Shaft and Bearing Calculation

with TIMKEN Cloud Services

Introduction
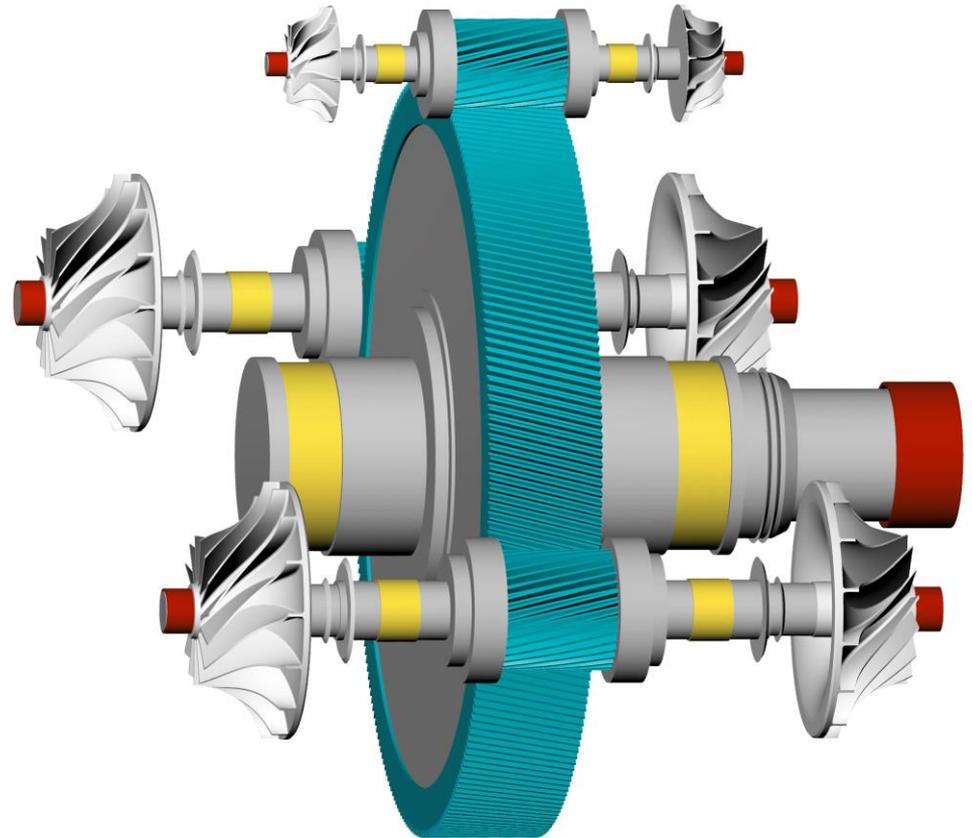
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Introduction

- 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 (1).
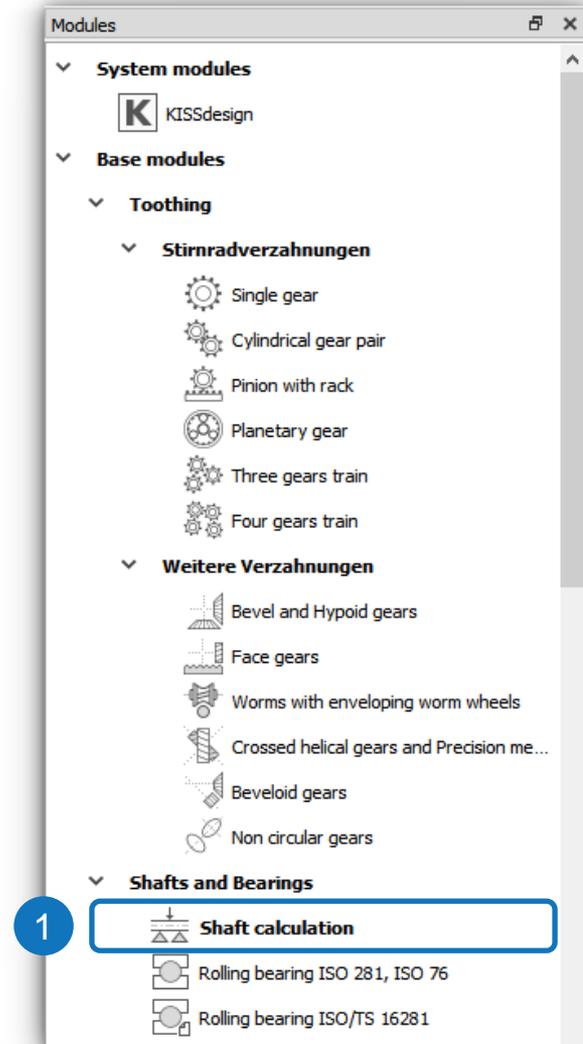
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Requirements

