# Rolling bearing calculation according ISO/TS 16281

The bearing life calculation according ISO/TS 16281 (2008) is the latest standardized version of a bearing life calculation. The bearing life is calculated using the load distribution on each rolling element and is therefore not limited to an external force but can also consider tilting moments and the influence of clearance or pretension. For each of the five degrees of freedom either a load or a displacement/rotation can be specified.

As in the calculation according ISO 281 (2007) the influence of the lubricant can be considered. Either the ratio κ or the specific film thickness Λ can be used. The life with and without consideration of the lubricant will be provided as result.
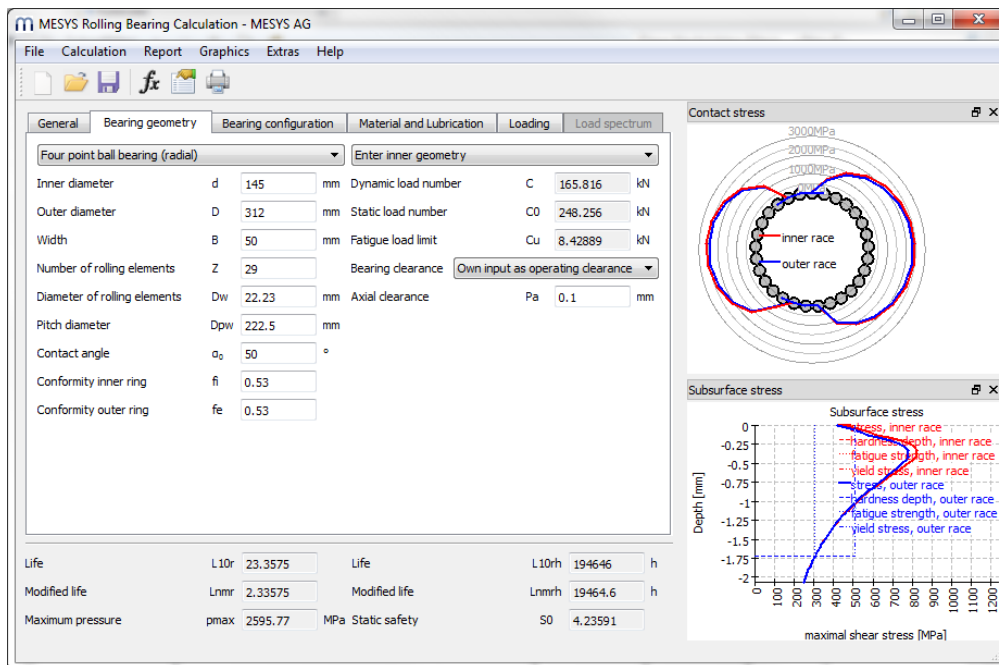

The software is considering the following effects:

- Bearing clearance
- Change of clearance through thermal effects
- Change of clearance due to fits
- Centrifugal loads
- Life reduction due to reduced hardness
- Lubricant
- Lubricant film thickness
- Load spectra
- Bearing sets (of several bearings)
- Hybrid or ceramic bearings
- Reliability
- Elastic deformations of the outer ring for track rollers as extension module
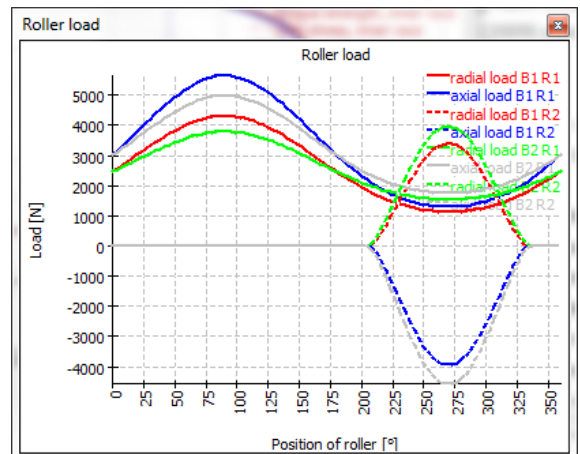
As results you will get

