smartFEM Parametrics Module

„ProjectExplorer“

Evaluation of Results of Electric Machine Model Variants

UserGuide

Release 1.00.05 – 30.04.2021

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Introduction

"*Parametrics*" offers a simple technique to create variants of an electrical machine design by parametric change of geometry parameter, simulate and evaluate them in order to improve and optimize the design with regard to certain result parameter.

The application consists out of two modules:

a) *„Parametrics.exe"*

An application which creates automatically model variants by *„linear"* variations of geometry parameter and provides information to the user in order to evaluate the results.

„linear" → *start value, step width, number of steps*

b) „ProjectExplorer.top"

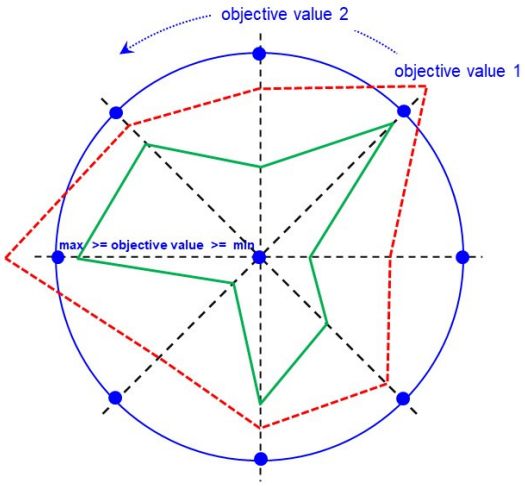
Evaluation of results with regard to a specification of targeted result values.

- Presentation of the results in a suitable format for a simple evaluation.
- Selection of those model variant which results are within specified limits.

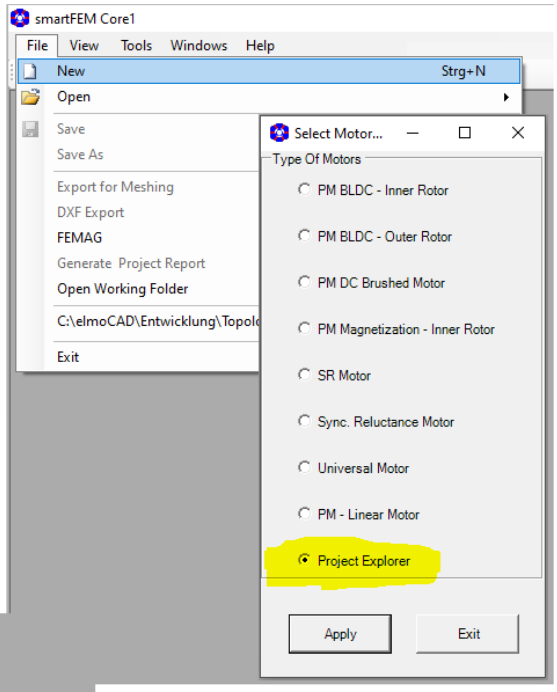
„ProjectExplorer.top“

In order for graphical evaluation of the simulation results a special 2D-Plot shows all results of all model variants

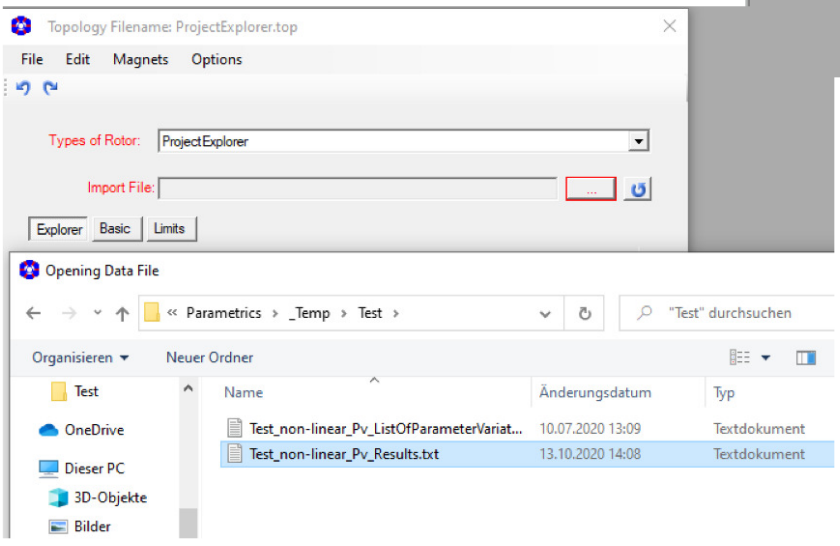
- Filtering of the results with respect to assignable limits. Only those results will be displayed which fulfill the limits (min. limit <= result value <= max. limit) liegen.
- n-dimensional 2D-Plot
  - maximum limits are on the outer circle and minimum limits on the center (or vice versa).
  - The limits can be changed during evaluation.