- KISSsoft release 2022

- Valid Timken account

- Basic knowledge about KISSsoft

  - Use tutorials (1-5)

  - Use manual (6, 7)

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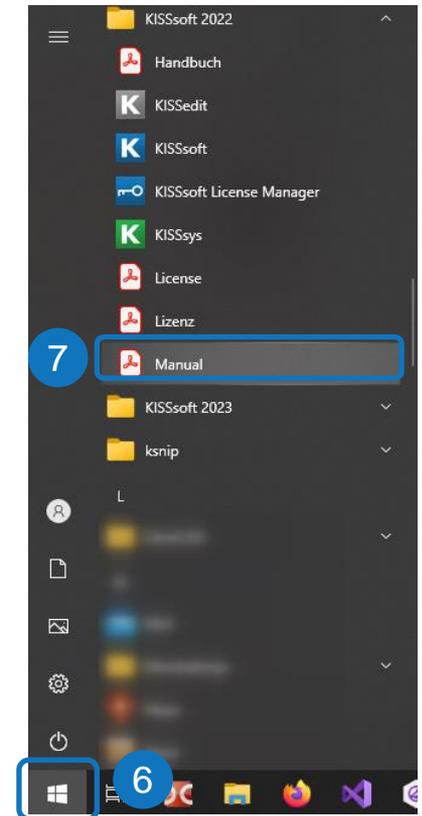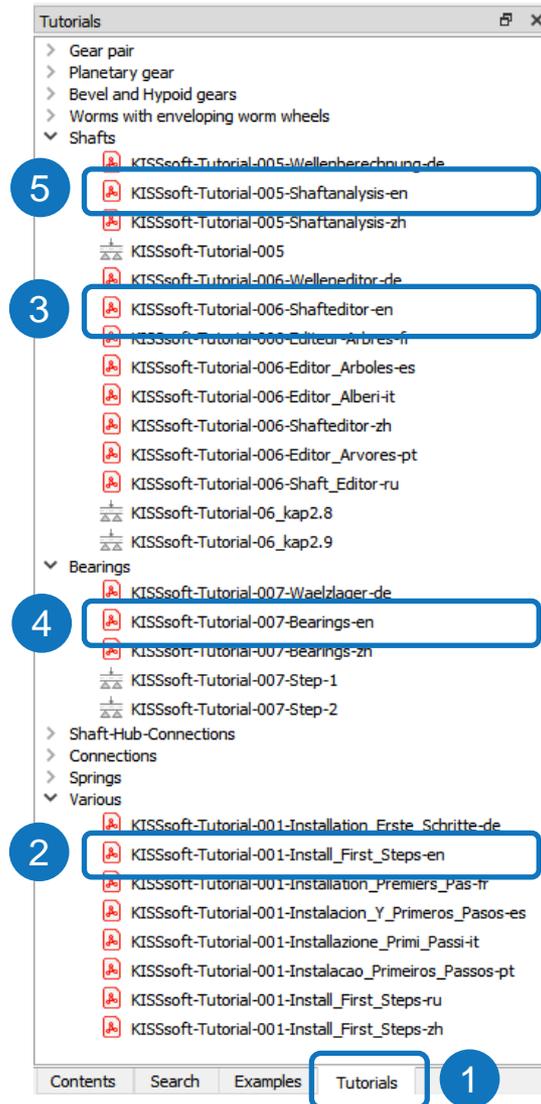
- When calculating bearings acc. to ISO/TS 16281 one must know internal geometry of the bearing (Z, D_w, D_{pw}, L_{we}, etc.).