- The load distribution in the bearing
- The hertzian contact stress
- The stresses below the surface for choosing the required harness depth
- The load dependent friction moment for ball bearings
- The contact angle under load
- The displacement and tilting of the bearing
- The minimal film thickness
- The spin-to-roll ratio
- The extension of pressure ellipsis
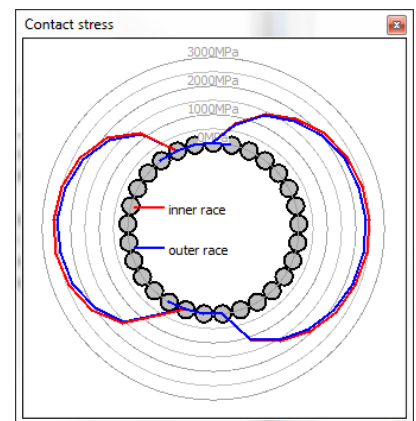- The load distribution in a set of bearings
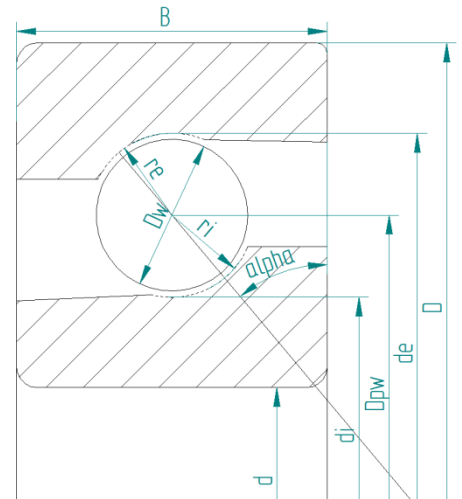
Typical applications

Single bearing under tilting moment

Generally you will try to avoid tilting moments on a bearing, but in track rollers or slewing rings the tilting moment can be the main load.

For roller bearings the influence of tilting on the load distribution or life can be checked.

Sets of angular contact bearings

Angular contact bearings or often used in sets, but the load distribution between the single bearings is difficult to assess. Using the software the load distribution, life and stiffness can be calculated dependent on the pretension of the bearing set. The pretension can be individually set for each bearing.

This also allows checking if the pretension is large enough and the bearings get load in each load case.
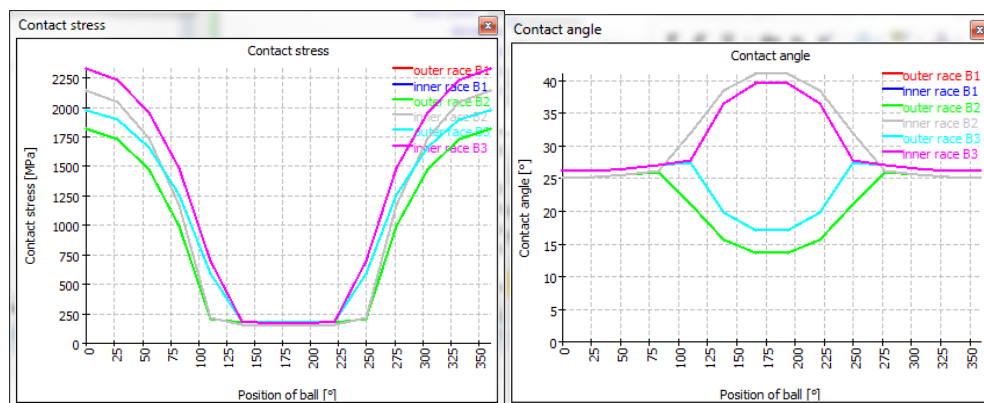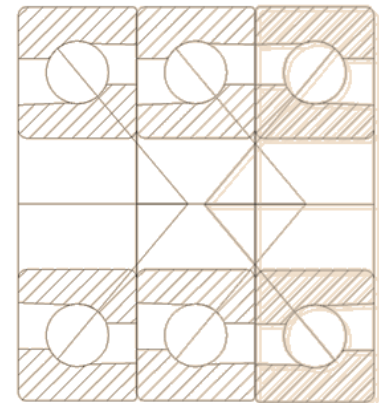
Influence of clearance and pretension

The influence of bearing clearance and pretension of bearing life and load distribution can be evaluated. The nominal clearance can be selected according C2..C4 according to standards or directly provides as number. The bearing tolerance class can be selected as P0..P2 and the tolerances of the shaft and housing according ISO 286. It is also possible to specify the fits as numbers directly. The change of clearance because of fits, thermal effects and centrifugal loads then determine the operating clearance.

