# Shaft and Bearing Calculation with TIMKEN Cloud Services



**Basic Training** 



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#### Introduction

- KISSsoft® is a calculation program for the design, optimization and verification of machine elements according to international standards.
- Supports numerous machine elements.
- Has 3 modules where rolling bearings can be calculated.
- TIMKEN Cloud Services can be used within the Shaft calculation module.

		~
✓ Syste	em modules	Î
K	KISSdesign	
✓ Base	modules	
~ G	ears	
~	Cylindrical gears	
	Single gear	
	Cylindrical gear pair	
	🖄 Pinion with rack	
	🛞 Planetary gear	
	🔆 🛱 Three gears train	
	출출 출출 Four gears train	
~	Other gears	
	Bevel and Hypoid gears	
	Face gears	
	Worms with enveloping worm wheels	
	Crossed helical gears and Precision mechanic	
	Beveloid gears	
	Non circular gears	
~ s	hafts and Bearings	
	$\frac{\downarrow}{\bigtriangleup}$ Shaft calculation	
	Rolling bearing ISO 281, ISO 76	
	Rolling bearing ISO/TS 16281	
~	Plain bearing	
	Hydrodynamic plain journal bearing	
	原則 面前 Hydrodynamic plain thrust bearing	
× C	onnections	
	Bolts and pins	
Madulaa	Projects Element Tree	_

#### Requirements

- KISSsoft release 2022
- Valid Timken account
- Basic knowledge about KISSsoft
  - Use tutorials (1-5)
  - Use manual (6, 7)



- When calculating bearings acc. to ISO/TS 16281 one must know internal geometry of the bearing (Z, Dw, Dpw, Lwe, etc.).
- Calculation is more precise if we have exact internal geometry → TIMKEN cloud services!
- Unknown internal geometry will be estimated by KISSsoft based on known external dimensions and bearing capacities C<sub>0</sub> and C.
- It has no effect on bearing calculation acc.
  to ISO 76/ISO 281.





- You must have a valid TIMKEN account. If you don't have one, you can create it from the TIMKEN log-in page (see next slide).
- In KISSsoft main window go to Extras (1) and choose Timken Cloud Services (2).
- In a windows that appears confirm Terms of Use (3) and click Sign in with Timken (4) account.





### Enabling TIMKEN cloud services (2/4)

- A default web browser should open, and a login page should appear in it.
- If you don't have a TIMKEN account yet, click on Don't' have an account yet? (1) and follow the procedure to create an account.
- Then enter username (2) and password
  (3) that you have selected when registering to Timken cloud services and click on Sign in (4) button.
- A new page should open where button
  Grant Consent (5) must be clicked.
- If signing in was successful a new page should appear which can be closed (6).





#### Enabling TIMKEN cloud services (3/4)

- Now go to KISSsoft where sign in window should says that you are signed in into Timken cloud services.
- Close the windows by clicking button Close (1).





- Open Shaft module or choose an existing example.
- Select menu Calculation (1) and click on Settings (2).
- A window with Module specific settings will open.
   Select tab Rolling bearings (3).
- Enable Timken Cloud
  Services (4) and Use
  proprietary bearing internal
  geometry (5).