- 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_0 and C.

- It has no effect on bearing calculation acc. to ISO 76/ISO 281.
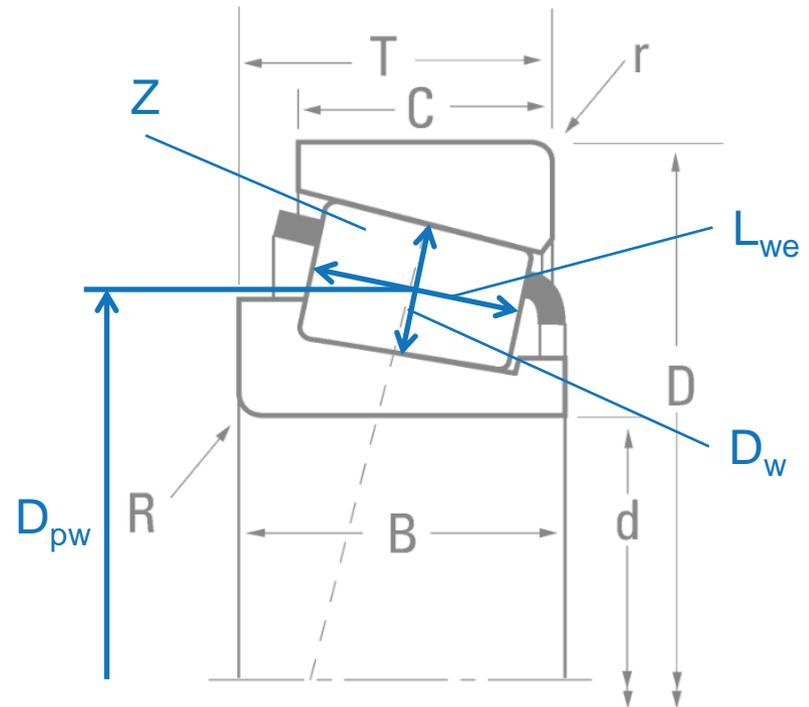
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Connect to TIMKEN (1/4)

- In KISSsoft main window go to Extras (1) and choose Connect with Timken (2).

- A new window will appear.

- If you don't have a valid Timken account, click on Register here (3) to create a new account and follow the procedure described in the next slide.

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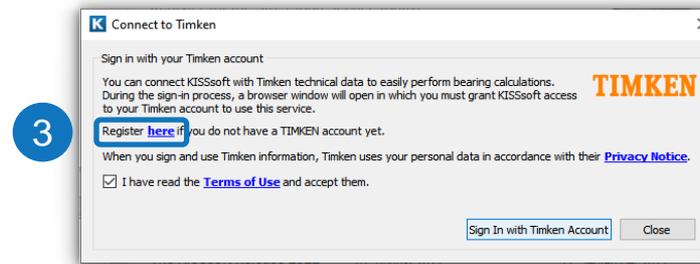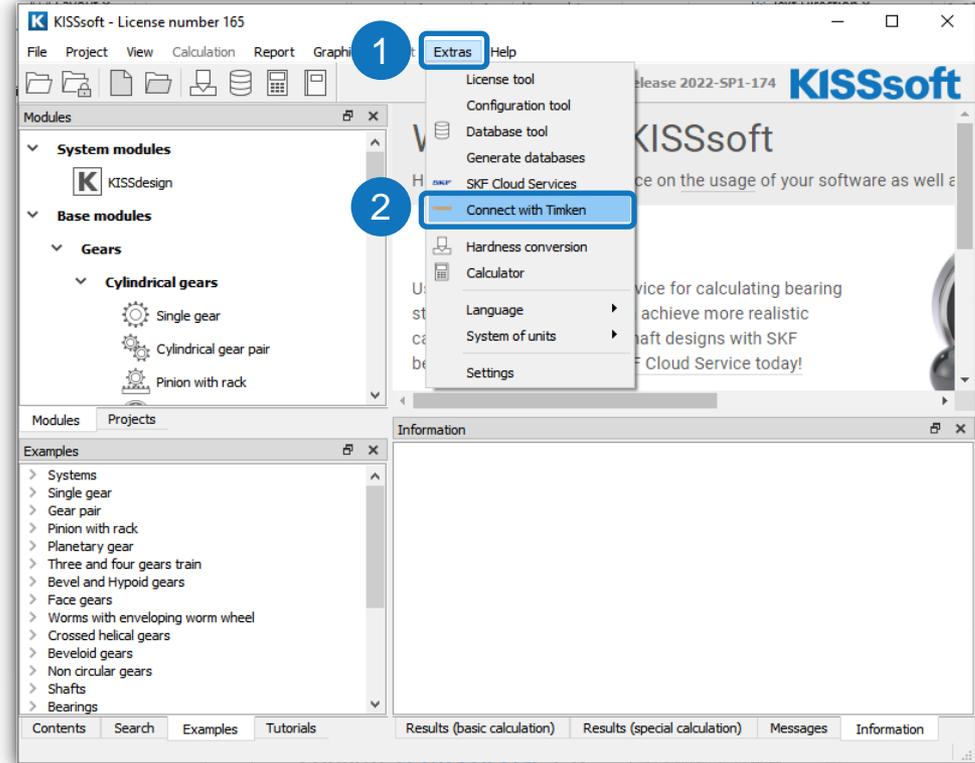
Creating a new TIMKEN account