High speed

Mostly the bearing inner race is higher loaded then the outer ring. For high speed this can change because of centrifugal load. The contact angle will be changed too.
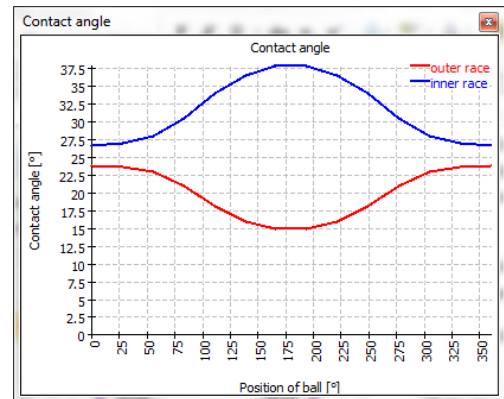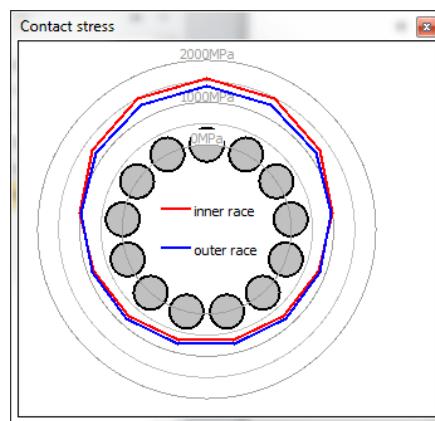
Support of a planet gear using several cylindrical roller bearings

Planetary gears in planet gears sets can be supported using several cylindrical roller bearings Using helical gears will lead to a tilting moment in addition to the radial load. This tilting moment has to be supported by the bearing set. The bearing clearance has an influence on the tilting angle which should be minimal for the gear contact and also on the load distribution in the bearing which also dislikes tilting. Here an example of the load distribution in a set of three cylindrical rolling bearings with different clearance is shown:
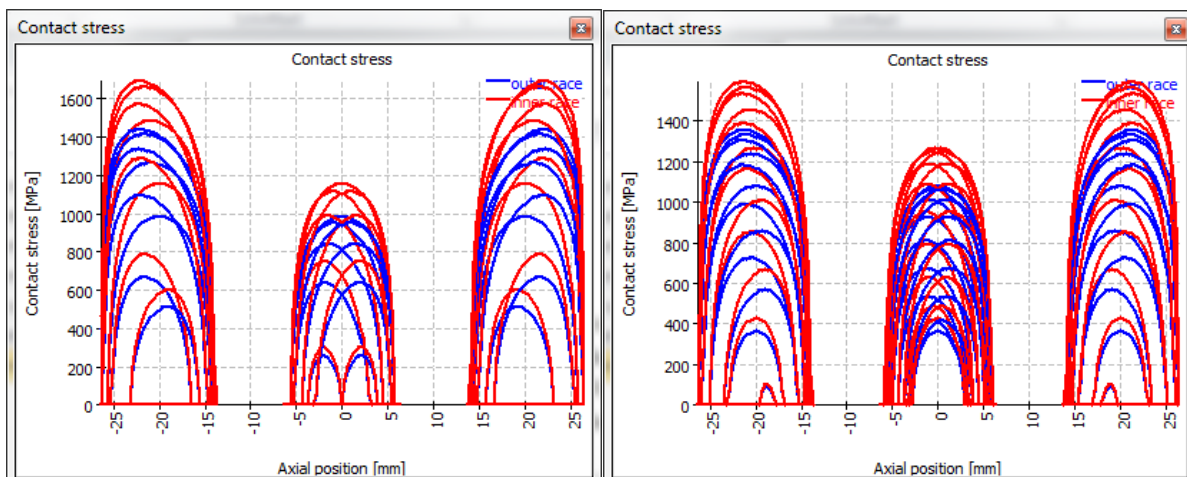
Slewing rings with four point bearings

Different bearing types are used for large slewing rings: Four point bearings with one or two rows and roller bearings having three sets of rollers. The configuration with one or two row four point bearings can be analyzed using the software.

Important results are the contact stresses, the friction torque, and the shear stress below the surface to determine the necessary hardness depth.

