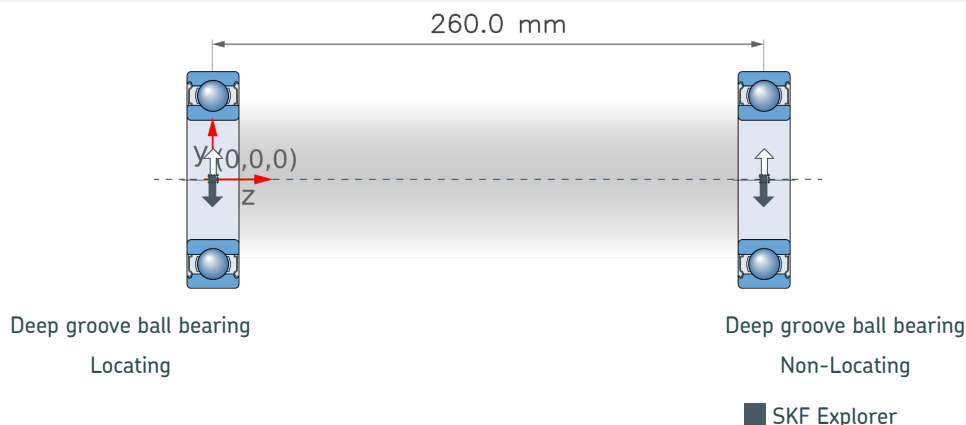


July 02, 2023

# 1. Abstract

## Calculation overview



		Bearing rating life		Grease	Static safety factor	Frictional moment	Power loss
Designation		Basic	SKF life	Catalogue grease life		Total	
		$L_{10h}$ (h)	$L_{10mh}$ (h)	$L_{10}$ (h)	$S_0$	M (Nmm)	$P_{loss}$ (W)
Left	<a href="#">61802-2Z</a>	$> 2 \times 10^5$	$> 2 \times 10^5$	100000	$> 20$	0.36	0.019
Right	<a href="#">61802-2Z</a>	$> 2 \times 10^5$	$> 2 \times 10^5$	100000	$> 20$	0.36	0.019

### Left bearing

#### Consideration

All calculated values are best estimates resulting from the input data and assumptions, and well-recognized data sources, and well-established calculation methods.

SKF follows standards and methods suggested by Greenhouse Gas Protocol for CO<sub>2</sub> estimates.

For details about data, methods, and assumptions used, follow the link below.

If you intend to use these values for decision making, contact SKF for more details and correct interpretation of calculation results.

The values calculated by SKF Bearing Select should not be compared with values obtained from other tools or sources, unless you are confident about the data sources, methods and assumptions used. [More info](#)

#### Consideration

Grease consumption is almost zero, therefore CO<sub>2</sub> emissions are not calculated.

#### Consideration

Low viscosity ratio  $k$ , reduced asperity contact. It is recommended to select a higher viscosity lubricant or improve cooling. It is not appropriate to look at basic rating life only. Instead use SKF rating life method. Recommended to use anti-wear (AW) or extreme pressure (EP) additives to reduce wear [More info](#)

#### Consideration

For rating life results above 100000 hours, other failure modes than those included in the current rating life models will dominate and limit the life of the bearing.

### Right bearing

### Consideration

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### Consideration

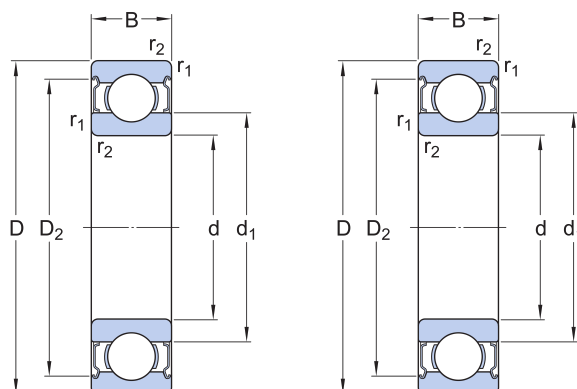
Low viscosity ratio k, reduced asperity contact. It is recommended to select a higher viscosity lubricant or improve cooling. It is not appropriate to look at basic rating life only. Instead use SKF rating life method. Recommended to use anti-wear (AW) or extreme pressure (EP) additives to reduce wear [More info](#)

### Consideration

For rating life results above 100000 hours, other failure modes than those included in the current rating life models will dominate and limit the life of the bearing.

