

User Guide and Terms of Use

"Material Explorer"

Creation of material data for FEM simulation of electrical machines from thyssenkrupp specific material grades of non-grained electrical steel

The software was created in collaboration with thyssenkrupp Steel Europe AG and is identical with the software "PowerCore® Explorer" which is published by thyssenkrupp Steel Europe AG.

> elmoCAD Engineering GmbH 01.12.2017 / V 2.4.0



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1 **Objective and Purpose**

thyssenkrupp provides the PowerCore® Explorer software with which by thyssenkrupp published digitized material data J(H), B(H), specific Losses Pv(B,f) and more different electrical steel grades can be viewed and prepeared for FEM calculation of electrical machines.

The material data are based on measurements in the thyssenkrupp laboratory accordingly to related standards (i.e. EN 10106 for cold milled electrical steel). The displayed mass densities are not the real ones but rather for magnetic measurements standardized densities.



The material data and further non-public and not visible data are provided by thyssenkrupp in mfs files. The material data can be changed and amended by using PowerCore[®] Explorer and can be provided for different software tools in their related file formats for simulation of electrical machines.

- FEMAG. smartFEM
- *.mc, *.mca
- JMAG Material files *.jmc _ tab.
- MAXWELL Material files
- SPEED Steel file *.stl _
- Text file *.txt

elmoCAD Engineering GmbH delivers the PowerCore® Explorer software named as "Material Explorer" as a part of the smartFEM software to clients of elmoCAD Engineering GmbH.



2 Installation

PowerCore[®] Explorer needs not to be installed on a computer but rather can be opened by starting the file "PowerCore Explorer.exe" from any folder. This folder must contain following shown files:

Desktop + Computer + Daten (D:) + elmoCAD + PowerCore Explorer_2.1.1 +						
🔜 Desktop ▷ 詞 Bibliotheken	Â	Name	Dateiversion	Typ		
 ▶ ♣ Heimnetzgruppe ▶ ♣ gh ▲ ▶ ■ Computer 		Materials PowerCore Explorer.exe	2.0.1.1	Dateiordner Anwendung		
System (C:) Daten (D:) PowerCore Explorer_2.1.1		User Guide 2.0.4 en.pdf		Adobe Acrobat Document Adobe Acrobat Document		
an Materials						

As far as it contains also a folder "Materials" all material files *.mfs and *.mc will be listed directly after the start of PowerCore[®] Explorer.



3 Functional Description

3.1 PowerCore[®] Explorer - Explorer

PowerCore[®] Explorer will be opened in "Explorer" mode.

User can then select that folder, which contains his material data files. All material data files *.mfs (thyssenkrupp) and *.mc (FEMAG, smartFEM) will be listed which fulfill the conditions of the text filter. All file types of the other software tools mentioned in §1 are not displayed because they don't contain all information.

After selection of one file all saved public data will be shown in tables which can be selected by tabs "B-H-Curve", "User Data" and "Loss Data" "Extra". B(H,f) values are recalculated from J(H,f) values which were measured by thyssenkrupp. The loss data are also based on by thyssenkrupp measured values.

File Plot Help							
Material Folder: C:\Users\Por	werCore Explorer 2.2.9\Material	S	Select	U			Update
rilter: .mfs K 235-35 Anns K 250-35 Anns K 400-50 Annfs K 400-50 Annfs	Filename: Material Name Comment: Expire Date: Mass Density Temperature [Remarks	: [Kg/m3]: °C]:	TK_250-35_A TK M 250-35 A PowerCore® M 01.01.17 7600 20 It c	Select Folder V 1 250-35 A by Th 2 The contains orig	Vith Materials yssenKrupp signature is inal data fror	valid. n ThyssenKrup Sav	pp. /e File
	B-H Curve U	ser Data Lo	oss Data Extra				
	f=1Hz	Point	H [A/m]	B [T]	J [T]	η_μ	
	f=60Hz	1	0	0	0		
	f=100Hz	2	34,981	0,29909	0,29905	6803,93	
	f=200Hz	3	40,024	0,39027	0,39022	7759,52	
	f=400Hz f=500Hz	4	45,309	0,48694	0,48688	8552,265	
	f=700Hz	5	50,539	0,58575	0,58569	9223,076	
	f=1000Hz	6	57,98	0,69393	0,69386	9524,18	
	f=2000Hz		00.000	0 70007	0 70000	0.005 507	



"User Data" can be edited by user. They are saved in the public area of the thyssenkrupp specific material files (*.mfs):

B-H Curve User	B-H Curve User Data Loss Data Extra						
Export to text f	Export to text file Edit User Data						
Loss Data Base	- fo [Hz]:	50					
	- Bo[T]:	1.5					
Hysteresis	- ch [W/kg]:	0					
	- freqcoef.:	0					
Eddy Current	- cw [W/kg]:	0					
	- freqcoef.:	0					
Induction	- coefficient:	0					

"Loss Data" contains loss data P = f(B,f):

3-H Curve User Data Loss Data Extra							
Type: Loss Data Table 💌							
f=1Hz	Point	B[T]	J[T]	P[W/kg]	H[A/m]	<u>^</u>	
f=50Hz	1	0,29909	0,29905	0,00198	34,981		
f=100Hz	2	0,39027	0,39022	0,00305	40,024	E	
f=200Hz	3	0,48694	0,48688	0,00432	45,309		
f=400Hz f=500Hz	4	0,58575	0,58569	0,00576	50,539		
f=700Hz	5	0,69393	0,69386	0,00725	57,98		
f=1000Hz	6	0,78697	0,78689	0,00911	66,442		
t=2000Hz	7	0.88945	0.88935	0.01108	77.275	+	

"Extra" contains electrical und thermal coefficients:

B-H Curve User Data Loss D	ata Extra	
Specific Electrical Resistance	- ρ [μΩm] (20°C):	0.552
	- α [1/K]:	0.001
Thermal Conductivity	- κ [/\//(m·K)] (20°C):	22
	- α [1/K]:	0.0019



By selection in the menu "Plot" the related table data B(H,f) respectively J(H,f) and loss values are displayed in a graphic window:





Physical units of x and y axis can be selected by menus in the right part of the status bar. The left side of the status bar shows the physical values of the xy position of the mouse pointer.



Single graphs can be foregrounded by click with right mouse button on the related graph or legend:



Additionally can the graphics be formatted in a popup window after click with right mouse button into the graphic window, i.e.:

- text
- scalining of axis
- selection and presentation of the graphs
- display of the sampling points



The data of permeability and losses can displayed as function of magnetic flux density B(H,f) or polarization J(H,f)



🛞 Powe	erCore	Explorer								
File	Plot	Help								
Mater		B (H)	erCore Explo	rer 2.2.9\Materials		Select	15		Update	
		J (H)								
Filter:		µ_r (B)		Filename:		TK_250-35_A	mfs			
TK_235 TK_250		µ_r (J)		Material Name:		TK M 250-35	Ą			
TK_400 TK 800	~	Losses (B)		Comment:		PowerCore® M	4 250-35 A by Ti	nyssen Krupp		
		Losses (J)	1	Expire Date:		01.01.17				
	-		-	Marco Danaita I	16-1-21	7000				
				Mass Density [Ng/maj:	/600				
				Temperature [*	C]:	20				
				Remarks		lt	The contains ori	e signature is v ginal data from	ralid. ThyssenKrupp.	
									🛞 B-Loss Curves	
				B-H Curve Us	er Data L	oss Data Extra			File Options	
					Турс:	Loss Data Tab	lc	-	TK 250-35 A mfs	
				f=1Hz	Point	B[T]	J[T]	P[W/kg]		
				f=50Hz f=60Hz	1	0.09994	0,0999	1,0548	1.1.1.1.1.1.1	
				f=100Hz	2	0,20007	0.2	3,88438	320	
				f=200Hz	3	0,29977	0,29968	7.9745	280	
				f=500Hz	4	0,39991	0,3998	13,28551	240	
				f=700Hz	5	0,50009	0,49996	19,75932	200	
				f=2000Hz	6	0,59998	0,59982	27,46577	160	
					7	0,70011	0,69993	36,68586	120	
					8	0,79991	0,7997	47,54135		
					9	0,90003	0,89979	50,43514	00	
					10	1 10025	1,00004	92 26141	40	
					12	1,10025	1 19956	114 1649		6 18 20 BTT
					12	1,13331	1,13330	114,1045	1 Hz - 50 Hz 60 Hz 100 Hz 200 Hz 400 Hz	- 500 Hz - 700 Hz
									1000 Hz 2000 Hz	
To defin	e new	material, select	File->New M	laterial					x= -2,3510E-01, y= 378,6082 X-Axis Unit	s in T 👻 Y-Axis Units in W/kg 👻 🔡

Specific losses *P*(*B*,*f*): selcted table cells are marked as dots on the related graph

All diagrams can be copied by menu *"Options"* as jpg-pictures to clipboard or saved to file .



User defined settings of the diagrams are saved in config-files per user:

- working directory
- position and size of the main window
- position and size of the plot windows
- scaling of the plots
- agreement to EULA

3.2 PowerCore[®] Explorer - Editor

For creation of material data files which can be used in other software systems (i.e. SPEED, MAXWELL, JMAG, etc.) are different functions available. When in menu "File" one of the



functions "New Material ..." or "Edit User Data ..." is selected, then will the material editor be opened.

File	Plot Help		
	New Material Strg+ New Material From TK_250-35_A.mfs	N Aaterials	Select 0
	Edit User Data Inside TK_250-35_A.mf	s ne:	TK_250-35_A.mfs
	Export Material Data Strg	+S il Name:	TK M 250-35 A
	Update Material mfs Files	ent:	PowerCore® M 250-35
	Exit PowerCore Explorer	Date:	01.01.17
		Mass Density [Kg/m3]:	7600

• "New Material"

Empty tables are displayed which can be filled with material data for B(H) curves and specific losses. The new material data can be saved as *.mc (binary) file or *.mca (ASCII) file.

• "New Material From selected material"

The material editor opens with tables in which all public values of the selected material file are filled in. The values can be changed respectively new can be added. The new material data can be saved as *.mc (binary) file or *.mca (ASCII) file.

• "Edit User Data Inside selected material"

The material editor opens with tables in which all public values of the selected material file are filled in. Only the values in tab "User Data" can be changed or additional parameter can be defined. The material data can be saved in *.mfs, *.mc or *.mca files.

• "Export Material Data"

The data of the selected material can be exported for use by the in §1 mentioned software tools in its related files format.



The material files of thyssenkrupp (*.mfs) are encrypted with a private thyssenkrupp key and signed. By the menu "Help - About - Verify Signature" can user check, whether the selected mfs file is an origin file provided by thyssenkrupp or an unchanged copy. Additionally is the signature of a selected mfs file checked and a related information displayed:

PowerCore E	xplorer			
File Plot	Help	Δ.		
Material Fold	LUL	<u> </u>		3.0\Materials Select Update
Ciler.	Veri	fy Signa	ture	Verification
TK 235-35 Am	Load	d Key	Strg+K	
TK_250-35_A.m	User	r Guide 2	2.3.0 de	
TK_400-50_A.m TK_800-50_A.m	User Guide		2.3.0 en	File Verified - Original vssenKrupp
	Abo	out		
			Mass Dens	
			Temperatu	
			Remarks	The signature is valid. It contains original data from ThyssenKrupp.

The signature is valid.

TK_235-35_A.mfs TK_250-35_A [1].mfs	Material Name:	тк м 250-35 А
TK_250-35_A.mfs TK_400-50_A.mfs	Comment:	PowerCore® M 250-35 A by ThyssenKrupp
TK_800-50_A.mfs	Expire Date:	01.01.17
	Mass Density [Kg/m3]:	7600
	Temperature [°C]:	21
	Remarks	The signature is not valid. The original data from ThyssenKrupp have been changed.

The signature is not valid, data are changed.

TK_235-35_A.mfs TK_250-35_A [1].mfs	Name:	TK M 250-35 A
TK_250-35_A.mc TK_250-35_A.mfs	Description:	PowerCore® M 250-35 A by ThyssenKrupp
TK_400-50_A.mfs TK_800-50_A.mfs	Mass Density [Kg/m3]:	7600
	Sat. Magnetization [T]:	0
	Material Type:	Soft Iron
	Remarks	This material file is generated by user and contains user defined data.

This material file was created by a user and contains no signature.



3.2.1 Creation of new material data

User can define and edit his own material data by the menu *"File - New Material"* and save it as *.mc or *.mca files.



All data can be entered manually or copied from other applications (i.e. Microsoft[®] Excel) by clipboard into the tables of PowerCore[®] Explorer.