- Fill in the necessary data, accept Terms and conditions (1) and click on Sign up (2).

- In a new window that appears click on OK (3) and wait for the account registration to be confirmed by email by Timken company.

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- Once you have a valid and confirmed TIMKEN account go back to KISSsoft.

- In a window Connect to Timken confirm Terms of Use (1) and click on Sign In with Timken Account (2).

- A default web browser will open, and a login page will appear as shown in the next slide.

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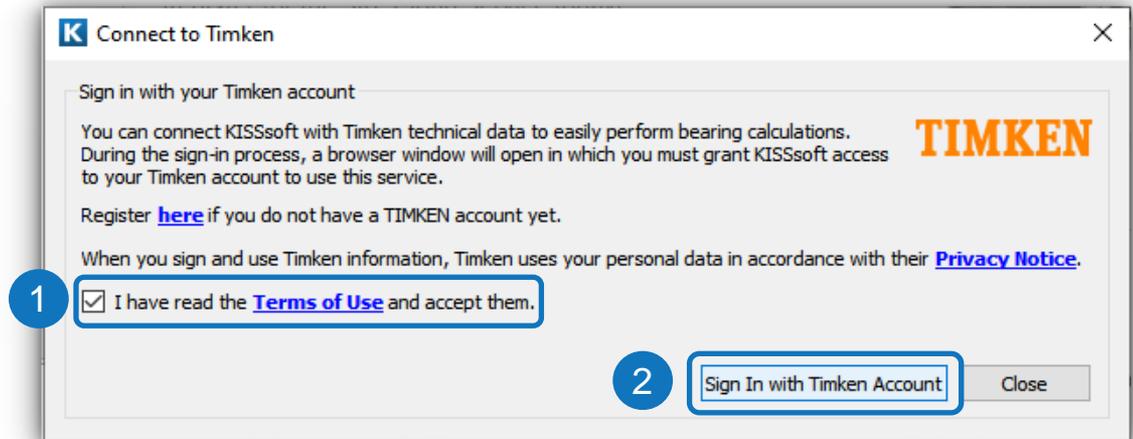
- Enter username (1) and password (2) that you have selected when registering a Timken account and click on Sign in button (3).

- If at this point you still don't have a TIMKEN account, click on Register (4) and follow the procedure to create an account as described 2 slides back.

- After signing in a new page will open where button Grant Consent (5) must be clicked.