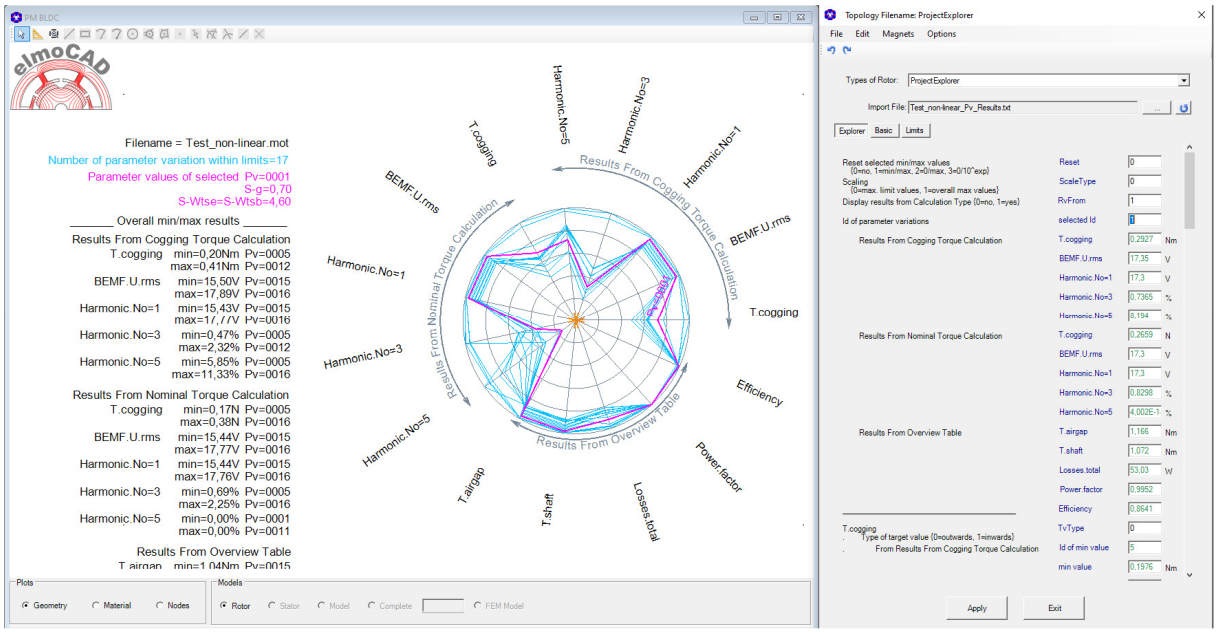
The software is developed as rotor topology with filename *“ProjectExplorer.top“*. It can beopened after start of smartFEM via the menu *"File - New - ProjectExplorer"*.



Afterwards a window for import of the result file *„ModelFileName_Pv_Results.txt“ pops up.*



For every model variant a polyline is drawn within a circular area whereby the corner points are related to the results between the related minimum and maximum limits.