		F0		K Module specific se	ttings			? ×	0228-57	entt
mant Trans E V	2D Viewer								NJJ	SUIL
mentiree or A	3D viewer	enerating enoug		Cal 3 Rollin	ig bearings Reliabilit	y Shaft editor and 3D view	er			ShartD
)verview ~	Final line medi	operating speed		General						
✓ III Shaft	Campball diage			Display critical b	earing					1 🖤 Sł
✓ Outer co	Campbel diagr			Display rating life	n in crientific notation					
2 📃	Porceu respons	æ			e in sciencific notadori					
	Nab			✓ Save user define	ed bearings in calculation	n nie				
	Rough sizing			Read user-defin	ed rolling bearings from	calculation file				
Inn 2	Settings			Define lubricatio	n for each bearing indiv	dually				
Y Force	arrier contour		Z	Axial clearance (clas	sical calculation) u	A	0.0100	mm Ç		
<u> </u>				Failure probability	r		10.0000	%		
1⊒1 ··· ⊻ Bearing	Forces			Required service life		h	5000.0000	l h		
2	<b>4 4</b> "		1	Maximum life modifie	ation factor	150 mm	50.000	i		
8	<u>x</u> x "			Plaximum me mount	Character c	ISO,Max				
✓ Cross se	Bearing		4	Surface roughness of	or nousing	N/ KZ=8.0 (Turned )	with diamond)	·		
· · ·	📤 🗟 »			Timken Cloud Se	rvices: Use proprietary	internal geometry data (used f	or calculation only, not available for repor	ts and similar)		
#	Cross sections	×		Use proprietary	bearing internal geome	ry data, if available (only of ca	lculation, not visible in reports or similar)			
÷		×	5	SKE						
Connecting el				SKE coherical rol	lar thrust baarings: Vari	ations in concentricity in the he	aring system can affect load distribution			
					el li condicionario del		anny system can an eccloud distribution.	0		
				SKF Cloud Servic	es: Calculate ISO and S	KF rating life and various other	bearing performance parameters	Ŷ		
				SKF Cloud Servic	es: Use SKF bearing sti	ffness and calculate ISO/TS 16	281 reference rating life	ç		
				Grease lifetime						
		E	and shall be	Calculation method		None	~			
		Porce and support	symbol size							
		Results (basic calcula	tion)	Friction					5 ×	
				Calculation method		SKF Catalog 2018	~			
		maximum deflection		Take oil level int	o account					
∃∃		maximum equivaler	it stress	Oil level	hat		-30.0000 mm	ç		
T. E		minimum bearing ra	ting life	Lubrication		Oil bath lubrication	~	-		
		minimum fatigue sa	fety							
Tutoriale 2022		minimum static safe	ty	sears torque loss		SNF main catalog according	to chosen calculation method V			
Gear pair			Safeties	Bearing manufacture	a.					<
Planetary gear		A-A	3.65	FAG	NSK	V INA	KRW			
Worms with		B-B	3.80	Timken	SKF	Kovo	- RKB		-	~
t Tu ◀ >		Messages Res	ilts (basic calculat				Others			<





# Several reports are available





#### Calculation example

#### "Normal" rolling bearing

3.3 Bearing		
3.3.1 Rolling bearing (TIMKEN)	32010X-32010X)	
Bearing inner geometry data pro	vided by TIMKEN Clou	d Services
TIMKEN 'Fo	r further information, Pl	lease visit www.timken.com
Bearing type		Taper roller bearing (single row)
Bearing position (mm)	[y <sub>lokal</sub> ]	201.000
Bearing position (mm)	[y <sub>plobal</sub> ]	201.000
Attachment of external ring		Set fixed bearing right
Inner diameter (mm)	[d]	50.000
External diameter (mm)	[D]	80.000
Width (mm)	[b]	20.000
Corner radius (mm)	[r]	1.000
Calculation was peformed using r for reports.	eal bearing internal geo	ometry provided by bearing manufacturer. These values are however not available
The bearing pressure angle will b	e considered in the cal	culation
Contact angle (°)	[a]	15.732
Position (center of pressure) (mr	n) [y <sub>D,lokal</sub> ]	189.000
Position (center of pressure) (mr	n) [y <sub>D,global</sub> ]	189.000
Basic static load rating (kN)	[C <sub>0</sub> ]	92.700
Basic dynamic load rating (kN)	[C]	69.800
Fatigue load limit (kN)	[C <sub>u</sub> ]	0.000
Values for approximated geometry	y:	
Basic dynamic load rating (kN)	[C theo]	58.367
Basic static load rating (kN)	[C <sub>Otheo</sub> ]	80.563
Correction factor Basic dynamic I	oad rating	
	[fc]	1.000
Correction factor Basic static load	d rating	
	[fco]	1.000

#### "Connecting" rolling bearing

5 Connections		
o connections		
5.1 Connecting rolling bear	ing (TIMKEN 6210-2RS)	
Bearing inner geometry data	provided by TIMKEN Cloud Serv	ices
TIMKEN	• For further information, Please v	isit www.timken.com
Bearing type	De	eep aroove ball bearing (single row)
Position (mm)	~	45.000
Snaπ 'Snaπ 1' <-> Snaπ 'Snaπ	Z	
Fixed bearing	1-1	50.000
Inner diameter (mm)	[0]	50.000
External diameter (mm)	[0]	90.000
vvidtn (mm)		20.000
Corner radius (mm)	[7]	1.100
Basic dynamic load rating (kN		35.100
Basic static load rating (KN)		23.200
Fatigue load limit (KN)	[C <sub>u</sub> ]	0.000
Basic dynamic load rating (kN	) [C <sub>theo</sub> ]	35.074
Basic static load rating (kN)	[C <sub>0theo</sub> ]	23.180
Correction factor Basic dynan	nic load rating	
	[fc]	1.000
Correction factor Basic static	load rating	
	[f <sub>co</sub> ]	1.000
Calculation was peformed usi for reports.	ng real bearing internal geometry	provided by bearing manufacturer. These values are however not availabl
Nominal diametral clearance* (*) ISO 5753-1:2009 C0	(µm) [Pd]	14.500
Nominal axial clearance (µm)	[Pe]	191.363