- If signing in was successful a new page will appear which can be closed (6).
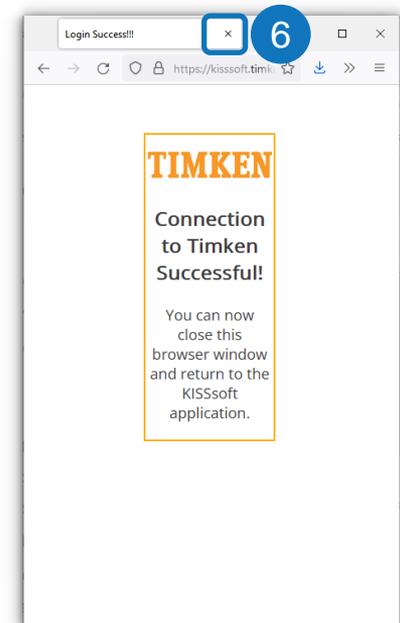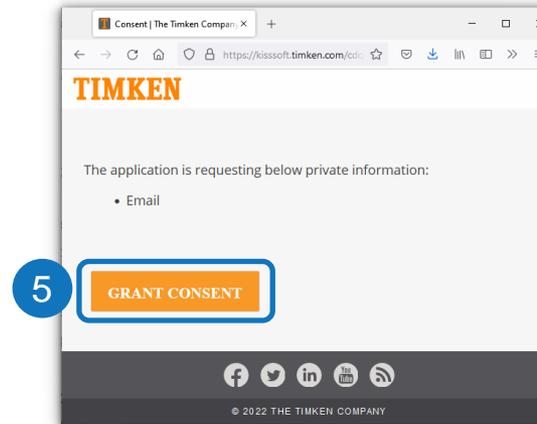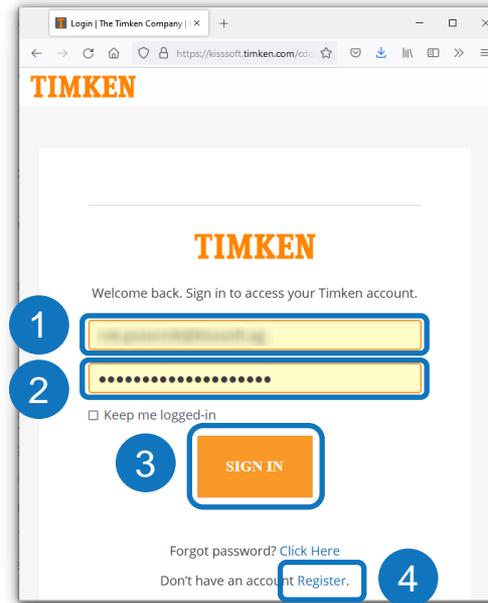
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- Now go back to KISSsoft again where a window Connect to Timken should give you a notification that you are signed in with your Timken account (1).

- Close the windows by clicking button Close (2).

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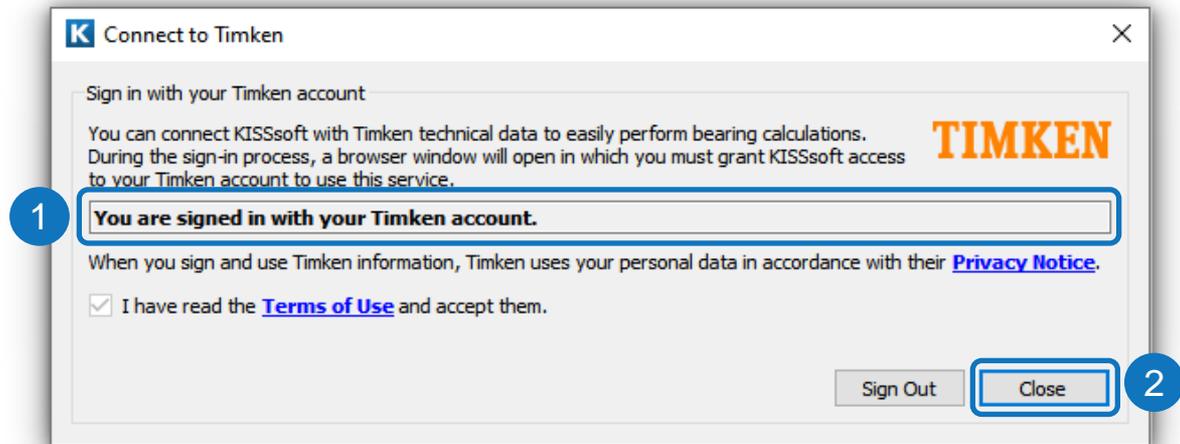
Enable use of proprietary internal geometry data from TIMKEN cloud services

- In order to make use of Timken proprietary internal geometry data you must first enable it in Shaft calculation module.

