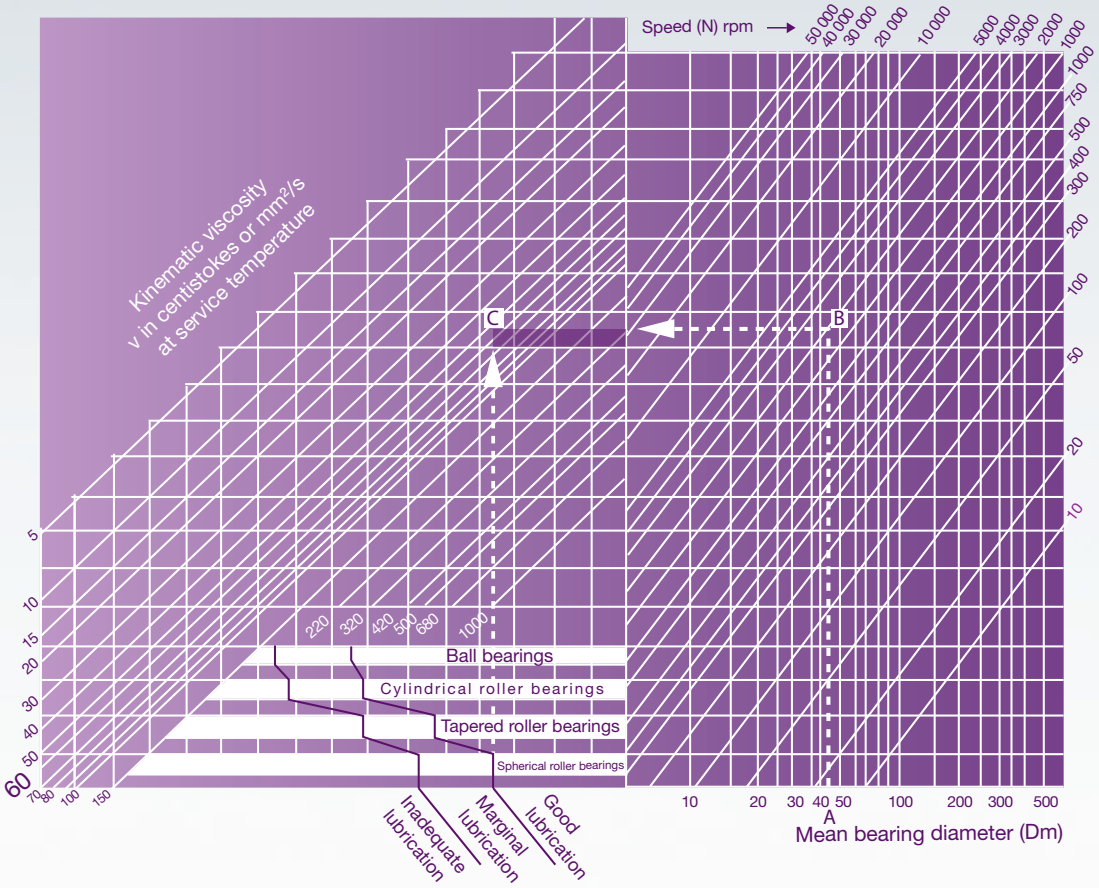
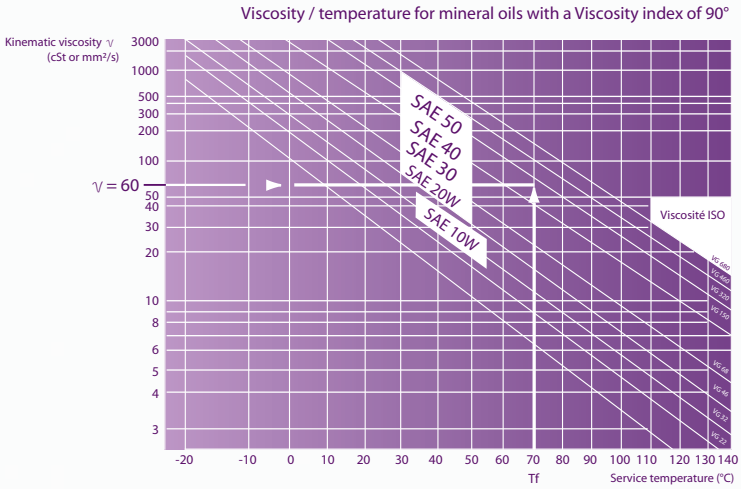
3. LUBRICATION THEORY AND METHODS

3•2 - LUBRICATION REQUIREMENT DESIGN TOOLS

SELECTING THE VISCOSITY OF LUBRICANTS (OIL OR GREASE)



- Determine the mean diameter of the bearing (A)= (Bore + outer diameter)/2.
- Find, by following point B on the graph, the intersection with the rotational speed line of the bearing.
- Identify point C, intersection of the horizontal line from B and the vertical line running from the effective lubrication limit per type of bearing.
- Determine the value of the oblique line passing through C (60, in this case).

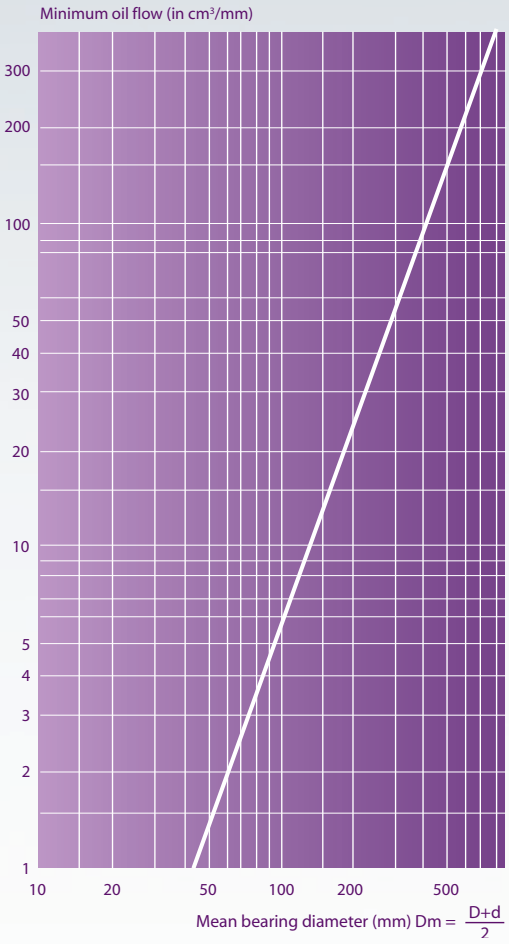


➤ Then calculate the viscosity of the lubricant to be selected on the basis of the service temperature of the bearing.

Mark the value of calculated basic viscosity on the vertical axis.
Identify the intersection between this value and the service temperature of the bearing.
The target viscosity is the value of the oblique line passing through this intersection. (Approximately SAE 50, i.e. VG 300 in this case).

INITIAL CHARGE OF LUBRICANT AND RELUBRICATION

• OIL LUBRICATION (MINIMUM QUANTITY)



• GREASE LUBRICATION (DOSING)

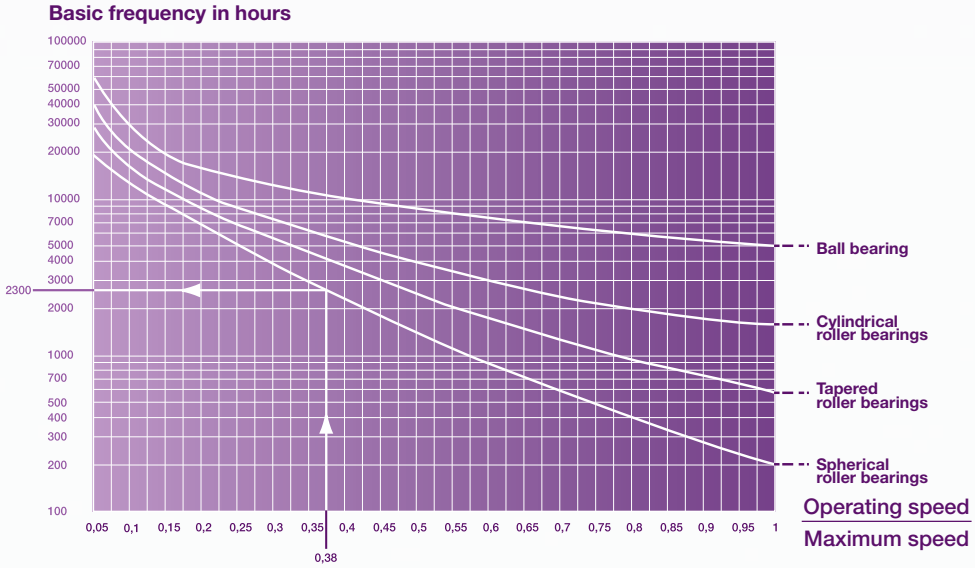
Excess grease can lead to heating. Grease must occupy 20 to 30% of free volume within the bearing.

