KISSsoft
Drivetrain Design Solutions

KISSsys 2020 – Instruction 0021

KISSsys default load spectrum calculation

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1 Document information

1.1 Document change record

Revision	Date	Author	Comments
0	10.6.2014	HD	Original document
1	31.3.2015	CY	Changes to adapt 2015 version, where own input is not available
2	11.04.2016	TP	Restructure of the buttons on the interface
3	15.08.2019	FK	Updating with Rel. 2019
4	08.06.2020	FK	Updating with Rel. 2020

2 Introduction

2.1 Load spectrum definition in KISSsoft database

Note that this function works for KISSsys models where you have simple kinematics. Models with **power splits** and **different power paths** (transmission gearboxes) can be handled better by using the load spectrum template (see documentation on the KISSsoft homepage).

3 Using the KISSsys functions

3.1 Select a load spectrum

Once some calculations are in the KISSsys file, you can select a load spectrum from using the button as shown below (general button since 2016, the other one is for the load spectrum template calculation).

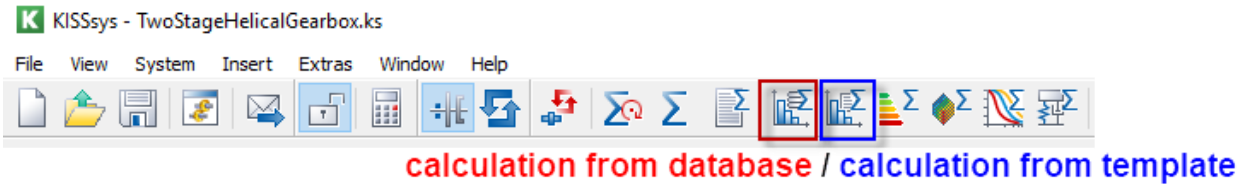

Figure 1. Function to select a load spectrum either from database or template

Then, a dialog will appear where you can select the load spectrum from a list. The following options are possible:

1) Use single load (nominal load condition)
2) Select a predefined load spectrum from the database.

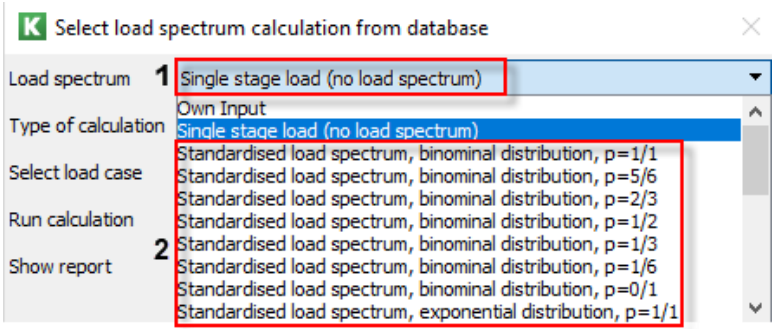

Figure 2. Select load spectrum („Singe stage load“ or load spectrum from database) from list

3.1.1 Select from database

In the KISSsoft database, the user can add his own load spectra. Later, he can select these load spectra for calculation in KISSsys. To edit (e.g. to add a new load spectrum to the database) the database, use the database tool (close KISSsys and start KISSsoft as “Administrator”) in KISSsoft (not in KISSsys).