- Open Shaft module or an existing shaft calculation and select menu Calculation (1) and click on Settings (2).

- A window Module specific settings will open. Select tab Rolling bearings (3).

- Enable both Timken proprietary data (4) and Use proprietary bearing internal geometry (5).

- Close the window.

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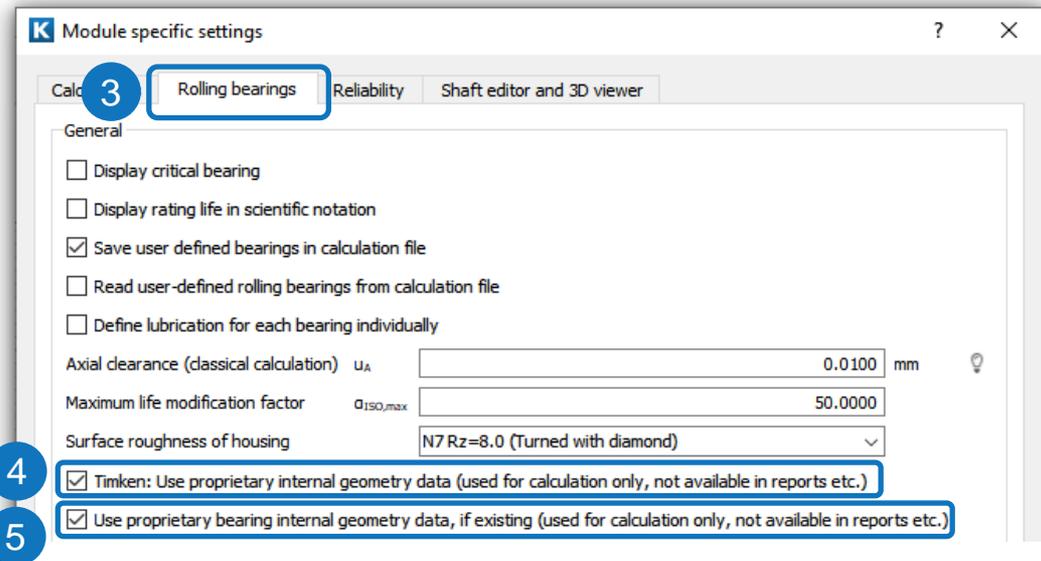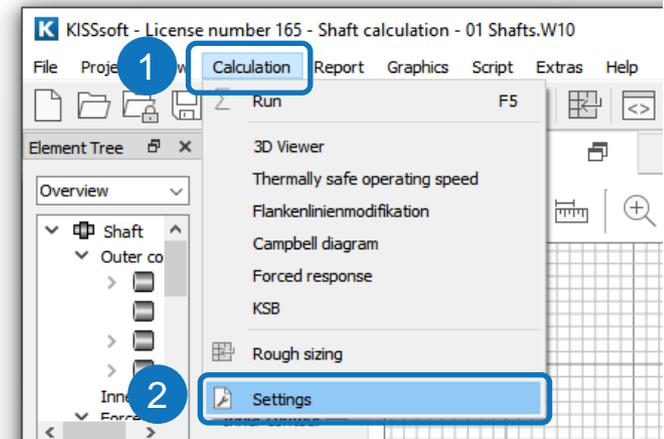
Calculation example

- Run a calculation with some Timken bearing(s) (1).

- Several reports with different data are available. Results referring to Timken proprietary internal geometry bearing data will be shown in the shaft report (1) and in the Rolling bearing report (2).

