

1. Abstract

Calculation overview



Deep groove ball bearing

■ SKF Explorer

	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)
■ <u>6004-2Z</u>	102000	13400	43700	2.5	58.9	0.12

Consideration

Grease consumption is almost zero, therefore CO₂ emissions are not calculated.

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 CO₂ 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.

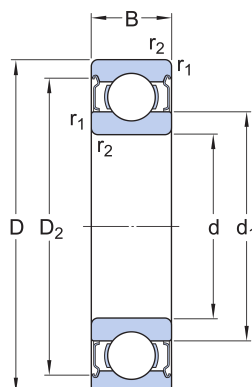
The values calculated by SKF Bearing Select should not be compared with values obtained from other tools or sources, unless you are confident about the data sources, methods and assumptions used. [More info](#)

Consideration

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](#)

2. Input

2.1. Bearing data



Designation	Bearing type	Principal dimensions			Basic load ratings		Fatigue load limit	Speed ratings		Clearance class
					Dynamic	Static		Reference	Limiting	
		d (mm)	D (mm)	B (mm)	C (kN)	C ₀ (kN)	P _u (kN)	n _{ref} (r/min)	n _{lim} (r/min)	
■ 6004-2Z	Deep groove ball bearing	20.0	42.0	12.0	9.95	5.0	0.212	38000.0	19000.0	Normal

2.2. Loads, Speed and Temperature

Shaft orientation		Horizontal				
Rotating ring		Inner ring rotation				
Forces			Speed	Temperature		Case weight
Radial (F _r) (kN)	Axial (F _a) (kN)		(r/min)	Inner ring (°C)	Outer ring (°C)	
LC1	2.0	0.0	20.0	30	30	1

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

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

2.3. Lubrication

Designation	Lubricant	Effective EP additives	Contamination	
	Name		Method	Cleanliness / Factor
■ 6004-2Z	MT47	False	Detailed guidelines	High cleanliness

2.4. CO₂ emissions settings

Designation	Input energy mix manually	Geographical location	Period of interest [Years]	Time operational [%]
■ 6004-2Z	False	European Union	1	100

2.5. Fits and tolerances

	Requirements	Tolerance Class		Calculated interference	Include Smoothing
Designation	Guidance	Housing	Shaft		
■ 6004-2Z	False	J7	j6	True	True

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)
■ 6004-2Z	4.97	2.5	2.0	2

3.2. Bearing minimum load

	Reaction forces		Minimum load	
Designation	Radial	Axial		Requirements
	F _r (kN)	F _a (kN)	F _{rm} (kN)	met?
■ 6004-2Z	2.0	0.0	0.0045	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
■ 6004-2Z	22800	0.56	1.07

3.4. Lubrication conditions

Designation	Operating viscosity			Viscosity ratio
	Actual	Rated	Rated @ 40 °C	
	ν (mm ² /s)	ν_1 (mm ² /s)	ν_{ref} (mm ² /s)	κ
■ 6004-2Z	128	640	332	0.19

3.5. Grease life and relubrication interval

Designation	Catalogue grease life	Speed factor
		Speed x mean diameter
	L_{10} (h)	nd_m (mm/min)
■ 6004-2Z	43700	620

3.6. Bearing rating life

Designation	Bearing rating life		SKF life modification factor	Contamination factor
	Basic	SKF		
	L_{10h} (h)	L_{10mh} (h)	a_{skf}	η_c
■ 6004-2Z	102000	13400	0.13	0.15

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3.7. Bearing friction & power loss

Designation	Frictional moment		Friction sources				Power loss
	Total	At start 20-30°C and zero speed	Rolling	Sliding	Seals	Drag loss	
	M (Nmm)	M_{start} (Nmm)	M_{rr} (Nmm)	M_{sl} (Nmm)	M_{seal} (Nmm)	M_{drag} (Nmm)	P_{loss} (W)
■ 6004-2Z	58.9	72.7	2.3	56.6	0	0	0.12

3.8. Bearing frequencies

Designation	Rotational frequencies				Frequency of over-rolling		
	Inner ring	Outer ring	Rolling element set & cage	Rolling element about its axis	Point on inner ring	Point on outer ring	Rolling element
	f_i (Hz)	f_e (Hz)	f_c (Hz)	f_r (Hz)	f_{ip} (Hz)	f_{ep} (Hz)	f_{rp} (Hz)
■ <u>6004-2Z</u>	0.333	0.0	0.133	0.78	1.807	1.193	1.559

3.9. Estimation of CO₂ emissions over period of interest

Designation	CO ₂ emissions caused by bearing production	CO ₂ emissions during bearing operation - over period of interest			Resources consumed during bearing operation - over period of interest	
		Frictional power loss	Grease consumption	Sum of CO ₂ during operation	Energy	Grease
	kg of CO ₂	kg of CO ₂	kg of CO ₂	kg of CO ₂	kWh	kg
■ <u>6004-2Z</u>	*0.3 (Learn more)	0.5	0.0	0.5	1.08	0.0

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

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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. 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)
■ 6004-2Z	-4	9	-10	0	-11	0	-11	14	7	12

Consideration

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

3.10.2. Fits, Probable Interference (+) / Clearance (-)

	Shaft			Housing		
Designation	Probable minimum	Middle	Probable maximum	Probable minimum	Middle	Probable maximum
	(μm)	(μm)	(μm)	(μm)	(μm)	(μm)
■ 6004-2Z	-8	1	9	-33	-19	-5