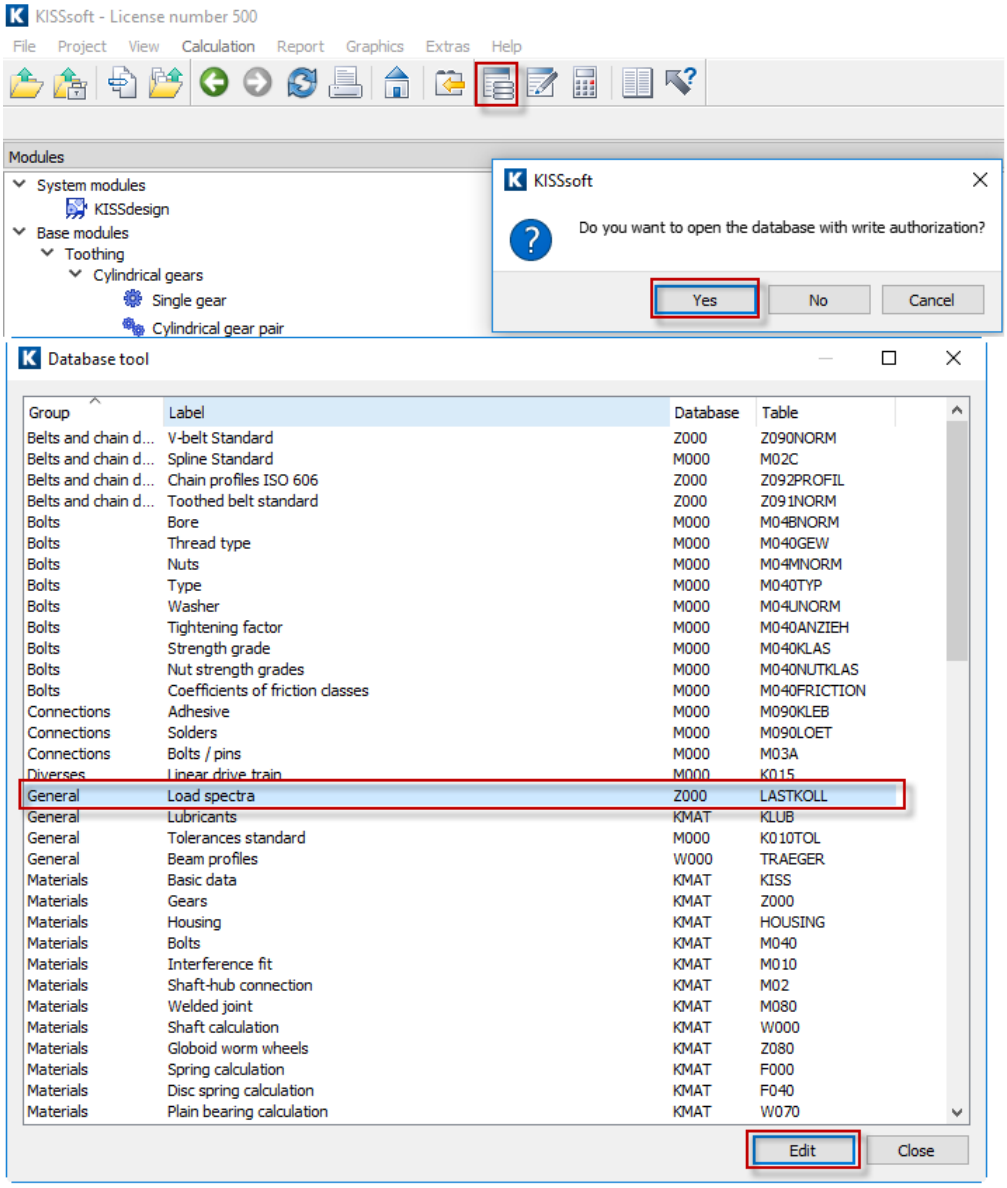

Figure 3. Opening the KISSsoft database tool

Open the Table named “LASTKOLL” and add a new load spectrum e.g. “KISSsys-ANL-14-908-Example-LDD” as described below.

Add e.g. a new load spectrum named “KISSsys-ANL-14-908-Example-LDD” as follows (press the  button and enter)

