

# **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	on Loa	ding T	rack roller					
Rolling Bearing Calculation									
Project name									
Calculation description									
Settings									
Reliability	S	90	%	Calculation for medium clearance	~ (J)				
Limit for alSO	alSOMax	50		Rolling element has maximum temperature	~				
Friction coefficient	ц	0.1		First rolling element on y-axis	✓ 4.5				
Calculate lubricant film thickness				Gyroscopic moment is not considered	~				
Consider centrifugal force				Rolling element set life is not calculated	~				
Consider temperature gradient in fits				Elastic ring expansion is not considered	~				
Oscillating bearing				Use load spectrum					
Calculate required hardness depth				Calculate modified life					
Use fatigue strength for hardness depth				Use extended method for pressure distribution					
Required subsurface safety	Ssmin	1		Calculate static safety factor based on stress	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.



Engineering Consulting Software	AG MESYS AG Technoparkstrasse 1 CH–8005 Zürich info@mesys.ch T: +41 44 455 68 00		Options for selected bearing type  Bearing has filling slot
General Bearing geometry Bearing configuration Materia	and Lubrication Loading Track-roller		Bearing inner ring is shaft
Angular contact ball bearing		~	Bearing outer ring is housing
Inner diameter	d 40 mm N Dynamic load rating	Cr 15.8297 kN	Use ring diameter for equivalent cross section for calculation of fits
Outer diameter	D 68 mm G Static load rating	C0r 10.5592 kN	☑ Calculate load capacity for hybrid bearings automatically
Width	B 15 mm Fatigue load limit	Cur 0.55028 kN	Calculate load capacity for hybrid bearings
Number of rolling elements	Z 11 Bearing clearance	User input as operating clearance $\vee$	Calculate X/Y-factors based on free contact angle
Diameter of rolling elements Internal Ge-	Dw 7.9375 mm Axial clearance	Pa 0 µn	Direction of contact angle left ~
Pitch diameter Omotry Pa-	Daw 54 mm		Permissible ellipse length ratio 100 %
Contact apple	~ 0 · 6	Calculation of Axial clearance Pa X	Lower stress limit for truncation pmin(eLR) 1 MPa
Conformity inner ring	fi 0.52	Mounted axial clearance Pam 0 mm O	Stress concentration factor for truncation cTr 1.8
Conformity outer ring	fe 0.52	Effective axial clearance Paeff 0 mm O	Use ISO conformity in case of small conformity
Shoulder diameter inner ring	dsi 0 Avial Clearance	Pretension force Fp 1000 N	Limit for conformity for dynamic load rating f_limCr 0.515
Shoulder diameter outer ring		Unmounted pretension force Fpu 0 N O	Limit for conformity for static load rating f_limC0r 0.515
	(Pa) Depending	Mounted pretension force Fpm 0 N O	Friction coefficient for fitting µfit 0.1
	on Preload (Fp)	Effective pretension force FpEff 0 N O	Reduction of load rating because of hardness according to Harris $\sim$
		OK Cancel	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:

![](_page_1_Figure_4.jpeg)

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**

![](_page_1_Figure_7.jpeg)

![](_page_2_Picture_0.jpeg)

#### 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.

Gener	al	Bearing geometry	Bearing configuration	Material and L	ubrication	Load	ing	Track roller					Figure 7
Axia	l load	i		Fx	100	N	۲	Displacement			ux	0.262831	] µm ()
Radi	al loa	d		Fy	0	Ν	۲	Displacement		Ý	uy	0	mm O
Radi	al loa	d		Fz	5000	Ν	۲	Displacement	Load or di	splacement	uz	0.0192696	mm O
Mor	nent			My	2.83925	Nm	0	Rotation angle		placement	ry	0	mrad 🖲
Mor	nent			Mz	0	Nm	0	Rotation angle			rz	0	mrad 🖲
Spee	ed inr	ner ring		ni	550	rpm	I	Inner ring rotates to	load				
Spee	ed ou	ter ring		ne	0	rpm		Outer ring rotates to	o load				
Tem	perat	ure inner ring		Ti	20	°C		Temperature outer ring	1		Te	20	] °C

## Calculation

Calculation Report Graphics Extras The calculation can be started using the 🚯 button, the F5 key, or the correspon-G Calculate ding 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 Pa = 0 mm.

Axial clearance	Pa	0	μm
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#### **Results**

**Result overview** 

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

![](_page_2_Figure_13.jpeg)

distribution 3D, Contact Stress, Subsurface stress, and Reliability as shown in Figure 9.

Circumferential ball advance	Load rating diagram
Gyroscopic slip coefficient	Deformation of ring
Wear Parameter QV	Radial expansion of
Wear Parameter PVmax	
Wear Parameter PV on major axis	
Contact stress and sliding speed on major axis	maxSni

eformation of rings

Radial expansion of races

15VS 100022.0

mm Ef

N

Pdeff 0.26203

maxSpinToRoll 0.216789

Circumferential ball advance

c safety factor (ISO 17956)

Deformation of rings 2D

Deformation of rings 3D

Deformation of rings

Gap width for rings

Deformation of rings 3D (animated)

Н

F5

![](_page_3_Picture_0.jpeg)

![](_page_3_Figure_1.jpeg)

![](_page_3_Figure_2.jpeg)

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

General Bearing geometry	Bearing configuration Ma	aterial and Lubrication	Loading Track roller		Bild 14
Avial land		F 5000			10 1171
Axiai load		FX 5000			ux 10.1171 μm Ο
Radial load	Assign the val-	Fy 0	N ( Displacement	Run the calcu-	uy 0.0265106 mm ()
Radial load	ues under	Fz 4500	N	lation: 73	uz 0.029306 mm 🔾
Moment	'Loading' ac-	My 119.302	Nm O Rotation angle		ry 0 mrad 🖲
Moment	cording to Fig-	Mz 9.06963	Nm O Rotation angle		rz 1 mrad 🖲
Speed inner ring	ure 14.	ni 1500	rpm 🗹 Inner ring rotates to load		
Speed outer ring		ne 0	rpm 🔲 Outer ring rotates to load		
Temperature inner ring		Ti 20	°C Temperature outer ring		Te 20 °C

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

![](_page_4_Picture_0.jpeg)

Result overview	5 Sp	in to roll ratio 🛛 🗗 🗙	Life over load 🗗 🛪	Load Distribution 🗗 🗙	Contact angle 🗗 🗙				
Modified reference rating life         Lnmrh         90067.3         h           Maximal pressure         pmax         2146.22         MPa           Static safety factor         SF         7.49423	^	Spin to roll ratio	Life over load 100% Fx = 5kN Fy = 0kN Fz = 4 L10rh 1e+07 1e+06 1e+06	SULUMPa 2000MPa 3000M0 3000M0 -inner_res	Contact angle outer race outer race outer race time to be unit (inner to be to be				
Static safety factor (ISO 17956) S0eff 7.52085		00x52222222222222	10000	-outer pe	to 15				
Reference load Pref 4319.36 N		Position of ball [*]	20 60- 120- 120- 140-		32555555555555555555555555555555555555				
Viscosity ratio K 3.59395	~ 5	Spin to roll ratio Messages	Loading [%]		Position of ball [*]				
Figure 15 M 🜌									

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.

![](_page_4_Picture_6.jpeg)

											F	igure 16
G	en	eral Bear	ing geor	metry	Bearin	ng configur	ation N	laterial an	d Lubricati	on L	oading	Track roll
		Frequency	Fx [N]	Fy [N]	Fz [N]	ry [mrad]	rz [mrad]	ni [rpm]	ne [rpm]	Tj [°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

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 .