

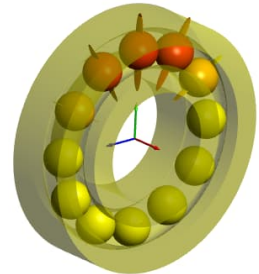
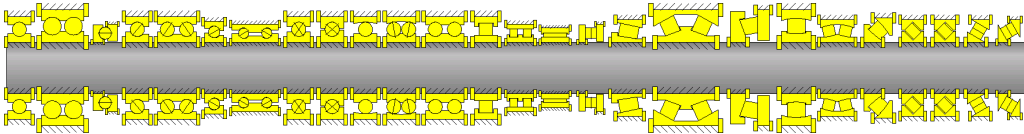
Tutorial Series

Rolling Bearing Calculation - Starter Essential

Operation – Settings – Results

Content

This tutorial provides a practical introduction to the key functions of the MESYS Rolling Bearing Calculation software. The goal is to help new users quickly become familiar with the core features and typical workflows. The version used in this guide is MESYS 12-2024.



General

Please refer to the corresponding section of the online manual for detailed information on the settings under the “General” tab.

For the purposes of this tutorial, keep the default settings after launching the rolling bearing calculation module.



Conclusion, Key Takeaway



Call to Actions

General
Bearing geometry
Bearing configuration
Material and Lubrication
Loading
Track roller

mesys

Engineering Consulting Software AG

Rolling Bearing Calculation

Project name

Calculation description

Settings

Reliability

\$

90

%

Limit for aISO

aISOmax

50

Friction coefficient

μ

0.1

☐ Calculate lubricant film thickness
 ☒ Consider centrifugal force
 ☐ Consider temperature gradient in fits
 ☐ Oscillating bearing
 ☒ Calculate required hardness depth
 ☒ Use fatigue strength for hardness depth

Required subsurface safety

Ssmin

1

Calculation for medium clearance

Rolling element has maximum temperature

First rolling element on y-axis

Gyroscopic moment is not considered

Rolling element set life is not calculated

Elastic ring expansion is not considered

☐ Use load spectrum
 ☒ Calculate modified life
 ☐ Use extended method for pressure distribution
 ☒ Calculate static safety factor based on stress

Figure 1

Figure 1

Bearing geometry

Here you have the option to select a rolling bearing directly from the software's internal database, using filters for bearing type and diameter.

Figure 2

for bearing type and diameter.

General **Bearing geometry** Bearing configuration Material and Lubrication Loading Track roller

Deep groove ball bearing

Inner diameter mm

Outer diameter mm

Dynamic load rating ☒ Fatigue load limit kN

Static load rating ☐ CDr kN

Cur kN

Fatigue load limit

Bearing clearance

Diametral clearance

User input as operating clearance mm

From database

User input as operating clearance

User input

User input as range

ISO 5753 - C2

ISO 5753 - CN

ISO 5753 - C3

ISO 5753 - C4

ISO 5753 - C5

Select bearing from database

Enter outside geometry only

Enter outside geometry and load capacity

Enter inner geometry

Enter inner geometry and load capacity

Select bearing from database

Five modes are available for the geometric definition of the rolling bearing, using load ratings from the database, from calculation, or from user input.

A wide range of basic bearing types can be selected via the dropdown menu.

The radial clearance (Pd) can be entered manually or selected as a clearance class according to ISO 5753.

For bearings with contact angle or axial bearings, you can define either an axial clearance (Pa) or apply a preload (Fp).