## 2. Input

### 2.1. Bearing data



Designation	Bearing type	Principal dimensions			Basic load ratings		Fatigue load limit $P_u$ (kN)	Speed ratings		Clearance class
		d (mm)	D (mm)	B (mm)	Dynamic	Static		Reference	Limiting	
					C (kN)	$C_0$ (kN)		$n_{ref}$ (r/min)	$n_{lim}$ (r/min)	
Left <a href="#">61802-2Z</a>	Deep groove ball bearing	15.0	24.0	5.0	1.9	1.1	0.048	60000.0	30000.0	Normal
Right <a href="#">61802-2Z</a>	Deep groove ball bearing	15.0	24.0	5.0	1.9	1.1	0.048	60000.0	30000.0	Normal

## 2.2. Loads & Speed

Locating	-1	
Bearing distance	260.0	mm
Shaft orientation	Horizontal	
Rotating ring	Inner ring rotation	

		Coordinate system	Coordinates			Forces			Speed	Case weight
Load			x r (mm)	y θ (mm deg)	z (mm)	Fx Fr (kN)	Fy Fθ (kN)	Fz (kN)	(r/min)	
LC1	F1	Cartesian	0.0	0.0	0.0	0.0	-0.046	0.0	500.0	1
	F2	Cartesian	0.0	0.0	260.0	0.0	-0.046	0.0		

## 2.3. Temperature

	Left		Right	
	Inner ring (°C)	Outer ring (°C)	Inner ring (°C)	Outer ring (°C)
LC1	70	65	70	65

Maximum temperature is used for calculating the actual viscosity,  $\kappa$ ,  $a_{SKF}$  and SKF rating life.

Mean temperature is used for calculating bearing friction and power loss.

## 2.4. Lubrication

		Lubricant	Effective EP additives	Contamination	
Designation		Name		Method	Cleanliness / Factor
Left	<u>61802-2Z</u>	LT10	False	Detailed guidelines	High cleanliness
Right	<u>61802-2Z</u>	LT10	False	Detailed guidelines	High cleanliness

## 2.5. CO<sub>2</sub> emissions settings

	Designation	Input energy mix manually	Geographical location	Period of interest [Years]	Time operational [%]
Left	<u>61802-2Z</u>	False	European Union	1	100
Right	<u>61802-2Z</u>	False	European Union	1	100

## 2.6. Fits and tolerances

		Requirements		Calculated interference	Include Smoothing	Easy axial displacement of inner ring on shaft
	Designation	Guidance	Load direction rotating ring			
Left	<u>61802-2Z</u>	True	rotating	False	False	False
Right	<u>61802-2Z</u>	True	rotating	False	False	False

### 3. Results

#### 3.1. Loads & static safety

		Load ratio	Static safety factor	Equivalent dynamic load	Equivalent static load
	Designation	C/P	$S_0$	P (kN)	$P_0$ (kN)
Left	<u>61802-2Z</u>	41.3	> 20	0.05	0.046
Right	<u>61802-2Z</u>	41.3	> 20	0.05	0.046

#### 3.2. Bearing minimum load

		Reaction forces		Minimum load	
	Designation	Radial	Axial		Requirements
		$F_r$ (kN)	$F_a$ (kN)	$F_{rm}$ (kN)	met?
Left	<u>61802-2Z</u>	0.046	0	0.00115	yes
Right	<u>61802-2Z</u>	0.046	0	0.00115	yes

