester	Lithium	Black
<b>Tenneco Chem. (Huls)</b>					
Anderol 753A		-40/300	Diester	Lithium	Lt. Brown
Anderol 757		-40/300	Diester	Lithium	Lt. Brown
Anderol 761		-40/400	Diester	Silica	Lt. Brown
Anderol 793A	MIL-G-3278A	-65/300	Diester	Lithium	Lt. Amber
Anderol 794		-65/250	Diester	Lithium	Lt. Amber
Anderol 795		-65/300	Diester	Lithium	Off White
<b>Texaco Oil Co.</b>					
Premium RB		-30/325	Mineral Syn-	Lithium	Orange
Low Temp EP	MIL-G-23827	-65/250	thetic Mineral	Lithium	Purplish Brown
Regal AFB #2	MIL-G-18709	-40/250	Parafin	Lithium	Green
Unitemp 500	MIL-G-3278A	-65/350	Diester	Sodium	Blue