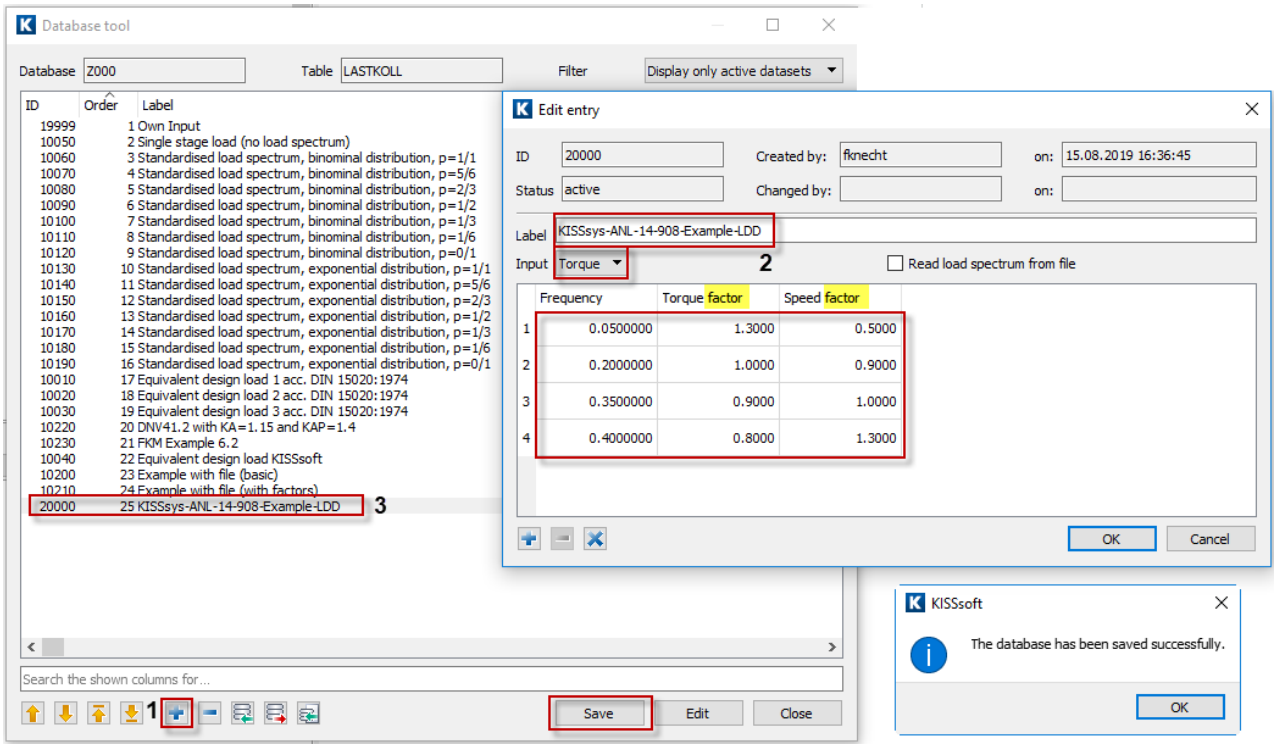

Figure 4. Adding a load spectrum in the database tool.

In order to calculate the load spectrum without changing the kinematic, it must be defined with **factors** and not absolute values.

Press “Ok”, “Save” and “Close” to complete and save the input. You can now select this new load spectrum from the database. By doing this, the load spectrum is set to all the elements in the three structure (but the flag to consider load spectrum is not set).

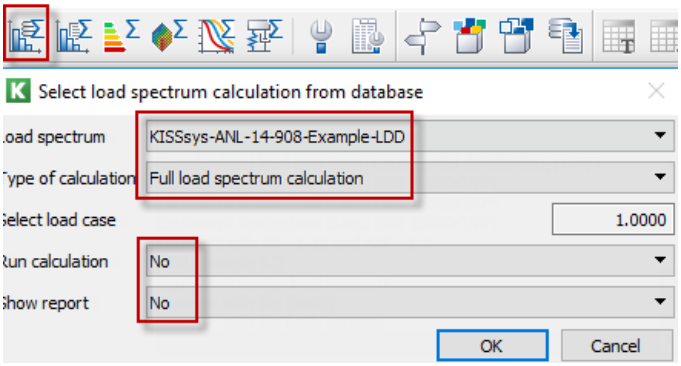

Figure 5. Choose defined loadspectrum from database

Then, a new window / table will be created by KISSsys, showing the load spectrum (note that you cannot edit this load spectrum in KISSsys level as it is imported from a database):

	Frequency	TorqueOrPower	Speed
1	0.05	1.3	0.5
2	0.2	1	0.9
3	0.35	0.9	1
4	0.4	0.8	1.3

LoadSpectrumFromDB

Figure 6. Load spectrum imported from database into KISSsys table.