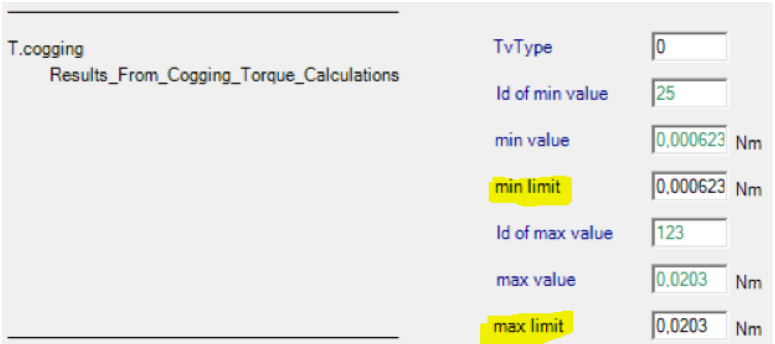
The text box on the left side of the graphic window contains following information:

- File name of the source model *"master-mot-file"* or the name of the folder which contains different model file and which results are displayed.
- The number of model variants which results are within the limits defined by the user.
- The values of the geometry parameter of the selected model variant *"Selected Id"* or the file name.
- Min/max values of the results of all model variants which results are within the limits and their Id.

As far as the result file contains the line *" | Display Results | ... "* are only those result columns displayed which are indicated by *"Yes"* or any other sign. If no sign is specified then the results are not displayed. The selection of results to be displayed can be done also later in the parameter tab *"Limits"*.

Results of Parameter Variation	FileName=Test_linear.mot	29.04.2021 14:59:13			
	Parameter	Results_From_Cogging_Torque_Calculatio			
	Display Results	Yes			
Pv-Ident Status	S-g S-Wtse=S-Wtsb	T.cogging[Nm]	BEMF.U.rms[V]	Harmon	
0001 finished	0,7 4,6	0,1819	17,41	17,4	0,1658 3,389
0002 finished	0,7 4,4	0,1817	17,4	17,39	0,1694 3,388
0003 finished	0,8 4,6	0,1561	16,78	16,77	0,1651 3,197

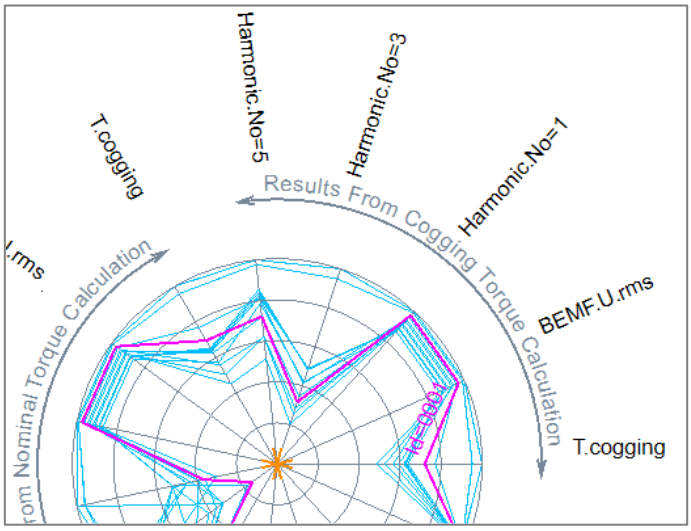
The results can be filtered by defining the min/max limit values of the results in the parameter tab *"Results"*.