#### 7.5 Rolling bearing 'Connecting rolling bearing'

Position (Y-coordinate)	[y]	45.00 mm
Dynamic equivalent load	[P]	7.05 kN
Static equivalent load	[P <sub>0</sub> ]	7.05 kN
Minimum EHL lubricant film thickness	[h <sub>min</sub> ]	0.186 µm
Spin to roll ratio	[ω_s/ω_roll]	0.049
Life modification factor for reliability	[a1]	1.000

#### 7.5.1 Results according to ISO 281

Lubricant	ISO-VG 220		
Lubricant with additive, effect on bear	ing lifetime confirmed in tests.		
ubricant - service temperature	[T <sub>B</sub> ]	70.00	°C
Il lubrication, on-line filtration, ISO 44	06 -/19/16		
ad ratio	[C/P]	4.977	
erating viscosity	[V]	48.884	mm²/s
erence viscosity	[V1]	13.887	mm²/s
osity ratio	[K]	3.520	
nodification factor	[a <sub>iso</sub> ]	1.502	
gue load limit	[C <sub>u</sub> ]	1.055	kN
ic bearing rating life	[L <sub>nh</sub> ]	1369.64	h
dified bearing rating life	[Lomb]	2057.22	h
tic safety factor	[S <sub>0</sub> ]	3.29	

7.5.2 Calculation with proprietary	bearing internal geor	netry data (ISO/TS 16281)		
Operating diametral clearance	[Pd]	14.500	μm	
Fatigue load limit	[C <sub>u</sub> ]	1.176	kN	
Reference rating life	[L <sub>nm</sub> ]	1338.98	h	
Modified reference rating life	[Lnmh]	2242.43	h	
Effective static safety factor	[Sow]	3.94		
Static safety factor	[Somet]	3.12		
Static equivalent load	[Pont]	7.45	kN	
Bearing reaction force	[F <sub>x</sub> ]	0.000	kN	
Bearing reaction force	[F <sub>v</sub> ]	1.368	kN	
Bearing reaction force	[Fz]	-7.053	kN	
Bearing reaction force	[F <sub>1</sub> ]	7.053	kN	
Inclination angle	[a <sub>Fr</sub> ]	-89.999	•	
Bearing reaction moment	[M <sub>×</sub> ]	-39.254	Nm	
Bearing reaction moment	[M <sub>v</sub> ]	0.000	Nm	
Bearing reaction moment	[Mz]	-0.002	Nm	
Bearing reaction moment	[M.]	39.254	Nm	
Inclination angle	[a <sub>Mr</sub> ]	-179.997	•	
Displacement of bearing	[ux]	0.002	μm	
Displacement of bearing	[u <sub>v</sub> ]	-101.453	μm	
Displacement of bearing	[Uz]	41.334	μm	
Displacement of bearing	[u <sub>i</sub> ]	41.334	μm	
Inclination angle	[aur]	89.998	•	
Misalignment of bearing	[r <sub>x</sub> ]	0.171	mrad	
Misalignment of bearing	[r <sub>y</sub> ]	-0.000	mrad	
Misalignment of bearing	[ <b>r</b> <sub>z</sub> ]	0.000	mrad	
Misalignment of bearing	[r <sub>c</sub> ]	0.171	mrad	
Oil level	[H]	0.000	mm	
Rolling moment of friction	[M "]	0.235	Nm	
Sliding moment of friction	[M <sub>si</sub> ]	0.228	Nm	
Moment of friction, seals	[M <sub>seal</sub> ]	0.000	Nm	
Moment of friction for seals determine	ed according to SKF m	ain catalog 17000/1 EN:2018		
Moment of friction flow losses	[M <sub>drag</sub> ]	0.000	Nm	
Torque of friction	[M <sub>loss</sub> ]	0.463	Nm	
Powerloss	[Ploss]	72.663	W	
The moment of friction is calculated a	ccording to the details	in SKF Catalog 2018.		
The calculation is always performed	with a coefficient for ad	ditives in the lubricant µbl=0.15.		

(\*) Note about roller bearings with an approximated bearing geometry:

The internal geometry of these bearings has not been input in the database.

The geometry is back-calculated as specified in ISO 281, from C and C0 (details in the manufacturer's catalog).

For this reason, the geometry may be different from the actual geometry.

This can lead to differences in the service life calculation and, more importantly, the roller bearing stiffness.

- Language and units
- Input fields
- Messages
- Restore points
- Navigating report and comparing results
- Use only desired bearing manufacturers
- Define custom bearings
- Load spectrum



### Thank you for your attention!



Sharing Knowledge

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