PowerCore Explore	er - New Material				
File Plot Help	Close Editor				
Name:					
Description:					
Mass Density [Kg/m3]:					
Sat. Magnetization [T]:	0				
Material Type: Soft Iron					
B-H Curve Loss Coef.	Loss Data				
Options Edit					
Point H [A/m]	в [Т] Ј [Т]				
1	Check Data				
	Add Row Before				
	Add Row After				
	Delete Row				
	Delete All				

input by Copy/Paste

B-H Curv	e Loss Coef. L	oss Data	
Option	ns Edit		
Point	H [A/m]	B [T]	J [T]
1	0	0	0
2	10 Copy		23
	•	Do You Want t	to Copy All Data
		Ja	Nein



3.2.2 Creation of new material data of existing material files

Material data of existing material files *.mfs and *.mc can be copied by the menu *"File - New Material From selected material"* into the tables of the editor. All data can be changed, additional data added and saved as *.mc or *.mca files.

First of all a window for selection of the frequency is opened and afterwards the window of the Material Editor.

				Upda
Importing Lis Files				Exit F
Select BH Curve for Edit and Export f=1Hz				TK_235-35 TK_250-35 TK_400-50_
f=50Hz f=60Hz				TK_800-50_
f=100Hz f=200Hz				
f=400Hz				
f=700Hz	PowerCo	re Explore	r – Editior	
f=1000Hz f=2000Hz	-			
	Power	Core Explorer -	New Material	
	File F	Plot Help	Close Editor	
	Name:		TK M 250-35	A
	Descriptio	n:	PowerCore® I	M 250-35 A by Thyssen K
	Mass Den	sity [Kg/m3]:	7600	
OK Cancel	Sat. Magn	etization [T]:	0	
	Material T	ype:	Soft Iron	
	P.H.Cupu	llans Cost lu	ann Data Ì Eutr	
	D-H Cuive	Loss Coel. I		
	Option	s Edit		
	Point	H [A/m]	B [T]	J [T]
	1	0	0	0



B) FOWER	core explorer	New Material				
File P	Plot Help	Close Editor				
Name:		TK M 250-35	A			
Descriptio	n:	PowerCore®	M 250-35 A by Ti	hyssenKrupp		
Mass Den	sity [Kg/m3]:	7600				
Sat. Magn	etization [T]:	0				
Material T	vpe:	Soft Iron				•
						Save File
B-H Curve	Loss Coef.	Loss Data Ext	ra			
Option	s Edit					
Point	H [A/m]	B [T]	J [T]	μr		<u>^</u>
1	0	0	0			
2	22,117	0,10002	0.09999	3598,742		
3	31,395	0,19998	0,19994	5068,929		
4	38,461	0,30004	0,29999	6207,958		E
5	44,652	0,39978	0,39972	7124,761		
6	50,738	0,49985	0,49979	7839,647	_	
7	57,066	0,59986	0,59979	8364,936		
8	63,79	0,70011	0,70003	8733,812		
9	71,787	0,79982	0,79973	8866,181		
10	81,858	0,90014	0,90004	8750,625		
11	95,749	0,99975	0,99963	8308,973		
12	116,967	1,10017	1,10002	7484,91		
10	101 331	1 10001	1 10000	C153 101		+
To define	new material,	select File->Ne	w Material			.:



3.2.3 Modification of user defined material data

By the menu *"File - Edit User Data Inside selected_material.mfs"* can all material data which are displayed in tab "User Data" be changed or new data added.

🛞 Pov	werCore Explorer						
File	Plot Help						
	New Material New Material From TK_25	Strg+N i0-35_A.mfs	/laterials	8	Sele	ect 😈	Update
	Edit User Data Inside TK_2	50-35_A.mfs		TK_250-3	35_A.mfs		
	Export 💦 aterial Data	Strg+S		TK M 250)-35 A		
	Update Material mfs Files			PowerCor	re® M 250-3	5 A by Thys	ssenKrupp
	Exit PowerCore Explorer			01.01.17			
TK_25 TK_40 TK_80	K 250-35 A.mfs K 400-50 A.mfs K 800-50 A.mfs	Mass Density [Kg/m3]:	7600			
	1-30_7 cm/3	Temperature [°(C]:	20			
		Remarks		h	The sig t contains Th	nature is original yssenKru	s valid. I data from upp. Save File
	ļ	B-H Curve Us	er Data	oss Data	Extra		
	ļ	Export to tex	ct file E	dit User Da	ta		
	I	Loss Data Bas	e - fo [H:	z]: 50			
	ļ		- Bo[T]]: 1,5			

	B-H Curve User	Data Loss Data	Extra
	Export to text f	ile Add Data I	Field Remove Data Field
	Loss Data Base	- fo [Hz]: ,	50
		- Bo[T]:	1,5
	Hysteresis	- ch [W/kg]:	0
		- freqcoef.:	0
	Eddy Current	- cw [W/kg]:	0
		- freqcoef.:	0
	Induction	- coefficient:	0
	User Data	data 1	123
4		data 2	0.456

Saving can be as mfs-, mc- or mca-files.