- Pay attention to the notes given in the reports which explain that the proprietary internal geometry data will not be shown in the reports (see next slides).
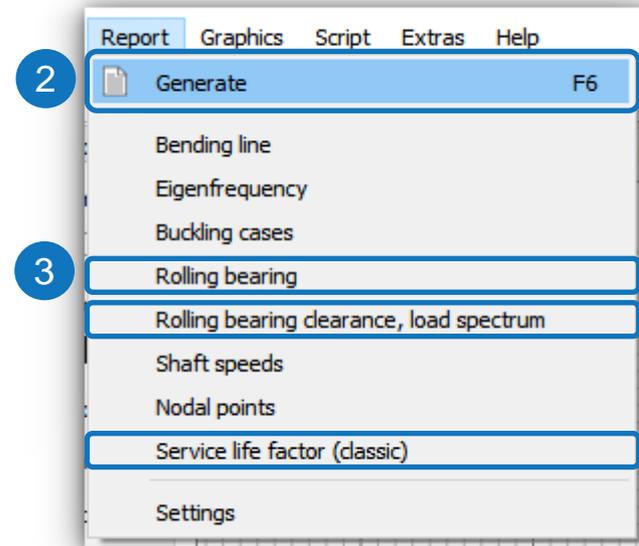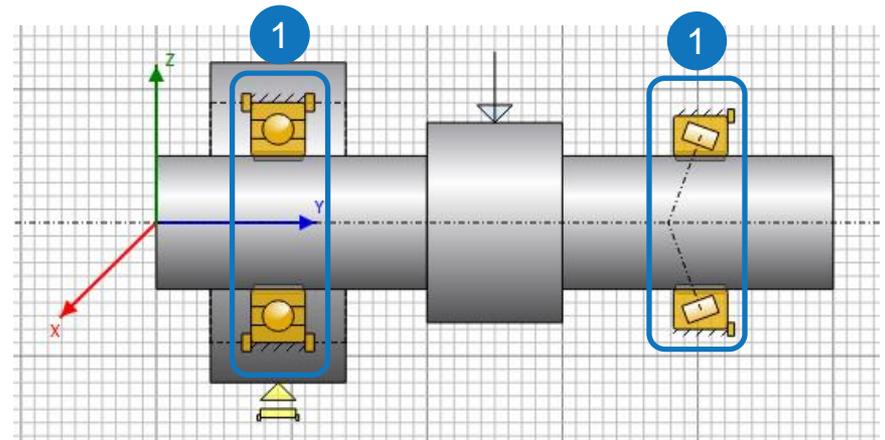
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Shaft report – input data

"Normal" rolling bearing

"Connecting" rolling bearing

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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$_0$]	7.05	kN
Minimum EHL lubricant film thickness	[h$_{min}$]	0.186	µm
Spin to roll ratio	[ω_s/ω_roll]	0.049	
Life modification factor for reliability	[a$_1$]	1.000	

7.5.1 Results according to ISO 281

Lubricant		ISO-VG 220	
Lubricant with additive, effect on bearing lifetime confirmed in tests.			
Lubricant - service temperature	[T$_B$]	70.00	°C
Oil lubrication, on-line filtration, ISO 4406 -/19/16			
Contamination factor	[e$_C$]	0.228	
Load ratio	[C/P]	4.977	
Operating viscosity	[ν]	48.884	mm²/s
Reference viscosity	[ν$_1$]	13.887	mm²/s
Viscosity ratio	[κ]	3.520	
Life modification factor	[a$_{ISO}$]	1.502	
Fatigue load limit	[C$_u$]	1.055	kN
Basic bearing rating life	[L$_{nh}$]	1369.64	h
Modified bearing rating life	[L$_{nmh}$]	2057.22	h
Static safety factor	[S$_0$]	3.29	

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7.5.2 Calculation with proprietary bearing internal geometry data (ISO/TS 16281)

