Rolling Bearing L10 Life from Load Rating

Basic rating life L10 of a ball or roller bearing in millions of revolutions and in hours, from its dynamic load rating, the equivalent load and the speed.

Method: Lundberg and Palmgren (1947, 1952); basic rating life of ISO 281

Input parameters

Unit system: SI

Parameter	Value	Unit
Bearing type	Ball bearing (p = 3)	
Basic dynamic load rating (catalogue)	30.700	kN
Equivalent dynamic load	4.0000	kN
Speed	1,450.0	rpm
Life factor for reliability (1 for 90 %) Take the value for your reliability from the bearing maker's catalogue.	1.0000	

Calculated results

Parameter	Value	Unit
Load ratio	7.6750	
Rating life, millions of revolutions	452.10	
Rating life in operating hours	5,196.6	h

Notes for this case

- Basic life only: lubrication, contamination and fatigue-limit effects (the a_ISO factor) come from the maker's method.

Formula and method

$$L_{10} = a_1 \left(\frac{C}{P}\right)^{p} \ (10^6 \text{ rev}), \quad p = 3 \text{ ball}, \ \frac{10}{3} \text{ roller}$$

$$L_{10h} = \frac{L_{10} \times 10^6}{n}$$

Variables

type	Bearing type	-
C	Basic dynamic load rating (catalogue)	N
P	Equivalent dynamic load	N
n	Speed	1/s
a_1	Life factor for reliability (1 for 90 %)	-
C/P	Load ratio	-
L_{10}	Rating life, millions of revolutions	-
L_{10h}	Rating life in operating hours	s
p	Life exponent (3 ball, 10/3 roller)	-

Method and standards

The Lundberg–Palmgren rating life used in bearing catalogues and in ISO 281's basic life; the reliability factor a_1 is entered by you from the maker's data.

Assumptions and limits

- Basic life only: no a_ISO factor.
- Constant load and speed.
- A load above the dynamic rating C is flagged: the basic rating life does not apply there.

References

• Lundberg and Palmgren (1947, 1952); basic rating life of ISO 281

Report details

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Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/mechanical/machine-design/bearing-l10-life

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Reopens the calculator with the inputs of this report.