3.1.2 Use nominal load calculation

Once you select “Single stage (no collective)”, the load spectrum will be removed from the whole model including all single elements. The user can thereby perform a “proper” nominal calculation with this selection to clean up the model (see following figure)

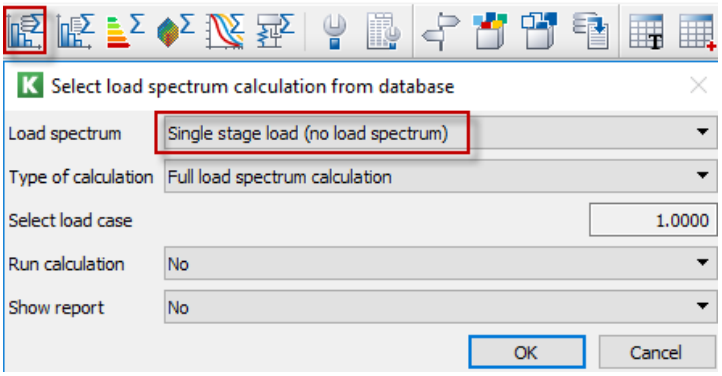

Figure 7. Selecting „Single stage load (no load spectrum)“

3.2 Calculation with load spectrum

To run the calculations with load spectrum, simply select “Yes” in the corresponding field.

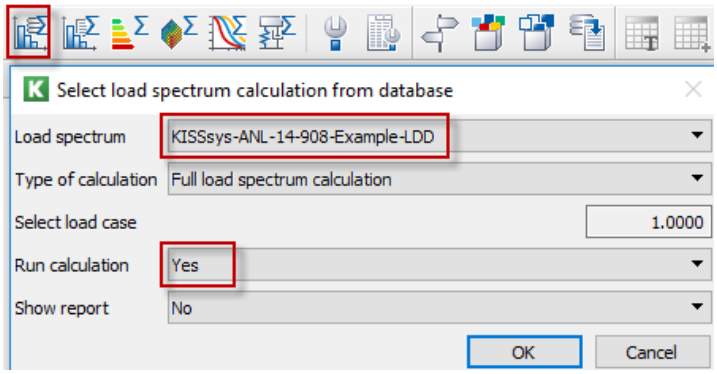

Figure 8. Running the calculation

Note that the flag “Consider load spectrum” is then only **TEMPORARILY** set to all calculations so that if you press the button  or  , then, the calculation will be done with its initial settings (if the user sets the flag manually in the calculation file, it is then calculated with load spectrum, otherwise with the nominal load).

When you run the calculation with load spectrum, the resulting gear and shaft safety factors and bearing life will be based on the load spectrum.

After running the calculation, you can see the load spectrum e.g. in the gear calculation.

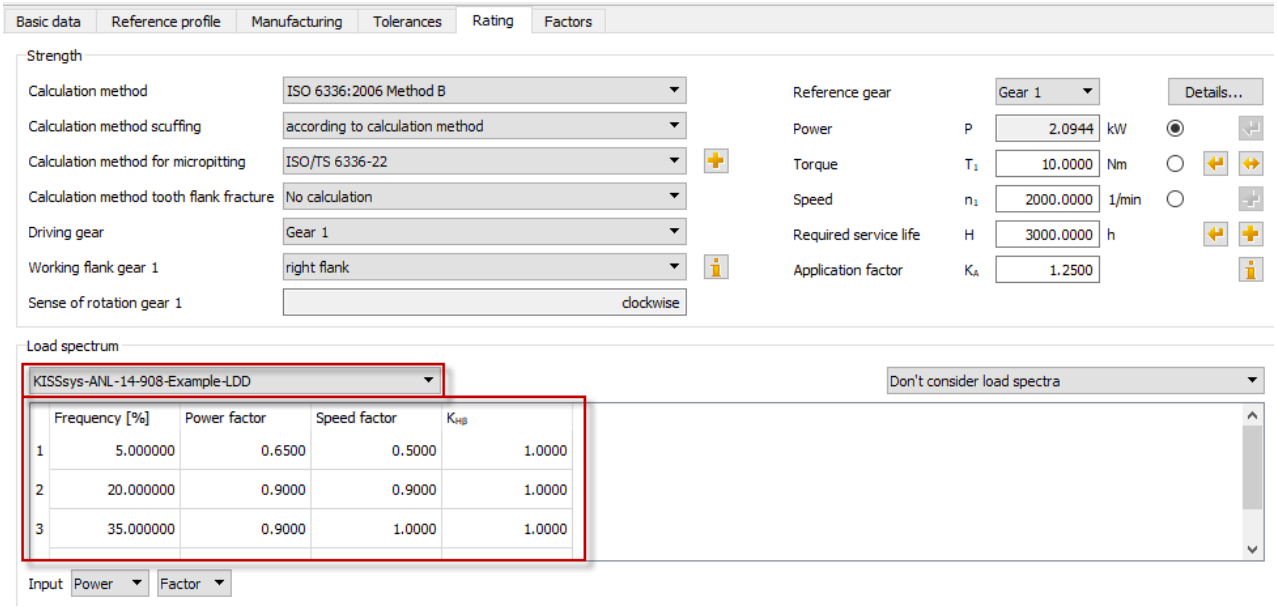

Figure 9. Definition of the load spectra in the gear calculation

Or also in the shaft calculation

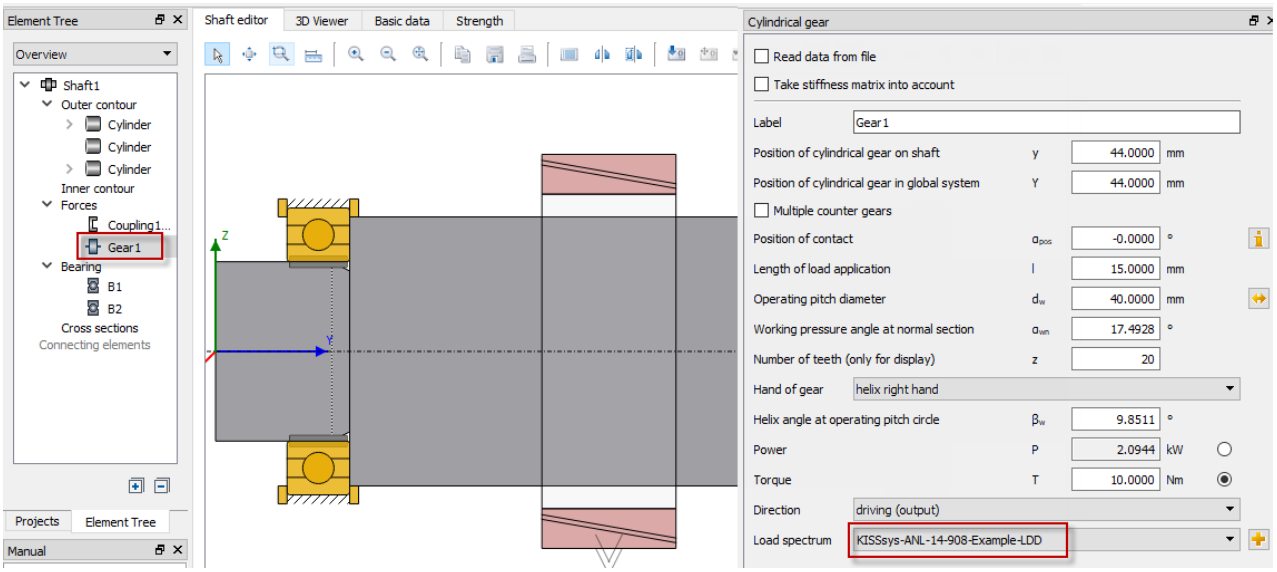

Figure 10. Definition of the load spectra in the shaft calculation

3.3 Single load step calculation

Like in KISSsoft, a single load step calculation can be performed with the selection below. The user can also select what bin to calculate. Once again, the flag is set only temporarily in the KISSsoft file.

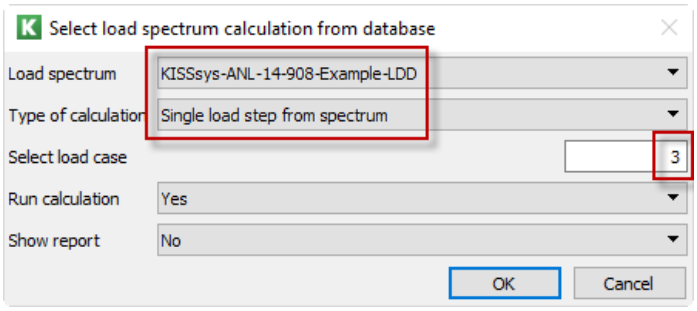

Figure 11. Single load step calculation

4 Example

4.1 File to start with

Open the below file to start and select administrator mode:

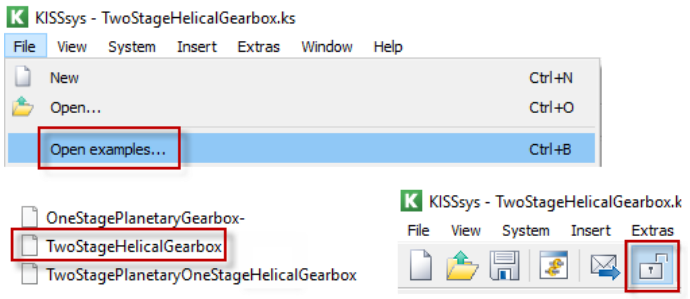

Figure 12. Open example file „TwoStageHelicalGearbox.ks“ and select administrator mode

4.2 Adding bearing life to user interface

Let us now add the resulting bearing lifetime to the user interface (and add some text). First, enter “Bearing Life B1 (h)” in the corresponding cell (see following figure). Then, use right mouse click on “B1” and select “Properties”. Then, mark the target cell and select the variable “Lh” and press “Insert as expression”.

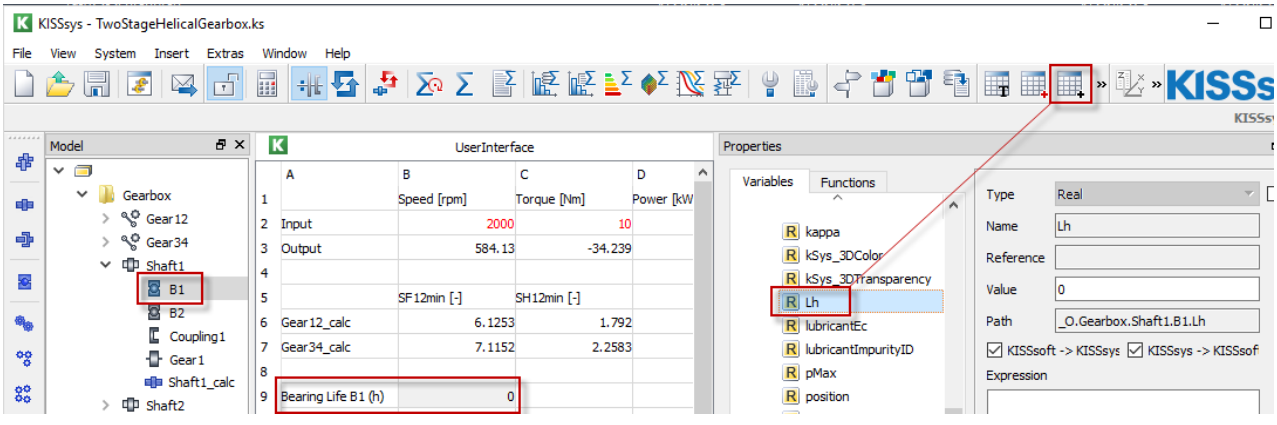

Figure 13. Adding a bearing life to the user interface

4.3 Calculation without load spectrum

To run a calculation without a load spectrum and e.g. with an input speed of 1900RpM and an input torque of 11Nm, proceed as follows:

1) Enter speed and torque in the “UserInterface”

UserInterface

	A	B	C
1		Speed [rpm]	Torque [Nm]
2	Input	1900	11
3	Output	554.92	-37.663

Figure 14. Nominal speed and torque input

2) Run kinematic calculation by pressing 

3) Run strength calculation by pressing 

The following results will appear in the UI:

	SF12min [-]	SH12min [-]
Gear12_calc	6.2349	1.6996
Gear34_calc	7.261	2.1454
Bearing Life B1 (h)	15842.51574	

Figure 15. Nominal load calculation - results

4.4 Calculation with load spectrum

Now, select a load spectrum by pressing  . Select e.g.:

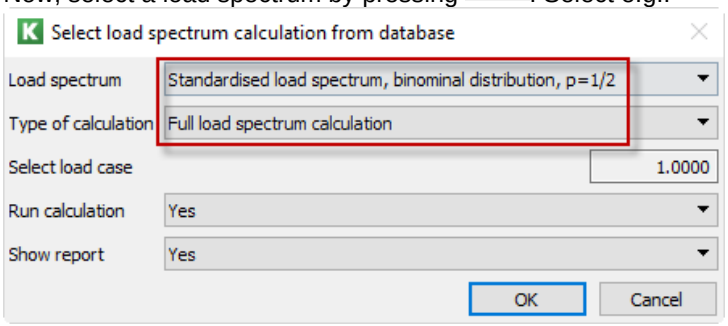

Figure 16. Spectrum selection

The load spectrum is shown as below:

UserInterface | LoadSpectrumFromDB

	Frequency	TorqueOrPower	Speed
1	2e-006	1	1
2	1.6e-005	0.975	1
3	0.00028	0.925	1
4	0.00272	0.863	1
5	0.02	0.788	1
6	0.092	0.713	1
7	0.28	0.638	1
8	0.60498	0.563	1

Figure 17. Spectrum definition

Then, run the load spectrum calculation with the corresponding button, you will get as result:

	SF12min [-]	SH12min [-]
Gear12_calc	7.9175	2.0407
Gear34_calc	8.9679	2.463
Bearing Life B1 (h)	60657.5804	

Figure 18. Spectrum calculation results

4.5 Calculation without load spectrum

Now, a load spectrum is defined. But if you again press  , the result will again be for the nominal load.

5 Messages

5.1 Message about application factor

By default, an application factor of KA=1.25 is used in the gear calculations. When you use a load spectrum, the application factor should be set to KA=1.00 in all individual gear calculations (because we use a load spectrum instead of an application factor). KISSsys checks whether any of the KISSsoft gear calculation still has an application factor KA different to 1.00. If so, you will get the below message. Note that the calculation will also run if the application factors are not equal to 1.00. Then, the application factor will be used together with the load spectrum.

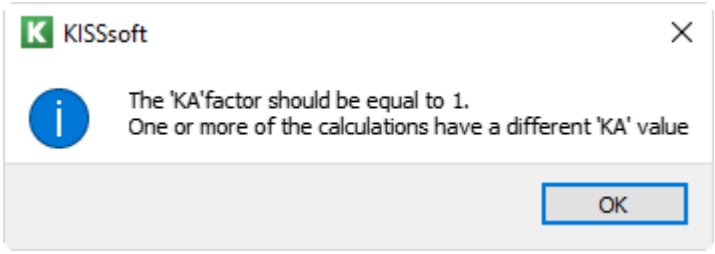

Figure 19. Message stating that KA should be equal to 1

5.2 Message if you are not in administrator mode

If you want to enter your own load spectrum using “Own input” but you are not in administrator mode, you will get the below message. Activate the administrator mode to avoid this.

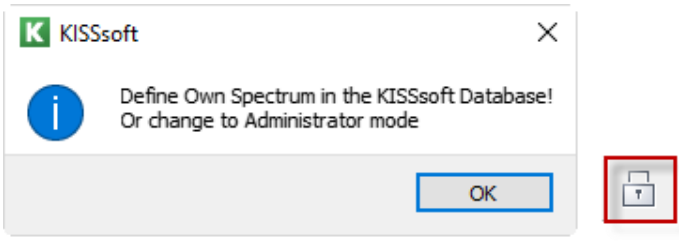

Figure 20. Restrictions without the activation of administrator rights