Calculation of Axial clearance Pa

Mounted axial clearance Pam mm

Effective axial clearance Paeff mm

Pretension force Fp N

Unmounted pretension force Fpu N

Mounted pretension force Fpm N

Effective pretension force FpEff N

OK Cancel

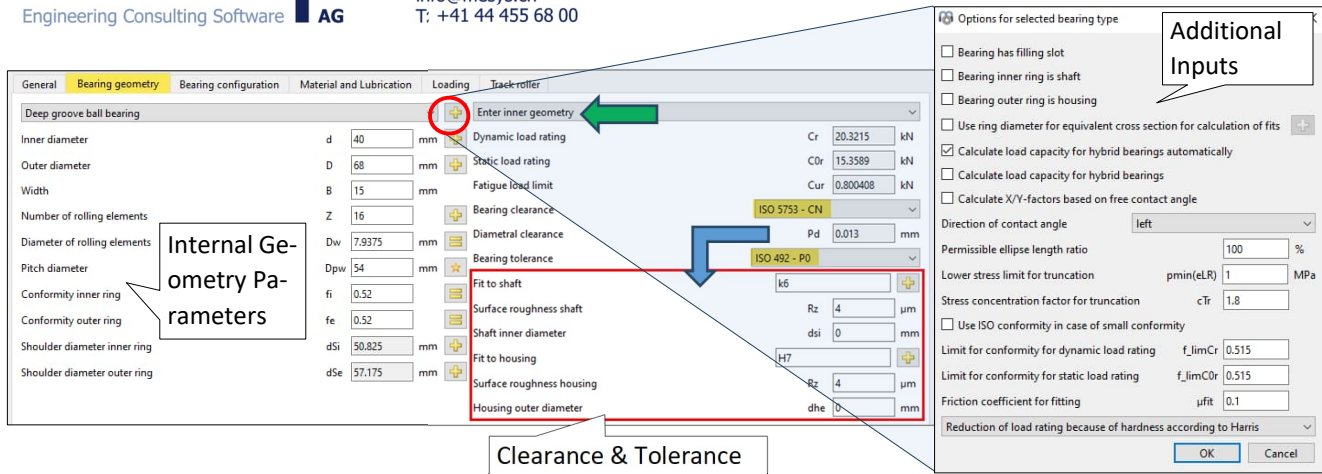


Figure 3

Bearing configuration

A generic angular contact ball bearing 7308B is to be paired or considered as a double-row bearing of the same type:

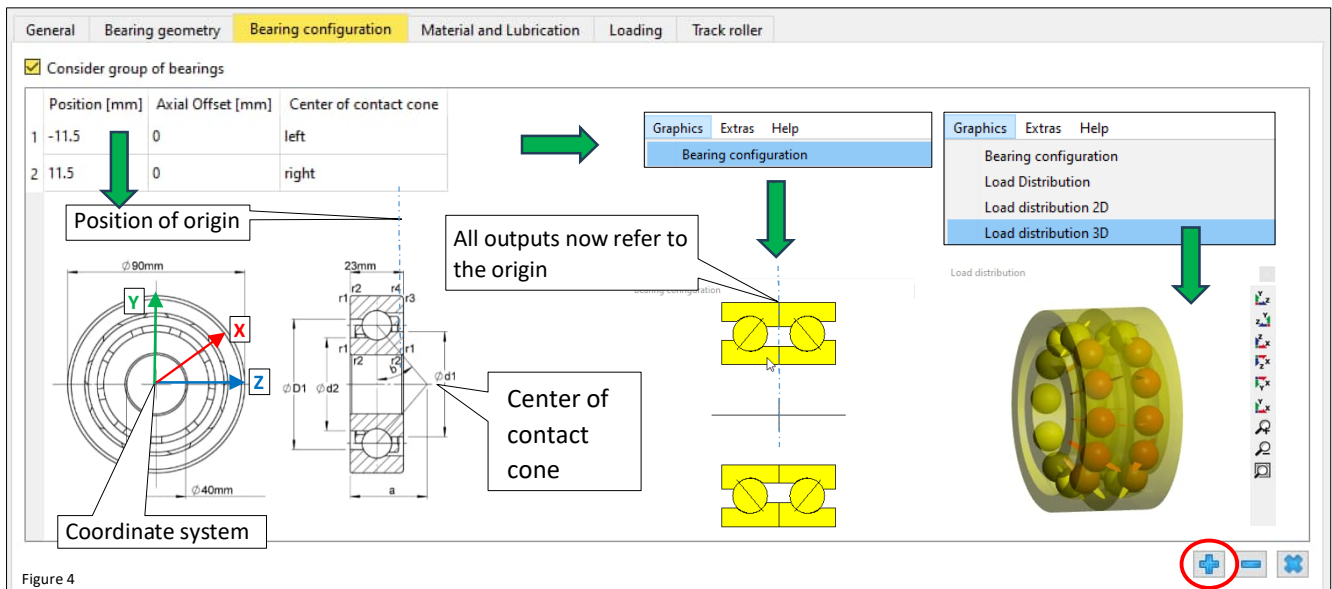


Figure 4

➡ Select the generic 7308B and activate 'Consider bearing set'. Define the Positions and orientations of contact cone Centers by adding rows using the button +, as shown in Figure 4.