Reduced hardness of the races will be taken into account according NREL DG03 guideline for the calculation of life and static safety.

The contact stress id calculated on all four (or eight) contact points. So you will see if and how often a 4 point contact occurs.

Several load cases can be considered in one calculation using load spectra.
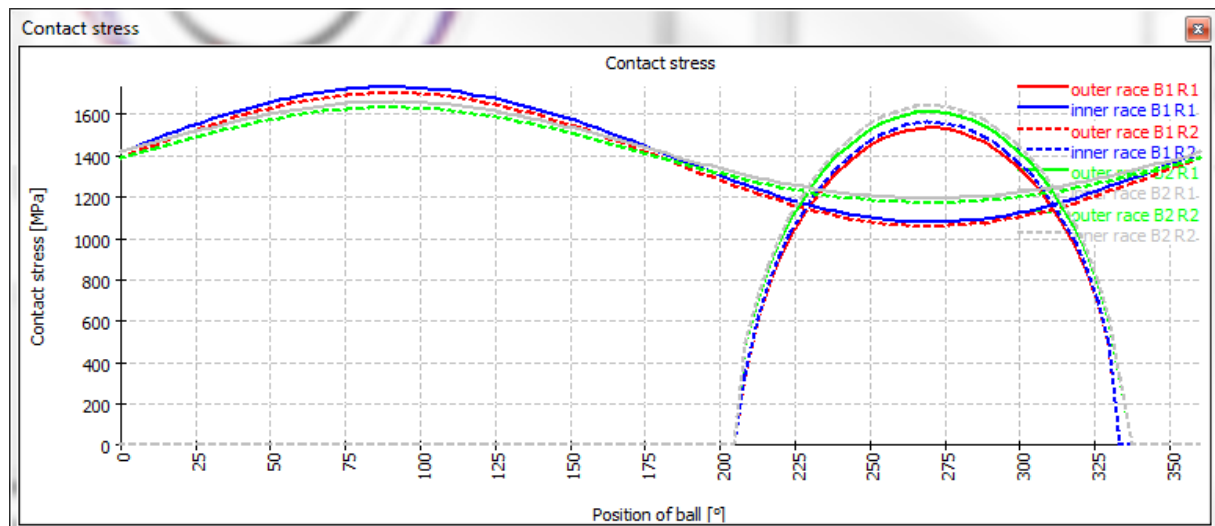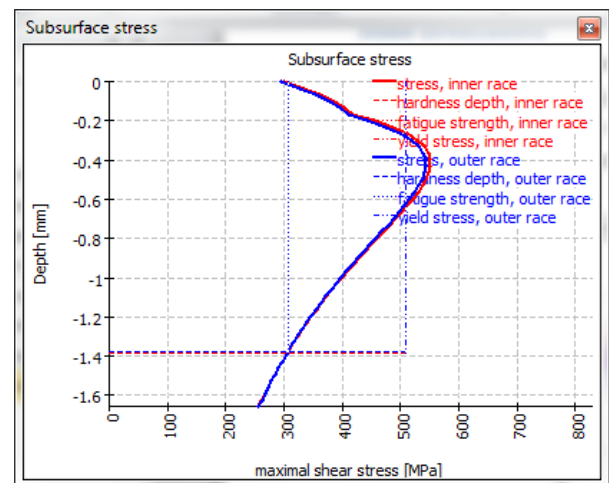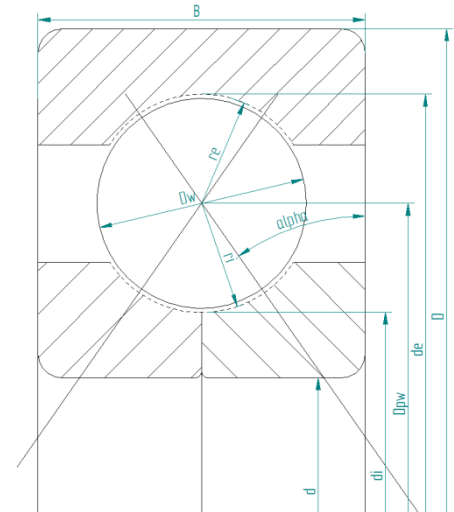
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A demo version and the software documentation are available as download on the website. Please ask for a test version without restrictions.