#### 3.3. Adjusted reference speed

		Adjusted reference speed	Adjustment factors	
	Designation		For bearing load P	For oil viscosity
		$n_{ar}$ (r/min)	$f_p$	$f_v$
Left	<u>61802-2Z</u>	129000	1.0	2.16
Right	<u>61802-2Z</u>	129000	1.0	2.16

#### 3.4. Lubrication conditions

		Operating viscosity			Viscosity ratio
	Designation	Actual	Rated	Rated @ 40 °C	
		$\nu$ (mm <sup>2</sup> /s)	$\nu_1$ (mm <sup>2</sup> /s)	$\nu_{ref}$ (mm <sup>2</sup> /s)	$\kappa$
Left	<u>61802-2Z</u>	5.7	49.9	208	0.11
Right	<u>61802-2Z</u>	5.7	49.9	208	0.11

### 3.5. Grease life and relubrication interval

		Catalogue grease life	Speed factor
Designation			Speed x mean diameter
		$L_{10}$ (h)	$nd_m$ (mm/min)
Left	<a href="#">61802-2Z</a>	100000	9750
Right	<a href="#">61802-2Z</a>	100000	9750

### 3.6. Bearing rating life

		Bearing rating life		SKF life modification factor	Contamination factor
Designation		Basic	SKF		
		$L_{10h}$ (h)	$L_{10mh}$ (h)	$a_{skf}$	$\eta_c$
Left	<a href="#">61802-2Z</a>	$> 2 \times 10^5$	$> 2 \times 10^5$	0.11	0.08
Right	<a href="#">61802-2Z</a>	$> 2 \times 10^5$	$> 2 \times 10^5$	0.11	0.08

#### Left bearing

##### Consideration

Low viscosity ratio  $k$ , reduced asperity contact. It is recommended to select a higher viscosity lubricant or improve cooling. It is not appropriate to look at basic rating life only. Instead use SKF rating life method. Recommended to use anti-wear (AW) or extreme pressure (EP) additives to reduce wear [More info](#)

##### Consideration

For rating life results above 100000 hours, other failure modes than those included in the current rating life models will dominate and limit the life of the bearing.

#### Right bearing

##### Consideration

Low viscosity ratio  $k$ , reduced asperity contact. It is recommended to select a higher viscosity lubricant or improve cooling. It is not appropriate to look at basic rating life only. Instead use SKF rating life method. Recommended to use anti-wear (AW) or extreme pressure (EP) additives to reduce wear [More info](#)

##### Consideration

For rating life results above 100000 hours, other failure modes than those included in the current rating life models will dominate and limit the life of the bearing.

### 3.7. Bearing friction & power loss

		Frictional moment		Friction sources				Power loss
Designation		Total	At start 20-30°C and zero speed	Rolling	Sliding	Seals	Drag loss	
		M (Nmm)	M <sub>start</sub> (Nmm)	M <sub>rr</sub> (Nmm)	M <sub>sl</sub> (Nmm)	M <sub>seal</sub> (Nmm)	M <sub>drag</sub> (Nmm)	P <sub>loss</sub> (W)
Left	<a href="#">61802-2Z</a>	0.36	0.26	0.15	0.2	0	0	0.019
Right	<a href="#">61802-2Z</a>	0.36	0.26	0.15	0.2	0	0	0.019

### 3.8. Bearing frequencies

		Rotational frequencies				Frequency of over-rolling		
Designation		Inner ring	Outer ring	Rolling element set & cage	Rolling element about its axis	Point on inner ring	Point on outer ring	Rolling element
		f <sub>i</sub> (Hz)	f <sub>e</sub> (Hz)	f <sub>c</sub> (Hz)	f <sub>r</sub> (Hz)	f <sub>ip</sub> (Hz)	f <sub>ep</sub> (Hz)	f <sub>rp</sub> (Hz)
Left	<a href="#">61802-2Z</a>	8.333	0.0	3.658	33.616	65.456	51.211	67.231
Right	<a href="#">61802-2Z</a>	8.333	0.0	3.658	33.616	65.456	51.211	67.231