Operating diametral clearance	[P$_d$]	11.588	µm
Contamination factor	[e$_C$]	0.228	
Fatigue load limit	[C$_u$]	1.176	kN
Reference rating life	[L$_{nrh}$]	1338.98	h
Modified reference rating life	[L$_{nrmh}$]	2242.43	h
Effective static safety factor	[S$_{0w}$]	3.94	
Static safety factor	[S$_{0iw}$]	3.12	
Static equivalent load	[P$_{0iw}$]	7.45	kN
Bearing reaction force	[F$_x$]	0.000	kN
Bearing reaction force	[F$_y$]	1.368	kN
Bearing reaction force	[F$_z$]	-7.053	kN
Bearing reaction force	[F$_r$]	7.053	kN
Inclination angle	[α$_{Fr}$]	-89.999	°
Bearing reaction moment	[M$_x$]	-39.254	Nm
Bearing reaction moment	[M$_y$]	0.000	Nm
Bearing reaction moment	[M$_z$]	-0.002	Nm
Bearing reaction moment	[M$_r$]	39.254	Nm
Inclination angle	[α$_{Mr}$]	-179.997	°
Displacement of bearing	[u$_x$]	0.002	µm
Displacement of bearing	[u$_y$]	-101.453	µm
Displacement of bearing	[u$_z$]	41.334	µm
Displacement of bearing	[u$_r$]	41.334	µm
Inclination angle	[α$_{ur}$]	89.998	°
Misalignment of bearing	[r$_x$]	0.171	mrad
Misalignment of bearing	[r$_y$]	-0.000	mrad
Misalignment of bearing	[r$_z$]	0.000	mrad
Misalignment of bearing	[r$_r$]	0.171	mrad
Oil level	[H]	0.000	mm
Rolling moment of friction	[M$_{rr}$]	0.235	Nm
Sliding moment of friction	[M$_{sl}$]	0.228	Nm
Moment of friction, seals	[M$_{seal}$]	0.000	Nm
Moment of friction for seals determined according to SKF main catalog 17000/1 EN:2018			
Moment of friction flow losses	[M$_{drag}$]	0.000	Nm
Torque of friction	[M$_{loss}$]	0.463	Nm
Power loss	[P$_{loss}$]	72.663	W
The moment of friction is calculated according to the details in SKF Catalog 2018.			
The calculation is always performed with a coefficient for additives in the lubricant µbl=0.15.			

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Thank you for your attention!
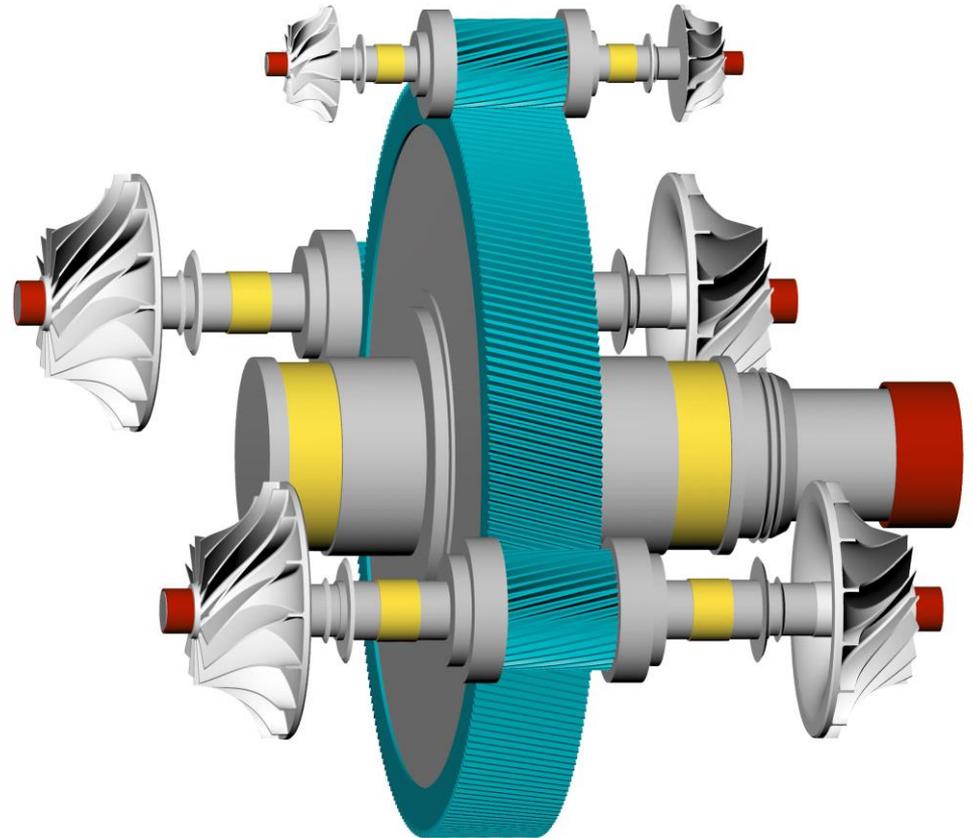
Sharing Knowledge

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