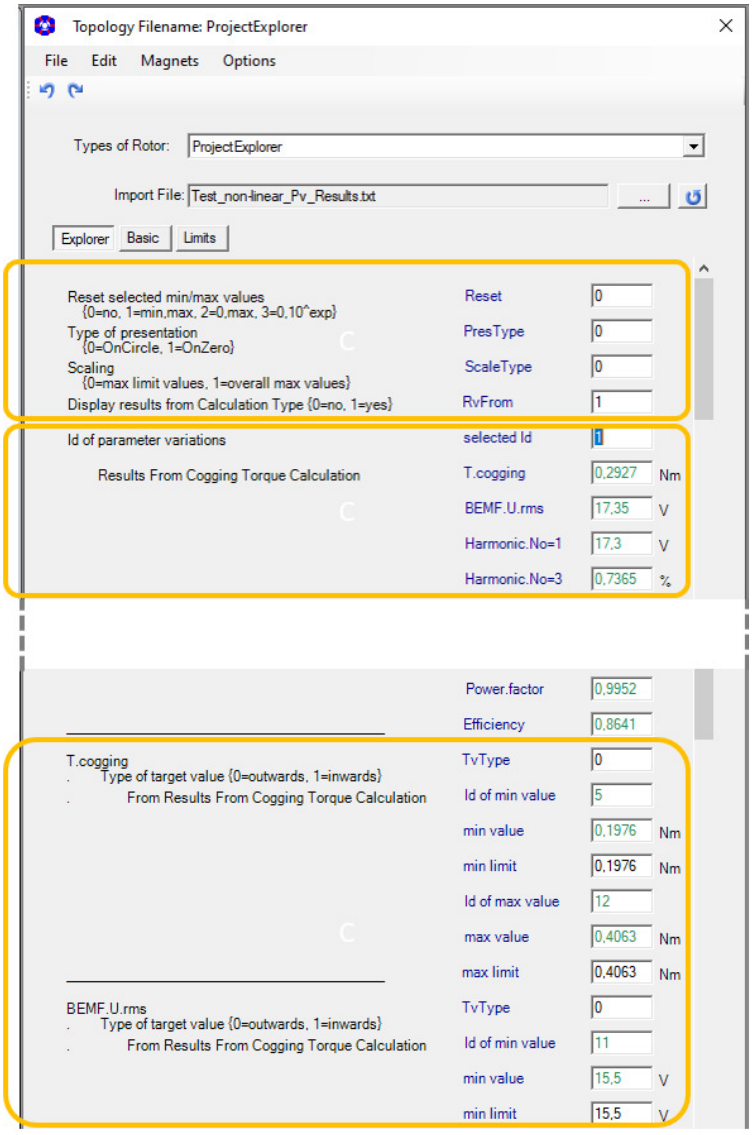
Details of the displayed information:

- Grafic chart with polylines

  The polyline which was selected by right mouse click is displayed in another color and with ident of the model file variant.



- Window for parameter input an d displays of results and limits.



Control parameter

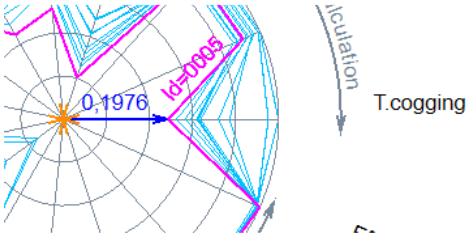
Results of the selected model variant „*selected ID*“.

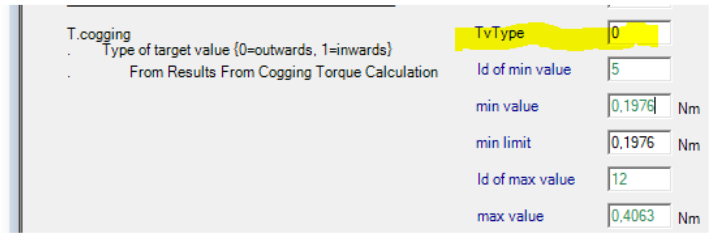
The selection can be done by right mouse click on the related polyline and by input of the ident number in the parameter field „*selected ID*“.

Display of the results of both polylines with minimum and maximum results and corresponding limits. The limits can be changed by parameter input.

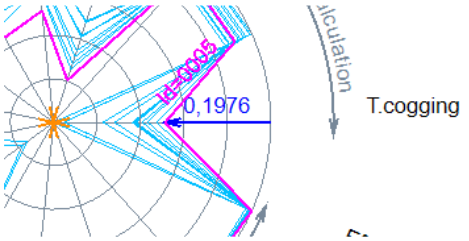
By parameter „*TvType*“ can the direction of the minimum respective maximum result values changed over:

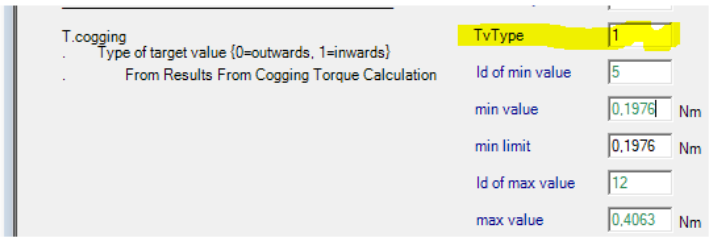
minimum inside and maximum outside





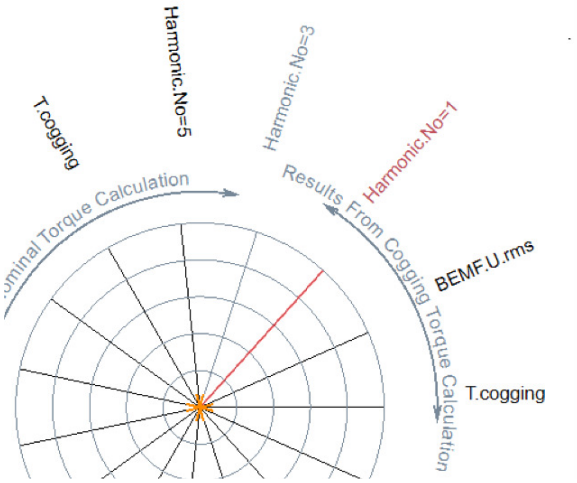
maximum inside and minimum outside

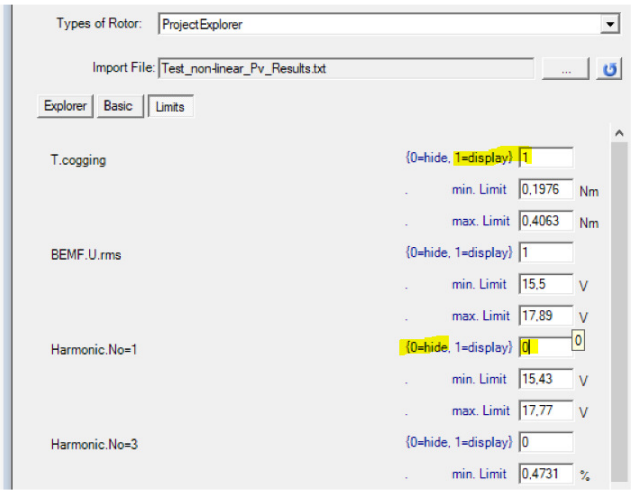
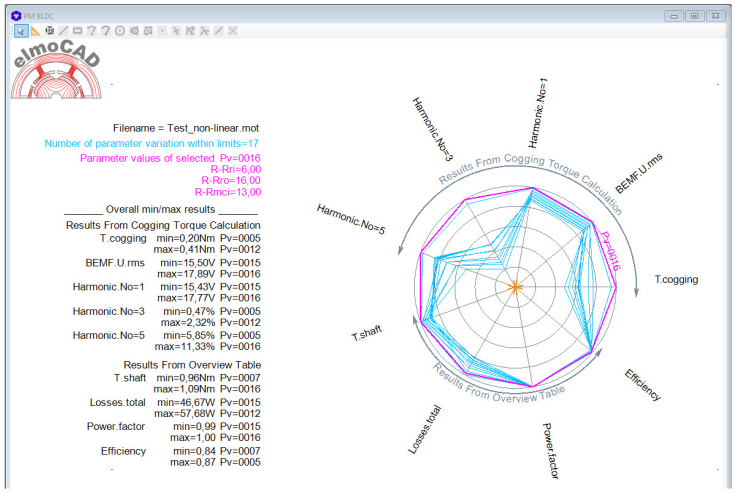




- Parameter tab „*Limits*“

  In this parameter tab can the min. and max. limits per result parameter be specified and whether the result parameter are displayed in the parameter tab *„Explorer“*. The actual selected result parameter is displayed in red color and the de-selected in light gray color.





Display of parameter tab „*Explorer*“ without the results of „*Nominal Torque Calculation*“: