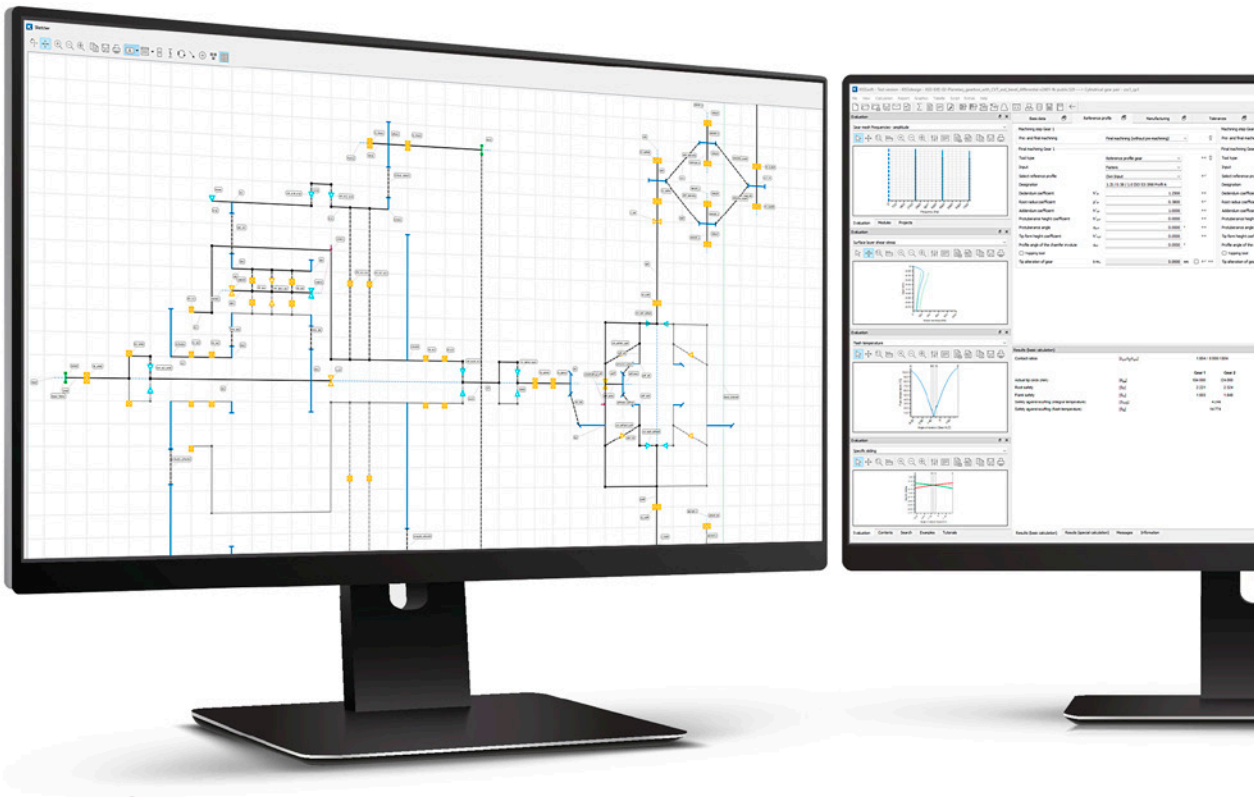

Powerful by Design

Accelerating gearbox development through intuitive, system-level engineering tools that adapt to any workflow

Hanspeter Dinner, Managing Director, KISSsoft AG—A Gleason Company

Speed is a key factor for success. It is as important as cost, value, uniqueness, vision, user acceptance. This holds true for processes, goods and services. And for tools, including the one presented here. A tool that is intuitive to use requires little time to learn. A versatile tool is quickly accepted by a team dealing with many projects or concepts simultaneously. A tool that adapts to the users' workflow and integrates seamlessly maintains these processes speed. Introducing the KISSsoft System Module.

Use Cases

CAE tools like the KISSsoft System Module play a crucial role in the sizing, optimization and rating of gears and other transmission components by addressing key design needs. It supports the design of new transmissions based on end user requirements, allowing for innovative solutions tailored to specific performance goals like reliability, vibration level or transmittable torque. In addition, the System Module is essential for modifying legacy systems to meet new operating conditions like the use of stronger engines, ensuring that older designs remain relevant and functional.

The System Module also supports the re-engineering of reference or competitor designs, facilitating improvements and optimizations of these. By re-creating in the KISSsoft System Module existing designs described through manufacturing drawings, it ensures accuracy and consistency across life cycle stages. One of its powerful features is the ability to manage and compare design variants that share the same topology, allowing engineers to evaluate different configurations efficiently, within a single System Module file.

For variants development, the System Module creates databases with various ratios tailored to different torque ranges, streamlining the design process for different gearbox sizes. Furthermore, it assists in visualizing and explaining concepts, preliminary designs, and proposals, making it easier to communicate and promote ideas within engineering teams, to stakeholders and potential buyers.

Finally, the System Module connects and manages available KISSsoft files, safeguarding these valuable component models used for individual analysis, ensuring data integrity and seamless integration of detail information elaborated by junior engineers in complex engineering projects managed by more senior staff. This approach keeps license costs as low as possible.

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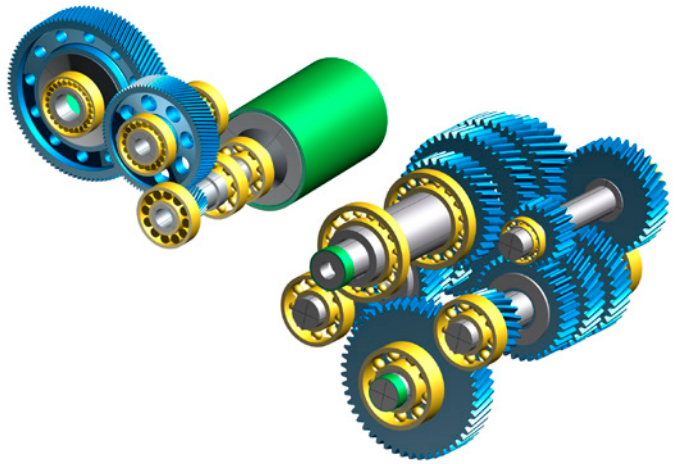
Rolling bearings

Rolling bearings			b1	b2	b3	b4	b5	b6	b8	b7
Calculation			sm_calc	sm_calc	sm_calc	sm_calc	s2_calc	s2_calc	saxle_calc	saxle_calc
Shaft			sm	sm	s1	s1	s2	s2	sc	sc
Type			Deep groove ball bearing (single row)	Deep groove ball bearing (single row)	Deep groove ball bearing (single row)	Cylindrical roller bearing (single row)	Tapered roller bearing (single row)	Tapered roller bearing (single row)	Tapered roller bearing (single row)	Tapered roller bearing (single row)
Number			SKF 6308	SKF 6308	SKF 6308	SKF NU 308 ECP	SKF 30209	SKF 30209	FAG 32011-X-XL	FAG 32011-X-XL
Geometry										
Type			Deep groove ball bearing (single row)	Deep groove ball bearing (single row)	Deep groove ball bearing (single row)	Cylindrical roller bearing (single row)	Tapered roller bearing (single row)	Tapered roller bearing (single row)	Tapered roller bearing (single row)	Tapered roller bearing (single row)
Number			SKF 6308	SKF 6308	SKF 6308	SKF NU 308 ECP	SKF 30209	SKF 30209	FAG 32011-X-XL	FAG 32011-X-XL
Inner diameter	d	mm	40.0000	40.0000	40.0000	40.0000	45.0000	45.0000	55.0000	55.0000
External diameter	D	mm	90.0000	90.0000	90.0000	90.0000	85.0000	85.0000	90.0000	90.0000
Width	B	mm	23.0000	23.0000	23.0000	23.0000	20.7500	20.7500	23.0000	23.0000
Nominal contact angle	α_0	°	0.0000	0.0000	0.0000	0.0000	14.9314	14.9314	15.1240	15.1240
Basic dynamic load rating	C	N	42300.0000	42300.0000	42300.0000	93000.0000	81600.0000	81600.0000	96000.0000	96000.0000
Basic static load rating	C_0	N	24000.0000	24000.0000	24000.0000	78000.0000	76500.0000	76500.0000	118000.0000	118000.0000
Fatigue load limit	C_u	N	1020.0000	1020.0000	1020.0000	10200.0000	8650.0000	8650.0000	19400.0000	19400.0000
Nominal clearance			ISO 5753-1:2009 C0	ISO 5753-1:2009 C0	ISO 5753-1:2009 C0	ISO 5753-1:2009 C0	Own input	Own input	Own input	Own input
Nominal diametral clearance	P_{dI}	mm	0.0130	0.0130	0.0130	0.0375	0.0000	0.0000	0.0000	0.0000
Tolerance class									DIN 620: 1988 PN Tapered roller bearing	DIN 620: 1988 PN Tapered roller bearing
Shaft tolerance		mm							k6	k6
Hub tolerance		mm							H7	H7
Inner ring temperature	T_i	°C	nan	nan	nan	nan	nan	nan	60.0000	60.0000
Outer ring temperature	T_o	°C	nan	nan	nan	nan	nan	nan	55.0000	55.0000
Rolling element temperature	T_w	°C	nan	nan	nan	nan	nan	nan	57.5000	57.5000
Offset of outer ring in X-direction	δ_x	mm	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Offset of outer ring in Y-direction	δ_y	mm	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Offset of outer ring in Z-direction	δ_z	mm	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tilting of outer ring around X-axis	δ_{rx}	°	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

The KISSsoft System Module streamlines variant development by managing component models, visualizing concepts, and enabling efficient collaboration across engineering teams, supporting data integrity, cost control, and seamless integration.

Features

The System Module combines kinematic analysis, lifetime calculation, 3D graphics and system reports with a programming language. It is the tool of choice for strength and lifetime analysis of various kinds of geared systems and gearboxes. The System Module lets the user do quick and detailed parametric studies of a complete power train in very little time to compare different variants of a concept or to analyze a given design for different loads.



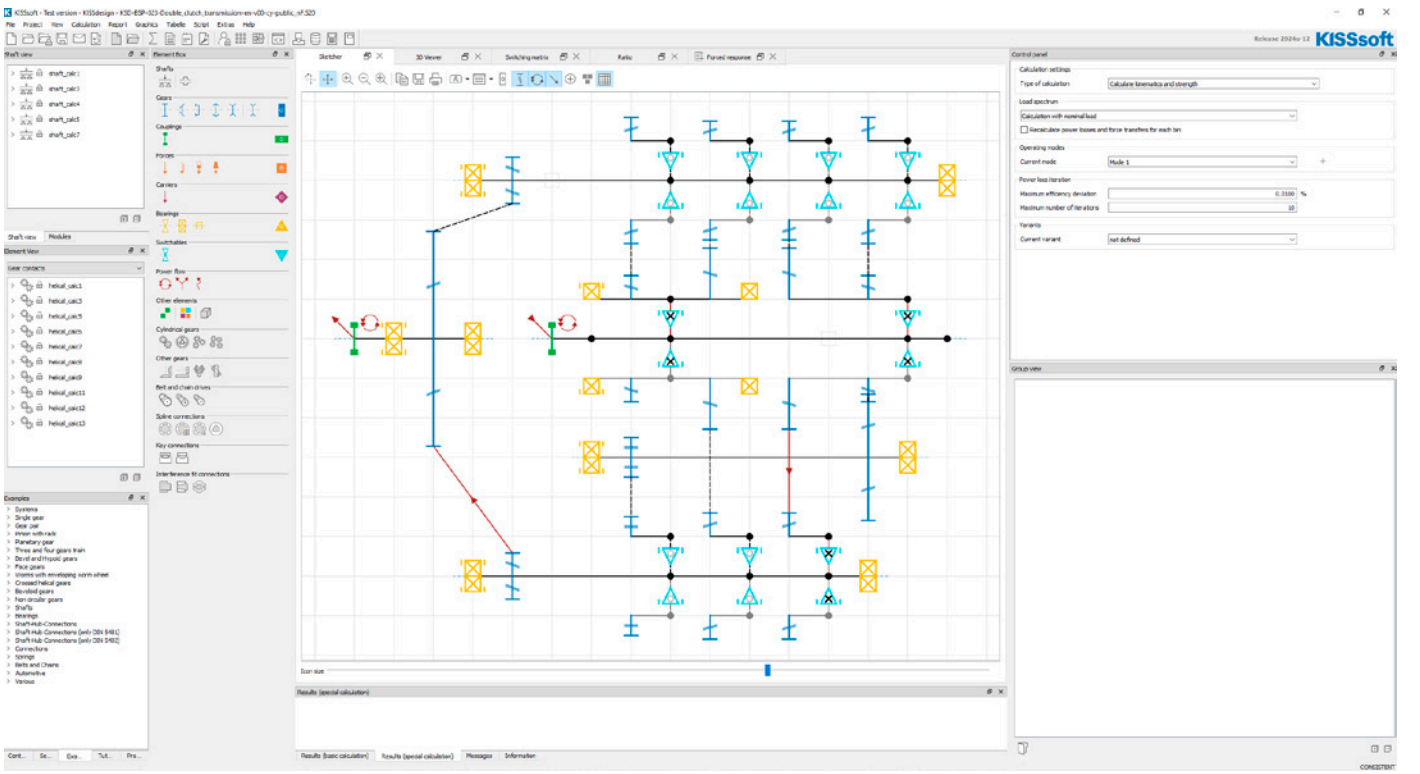
The KISSsoft System Module links all gearbox components for simultaneous strength and lifetime analysis, with 3D visualization that accelerates concept development, balances designs early and simplifies documentation in a single integrated file.

In the System Module, all parts (gears, shafts, bearings, connections) of the gearbox are linked and the strength / lifetime analysis is performed simultaneously for all elements. A three-dimensional graphical presentation of the current state of the system immediately shows the geometrical influence of every change in parameters. This approach greatly accelerates the design process and results in a much more balanced design even during the concept phase.

The machine elements calculated range from gears, shafts, bearings to shaft-hub connections. This will result in a more balanced starting design and fewer modifications will be necessary further down in the design process to reach an optimized design. Furthermore, documentation of the calculation is simplified and all calculation data for the whole gearbox is stored in a single file. The System Module uses other *KISSsoft* modules for the strength and lifetime calculations of the various components used in the system.

Basis of all component calculations is the system level kinematics calculation covering:

- Speed, torque, and power for complex systems including gears, couplings, speed and torque limiter, multiple boundary conditions
- Modeling of planetary systems like Ravigneaux, Wolfrom, Wilson, Simpson



With system-level kinematic analysis at its core, the KISSsoft System Module supports a wide range of drivetrain configurations—from planetary systems to CVTs—enabling accurate, efficient modeling of speed, torque, and power across complex transmission architectures.

- Differentials, (with bevel, face or spur gears), chain and belt transmissions
- Couplings may be activated and deactivated, slippage considered
- Allows for modelling of CVT transmissions
- System ratio and mesh ratio table in Kinematics tab
- Switching matrix for defining gear speeds
- Definition of operating modes, combining different boundary conditions with load spectra

Working Modes

With *KISSsoft*, the user may choose between three working modes:

1. **Component Level Only:** This mode involves using *KISSsoft* modules other than the System Module. It's a detailed, low-cost, and time-saving approach suitable for less complex systems where calculations for individual components are done independently from each other. This mode is ideal for projects requiring maximum speed, efficiency, and simplicity.
2. **System Level:** This mode integrates components into a holistic system, combining power flow analysis, spatial and collision-free arrangement, and top-level requirements-driven conceptual design. It is highly efficient for experienced designers with a deep understanding of all aspects of gearbox or transmission design. It is the mode of choice for most licensees globally.
3. **Collaborative Approach:** The System Module supports a team-based design process. Domain experts work on individual components using independent *KISSsoft* instances, performing detailed sizing, optimization, and analysis. Iterative design improvements are uploaded into the system model, enhancing its fidelity step-by-step.

Switching between these modes is immediate, with data exchange enabled through *KISSsoft* files as well as bespoke and neutral formats (e.g., Gleason *GAMA,* Gleason *GEMS, GDE* and *REXS*).

Return on Investment

The System Module's parameter-based design approach manages the numerous parameters of gearbox and bearing design efficiently, reducing errors from manual data transfer. Experience from hundreds of projects confirms that the module accelerates project timelines and reduces errors, even for basic designs. Once engineers become proficient, they consistently rely on the System Module for its efficiency and accuracy.

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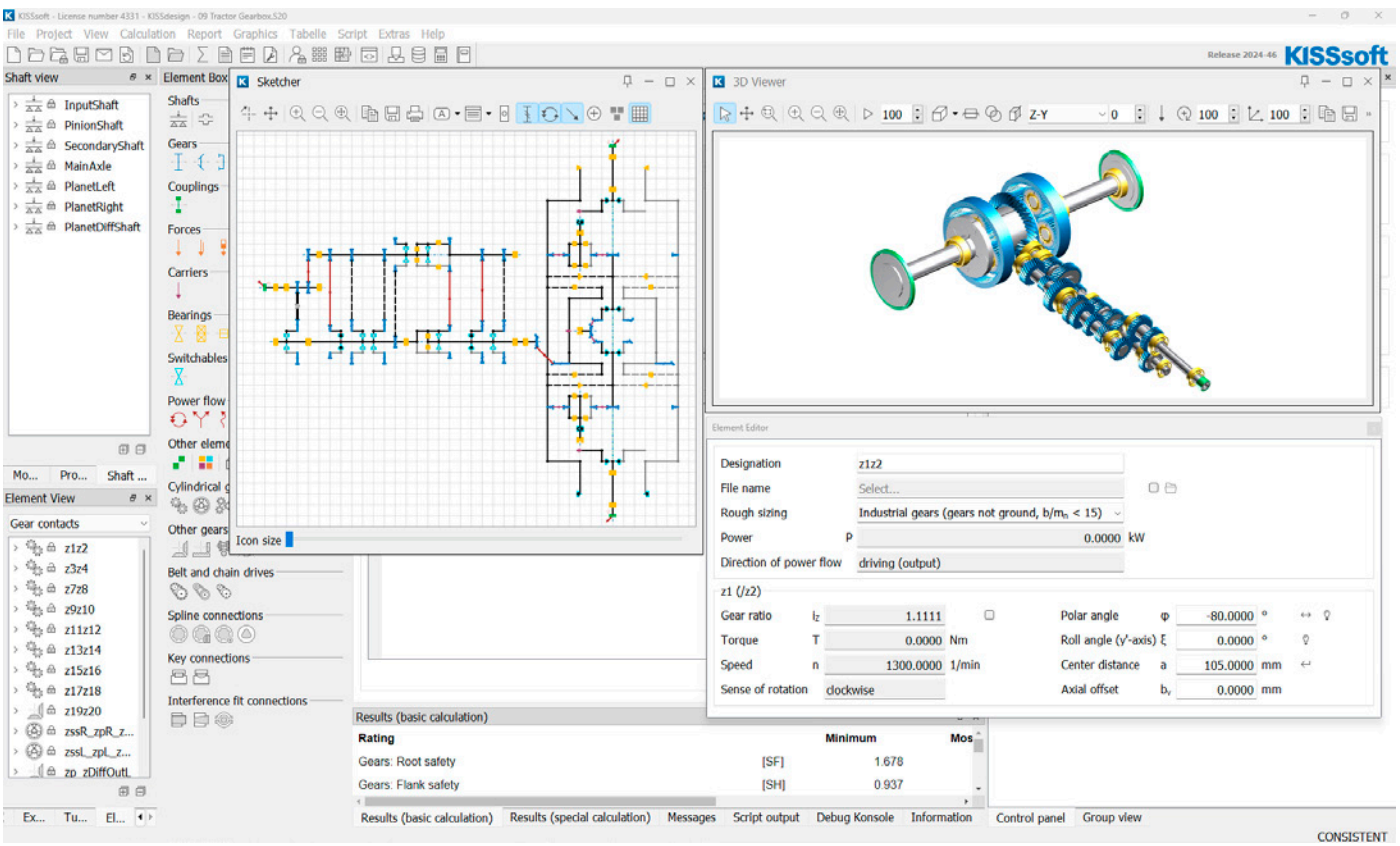
PTE



The KISSsoft System Module supports three flexible working modes—Component Level, System Level, and Collaborative—enabling seamless transitions between independent, integrated, and team-based design approaches for maximum efficiency and adaptability.