Material and Lubrication

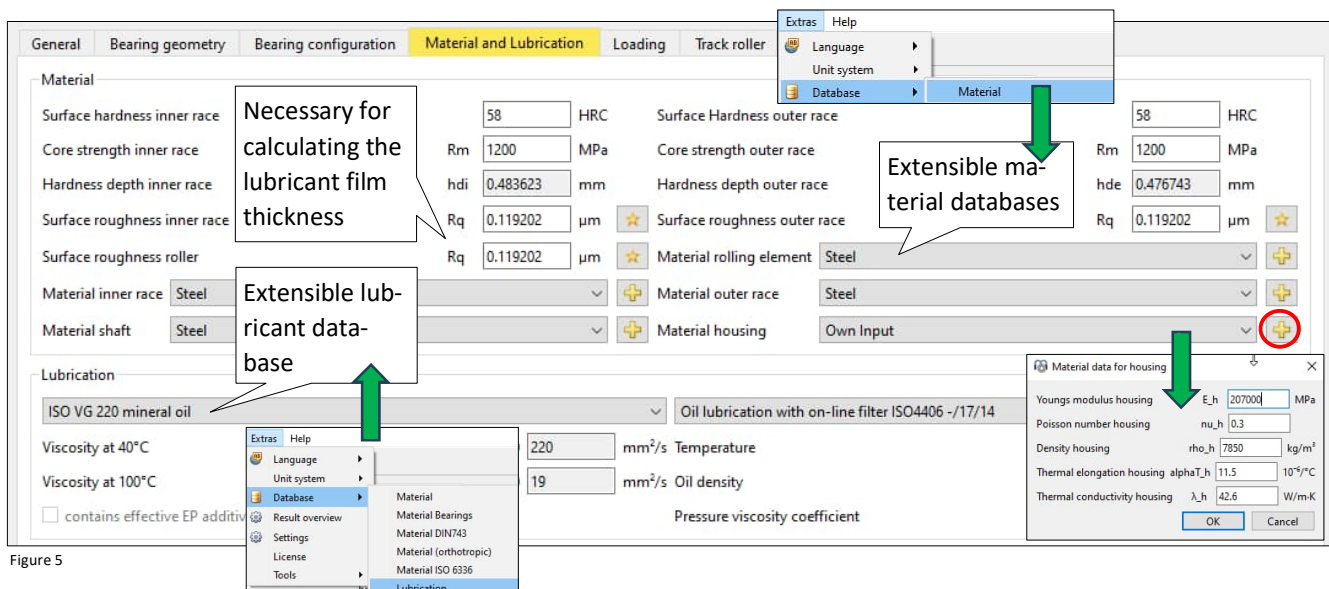


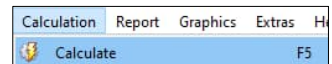
Figure 5

Loading

- ➔ For each coordinate direction, either a force or a displacement (ux) can be specified as needed (see Figure 6). If the ring used to apply preload on our angular contact bearing is assumed to be fixed, the axial displacement (ux) can be set to zero, and the resulting reaction force in the axial direction (Fx) will be calculated.
- ➔ A moment load or a tilt can only be defined in two directions, since rotation around the bearing axis (X) cannot be constrained.

Calculation

The calculation can be started using the ⚡ button, the F5 key, or the corresponding menu item.



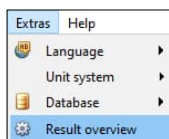
- ➔ Please always check the icon in the bottom right corner, which confirms that the calculation has been executed and is up to date.
- ➔ Apply the loads as shown in Figure 6 and start the calculation with an axial clearance $P_a = 0$ mm.

Results

Result overview

This overview provides various details about the bearing condition at the bottom of the user interface.

- ➔ The contents can be edited via the 'Extras' menu.



Result overview			
Modified reference rating life	Lnmrh	431669	h
Static safety factor	SF	12.1782	
Reference load	Pref	4897.41	N
Static load rating, system	Crsys	53322.6	N
Effective diametral clearance	Pdeff	0.26203	mm
Maximum spin to roll ratio	maxSpinToRoll	0.216789	
Basic reference rating life	L10r	2171.89	
Ellipse length ratio outer race	eLR_e	154.469	%
Extension contact ellipse outer ring	dCemin	73.6787	mm
Maximal pressure	pmax	1825.53	MPa
Static safety factor (ISO 17956)	S0eff	12.2561	
Dynamic load rating, system	Crsys	63422.8	N
Viscosity ratio	κ	1.74593	
Effective axial clearance	Paeff	0	mm
Maximum contact angle difference	Δα	31.1473	°
Ellipse length ratio inner race	eLR_i	151.673	%
Extension contact ellipse inner ring	dCimax	57.7444	mm
Effective free contact angle	α0eff	40	°

Figure 7

Graphics

- ➔ Various graphical representations can be loaded via the 'Graphics' menu.
- ➔ Open the graphics for load distribution 3D, Contact Stress, Subsurface stress, and Reliability as shown in Figure 9.

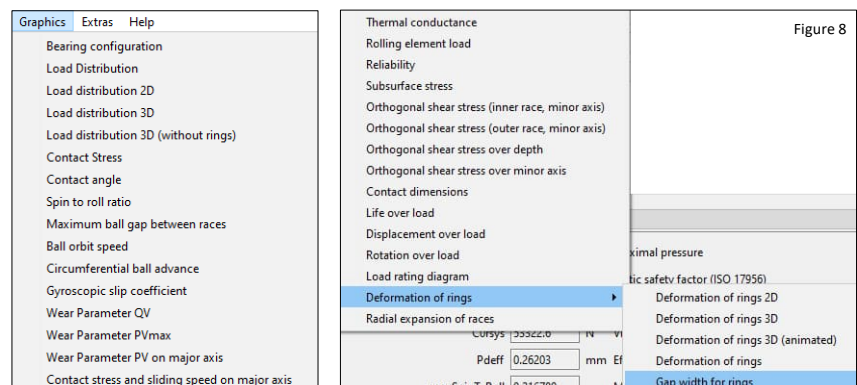


Figure 8

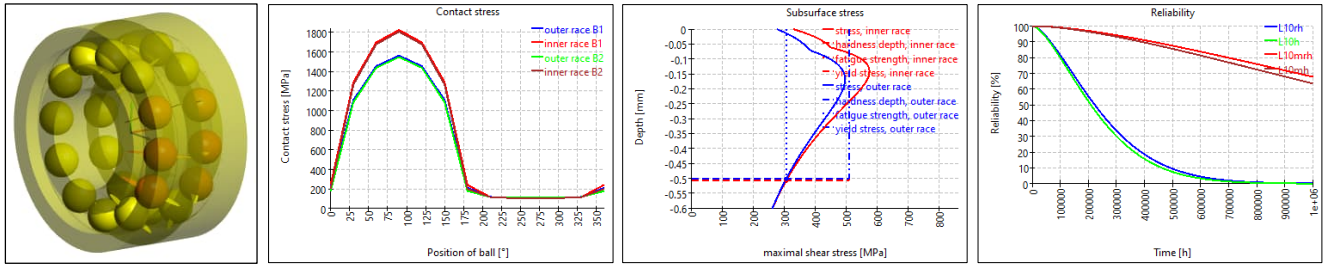


Figure 9

Now enter an unmounted preload F_{pu} of 1000 N as shown in Figure 10.

Compare the results prior to and after the change.

Figure 10 shows the 'Calculation of Axial clearance Pa' dialog box. The 'Unmounted pretension force' F_{pu} is set to 1000 N. Other parameters include Mounted axial clearance P_{am} , Effective axial clearance P_{eff} , Pretension force F_p , Mounted pretension force F_{pm} , and Effective pretension force F_{pEff} .

Figure 10

Parameter variation

By using parameter variation, you can analyze which value of axial clearance yields the best performance for a given application scenario.

Figure 11 shows the 'Calculation' menu with 'Parameter variation' selected. Below it is the 'Parameter list' table:

Parameter	Start value	End value	Number of steps
1 Pa [mm] (Nominal axial clearance)	0	-0.015	15

Figure 11

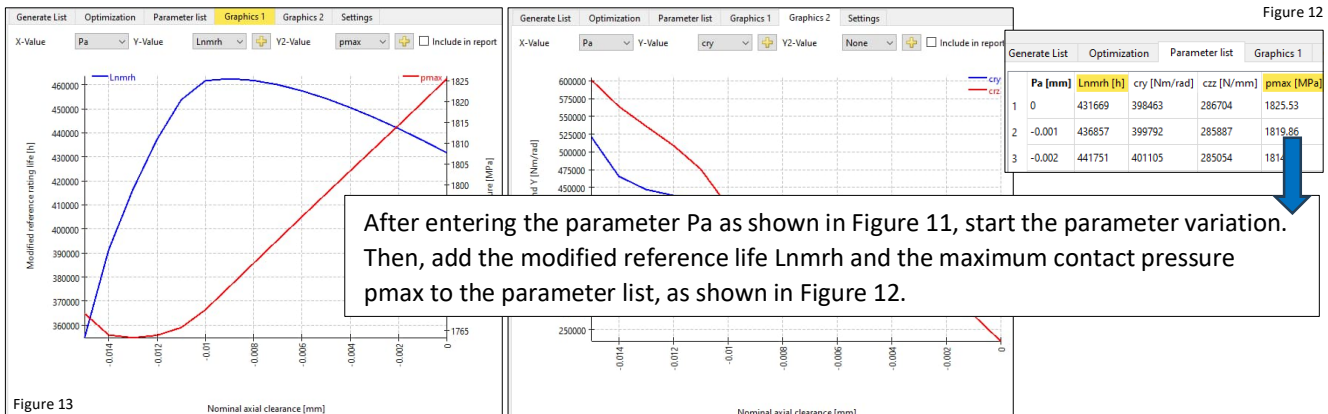


Figure 12

After entering the parameter P_a as shown in Figure 11, start the parameter variation. Then, add the modified reference life L_{nmh} and the maximum contact pressure p_{max} to the parameter list, as shown in Figure 12.

Deactivate the checkbox for 'Consider bearing set' (see Figure 4).

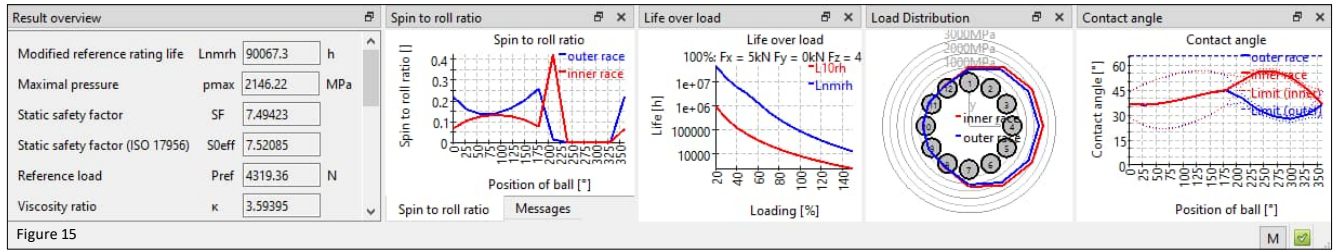
Figure 13 shows the 'Loading' tab in the software interface. The 'Loading' tab is active, showing various input fields for axial load, radial load, moment, speed, and temperature. The 'Consider bearing set' checkbox is deactivated.

Figure 13

Assign the values under 'Loading' according to Figure 14.

Run the calculation:

Drag the graphics to the lower area next to the results overview, as shown in Figure 15.



- ➡ Modify the inputs under 'Loads' and observe the changes in the graphics.
- ➡ Activate the load spectrum and check the corresponding box under the 'General' tab ☒ Use load spectrum (see Figure 1).

- ➡ Enter a load spectrum as shown in Figure 16 by adding entries using the **+** button.

Results for No 1

General	Bearing geometry		Bearing configuration		Material and Lubrication		Loading	Track roll			
	Frequency	Fx [N]	Fy [N]	Fz [N]	ry [mrad]	rz [mrad]	ni [rpm]	ne [rpm]	T _i [°C]	T _e [°C]	TOil [°C]
1	0.333333	5000	0	4500	0	1	1500	0	20	20	70
2	0.333333	5500	0	5000	0	1	1600	0	22	20	70
3	0.333333	6000	0	5500	0	1	1700	0	24	20	70

Figure 16

- ➡ Compare the results in the results overview and in the graphics for the three load spectrum elements.

MESYS wishes you an instructive and profitable experience with our tutorials. If you have any queries, suggestions or questions, please do not hesitate to contact info@mesys.ch.