Formula to calculate the weight of grease required:
G = 0.005 D.B

G=Gram (or cm³)
D=Outer diameter of the bearing in mm
B= Width of the bearing in mm

Exceptions:
- The quantity of grease may be increased by 20% for bearings equipped with a grease evacuation hole.
- A bearing rotating at a very low speed can be filled completely.

• FREQUENCY OF RELUBRICATION



The basic frequency (Fb) of relubrication depends on the type of bearing and the ratio of operating speed to the maximum speed indicated in the bearing characteristics.

3. LUBRICATION THEORY AND METHODS

This basic frequency must be corrected by the following coefficients on the basis of the specific conditions of the environment of the mechanism (dust, humidity, impact, vibrations, vertical axis, service temperature, etc.) according to the formula: Fc=Fb . Te . Ta . Tt.

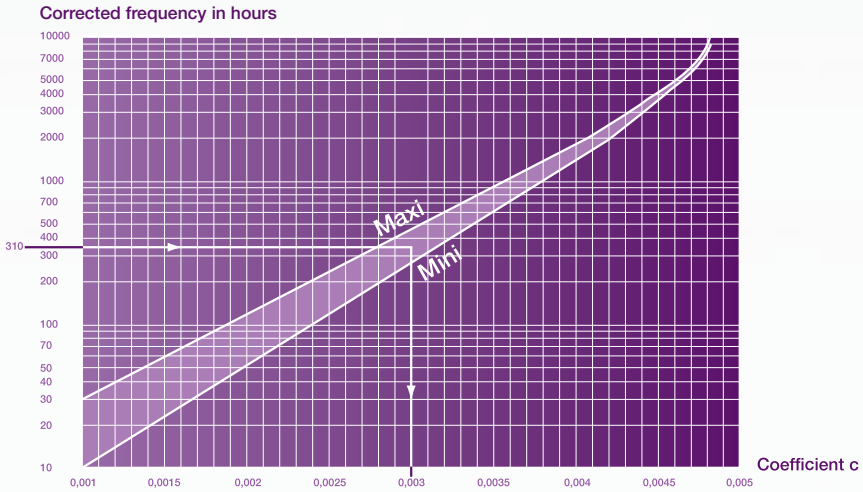
	Environment	Applications	Temperature		
Conditions	Dust Humidity Condensation	With shocks Vibrations Vertical axis	Level	For standard grease	For high temperature grease
Coefficients	Te	Ta		Tt	Tt
Mean	0.7 to 0.9	0.7 to 0.9	75°C	0.7 to 0.9	-
High	0.4 to 0.7	0.4 to 0.7	75°C to 85 °C	0.4 to 0.7	0.7 to 0.9
Very high	0.1 to 0.4	0.1 to 0.4	85°C to 125 °C	0.1 to 0.4	0.4 to 0.7
	-	-	130°C to 170 °C	-	0.1 to 0.4

Example: a 22 212EA bearing, lubricated with standard grease, rotating at 1500 rpm in a dusty environment, at 90°C, without any other operating restrictions:
22212 = Spherical roller bearing
Max. speed = 3900 rpm
Operating speed = 1500 rpm

$$\frac{\text{V operating} = 1500 \text{ tr/mn}}{\text{V speed} = 3900 \text{ tr/mn}} = \frac{1500}{390} = 0.38 \cdots\cdots\blacktriangleright \text{Basic frequency Fb} = 2300 \text{ H}$$

Te = 0.5 ·····▸ dust
Ta = 0.9 ·····▸ normal
Tt = 0.3 ·····▸ 90°C

• WEIGHT OF THE GREASE TO BE REPLACED



This corrected frequency can be used to determine the weight of grease to be added, depending on:
- bearing width B,
- outer diameter D,
- coefficient c taken from the graph below based on the formula **P=DxBxc**

Example :
for bearing 22 121 (roller bearings)
P= weight of the grease
Add approximately 9 grams every 310 hours of operation

An initial approximation gives the following values:

FLOW ADJUSTMENT PARAMETERS

Shaft diameter	Frequency of manual lubrication (1 pump stroke = 0,5 cm^3)	Quantity per day	Frequency of replacement of the automatic lubricator
100 to 120 mm	8 pump stokes per day	3 to 4 cm^3	1 month
80 to 100 mm	4 pump stokes per day	2 cm^3	2 months
65 to 80 mm	16 to 20 pump stokes per week	1.5 cm^3	3 months
50 to 65 mm	16 to 20 pump stokes every 15 days	0.7 cm^3	6 months
< 50 mm	16 to 20 pump stokes per month	0.3 cm^3	12 months