### 3.9. Estimation of CO<sub>2</sub> emissions over period of interest

		CO <sub>2</sub> emissions caused by bearing production	CO <sub>2</sub> emissions during bearing operation - over period of interest			Resources consumed during bearing operation - over period of interest	
Designation			Frictional power loss	Grease consumption	Sum of CO <sub>2</sub> during operation	Energy	Grease
		kg of CO <sub>2</sub>	kg of CO <sub>2</sub>	kg of CO <sub>2</sub>	kg of CO <sub>2</sub>	kWh	kg
Left	<a href="#">61802-2Z</a>	* < 0.1 ( <a href="#">Learn more</a> )	< 0.1	0.0	< 0.1	0.16	0.0
Right	<a href="#">61802-2Z</a>	* < 0.1 ( <a href="#">Learn more</a> )	< 0.1	0.0	< 0.1	0.16	0.0

\* Value is not designation specific, but based on bearing mass

#### Left bearing

##### Consideration

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##### Consideration

Grease consumption is almost zero, therefore CO<sub>2</sub> emissions are not calculated.

## Right bearing

## Consideration

All calculated values are best estimates resulting from the input data and assumptions, and well-recognized data sources, and well-established calculation methods.

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## Consideration

Grease consumption is almost zero, therefore CO<sub>2</sub> emissions are not calculated.

## 3.10. Fits and tolerances

## Note

Typically, it is not sufficient to use an interference fit alone to axially locate a bearing ring on a cylindrical seat.

## 3.10.1. Recommended tolerance class

		Tolerance Class	
	Designation	Shaft	Housing
Left	<a href="#">61802-2Z</a>	h6	M7
Right	<a href="#">61802-2Z</a>	h6	M7

## Consideration

The recommendation for the tolerance classes is based on the load case with the highest equivalent dynamic load.

## Consideration

Valid for solid steel shaft and split or non-split cast iron or steel housings.

## 3.10.2. Tolerances

		Shaft outer diameter		Bearing bore		Bearing outer diameter		Housing bore		Smoothing	
	Designation	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Shaft and bearing bore	Bearing outer ring and housing
		(μm)	(μm)	(μm)	(μm)	(μm)	(μm)	(μm)	(μm)	(μm)	(μm)
Left	<a href="#">61802-2Z</a>	-11	0	-8	0	-9	0	-21	0	N/A	N/A
Right	<a href="#">61802-2Z</a>	-11	0	-8	0	-9	0	-21	0	N/A	N/A

## Consideration

For the tolerances calculation, the normal tolerance for the bearing bore and outer diameter is used.



## 3.10.3. Fits, Theoretical Interference (+) / Clearance (-)

		Shaft			Housing		
	Designation	Theoretical minimum	Middle	Theoretical maximum	Theoretical minimum	Middle	Theoretical maximum
		( $\mu\text{m}$ )	( $\mu\text{m}$ )	( $\mu\text{m}$ )	( $\mu\text{m}$ )	( $\mu\text{m}$ )	( $\mu\text{m}$ )
Left	<u>61802-2Z</u>	-11	-1	8	-9	6	21
Right	<u>61802-2Z</u>	-11	-1	8	-9	6	21

LIMITED WARRANTY : The SKF Bearing Select software tool of the SKF Company supports the calculation and selection of bearings.

This software is provided 'as is' with out any warranty of any sort, implicitly as well as explicitly.

Please note that the obtained results can be affected by many external parameters and/or the quality of the assumptions taken into account. The results obtained using this software must be validated by the user who accepts the fact that the use of this software and the exploitation

of the obtained results are under the user's entire and sole responsibility.

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