Rolling Bearing Life

Sample document with complete example values. It shows the report the purchased export produces for YOUR input - it is not itself a report for any part.

Project: Sample project Part/Position: no real part Prepared by: Sample, not released

Deep groove ball bearing: L10h = 3,038 h at P = 5,007.5 N

Bearing data and load

Bearing type	Deep groove ball bearing
Dynamic load rating C	32,500 N
Static load rating C0	19,000 N
Radial force Fr	4,000 N
Axial force Fa	1,900 N
Speed n	1,500 min^{-1}
Calculation factor f0	13.8
Application area	short-duration machines (3,000 … 8,000 h)

Equivalent dynamic load P

Relative value f0·Fa/C0	1.38
Interpolation support points (rel: e / Y)	0.9: 0.28 / 1.58 and 1.6: 0.32 / 1.4
Limit value e	0.3074
Load ratio Fa/Fr	0.475
Branch of the e-criterion	Fa/Fr > e
Factor X	0.56
Factor Y	1.4566
Equivalent load P = X·Fr + Y·Fa	5,007.49 N

Nominal life

Life exponent p	3 (ball bearings)
L10 = (C/P)^p	273.4 10^6 revolutions
L10h = L10·10^6/(60·n)	3,038 h

Static verification (ISO 76)

Equivalent static load P0	4,000 N
Static load safety factor S0	4.75
Minimum reference value S0 (normal operation)	1
Minimum load against slippage	190 N

Assessment

Criterion	Value	Limit	Status
Life L10h versus reference value	3,038 h	>= 3,000 h	● OK
Static load safety factor S0 = C0/P0	4.75	>= 1	● OK
Load ratio P/C	0.15	<= 0.5	● OK
Minimum load against slippage	5,007.5 N	> 190 N	● OK

Calculation basis

Nominal life per ISO 281: L10 = (C/P)^p in millions of revolutions, using the dynamic load rating C from the manufacturer's catalog and the life exponent p = 3 for ball bearings or 10/3 for roller bearings. 90 percent of a large population of identical bearings reach or exceed this life. Together with the speed n, this yields L10h in operating hours.

The equivalent dynamic load is P = X·Fr + Y·Fa. Whether the axial force is taken into account is decided by the e-criterion: below Fa/Fr = e, deep groove ball bearings use P = Fr; the values e and Y are linearly interpolated between the catalog support points

using the relative axial load (f0·Fa/C0 or Fa/C0). Tapered and spherical roller bearings use the catalog values e, Y or Y1/Y2, while the cylindrical roller bearing, as a floating bearing, uses only the radial force.

In addition, the static verification per ISO 76 is carried out (S0 = C0/P0, minimum value 1.0 for ball bearings and 1.5 for roller bearings under normal operation), along with the minimum load against slippage damage and the P/C ratio as the validity limit of the life equation. The reference-value comparison of L10h uses typical experience bands per application area.

About this sample

All values on these pages come from a freely chosen example calculation and belong to no real part. The purchased export contains the same sections with your input, your header data (project, part, prepared by) and as searchable text. Pricing and scope: maschinenbaurechner.de/en/pricing