3.2.4 Amending updated material data with user defined material data

If thyssenkrupp delivers new mfs-files with updated material data then can these amended by user defined material from older mfs-files. To this user has to select in the main menu *"Update Material mfs Files"*.

G v k Computer V Temp (D:) V thyssenkr	upp PowerCore Explorer	Materials > • • • • • • • • • • • • • • • • • •	
Datei Bearbeiten Ansicht Extras ?			0 D
Conjunated 1 → Introducts during the 1 → International 1 Experiment 2 → Internatinternational 1 Experiment 2 → Internatinternational 1 Exp	Name Inew TK_470-50_A.mfs TK_530-65_A.mfs	Änderungsdatum Typ Größe 01.12.2017 11:42 Dateiordner	0 [•] LI W
thyssenkrupp PowerCore Explorer Materials new	TK 800-100_A.mfs	File Plot Help New Material Strg+N New Material From TK_470-50_A.mfs Edit User Data Inside TK_470-50_A.mfs Edit User Data Inside TK_470-50_A.mfs IName: TK_470-50_A.mfs IName: Update Material Data Strg+S Update Material mfs Files et: PowerCore Explorer Date: 01.08.2017, Please contact Th Mass Density (Ka/m3): 7700	rssenKrupp yssenKrupp for new data.

In a popup windows can then the folder be selected in which the by thyssenkrupp updated material data are saved.

Ordner suchen	10,000,000	×
Select Folder with New Material Files:		
 Computer System (C:) Temp (D:) elmoCAD thyssenkrupp PowerCore Explorer 		E
Materials	OK Abbred	+ hen



After "Ok" are backup copies *.bak of the user defined mfs-files created and origin mfs-files are updated with the by thyssenkrupp updated material data.

thyssenkrupp PowerCore Explorer N	Materials 🕨			• 4
▼ Freigeben für ▼ Brennen Name	Neuer Ordner	Änderungsdatum	Тур	Gröl
🐌 new		01.12.2017 11:42	Dateiordner	
TK_530-65_A. <mark>bak</mark>	File Plot Material Folde	Help er: D:\thyssenkrupp\Pow	erCore Explorer\Materials	
TK_800-100_A.mfs	Filter: TK_470-50_Amf TK_530-65_Amf TK_800-100_Am	is is nfs	Filename: Material Name: Comment: Expire Date: Mass Density [Kg	/m3]:



3.2.5 Interpolation of field strength values

Values of the induction B as well as values of the field strength H can be entered in table B-H-Curve.

B-H Curve	Loss Coef.	oss Data Ext	ra	
Option	s Edit			
Point	H [A/m]	B [T]	J [T]	μr
1	0	0	0	
2	21,844	0,09992	0,09989	3640,076
3	30,03	0,19993	0,19989	5298,01
4	36,282	0,29994	0,29989	6578,597
5				

Based on the conditions shown in following table will the H values be recalculated by interpolation of the already entered data:

	State	Action by user		Reaction of PowerCore [®] Explorer
a)	cell H is empty	B value is entered	>	H value is recalculated
b)	cell B is empty	H value is entered	>	no action
c)	B value exists	H value is entered	>	no action
d)	H value exists	B value is entered	>	no action
e)	H und B values exists	H value is deleted	>	H value is recalculated



3.2.6 Saving of material data files

New material data can be saved as FEMAG formatted *.mc (binary) or *.mca (ASCII) files which can be used directly by FEMAG and smartFEM for simulation. These files contents are conform to the public data which are saved in mfs-files by thyssenkrupp.

	verCore Explore	r - New Material		
File	Plot Help	Close Editor		
Name:		TK M 250-35 A		
Descri	ption:	PowerCore® M 250-35 A by ThyssenKrupp		
Mass (Density [Kg/m3]:	7600		
Sat. Ma	agnetization [T]:	0		
Materia	al Type:	Soft Iron	•	
			Save File	
		,		
B-H Ci	urve Loss Coef.	Loss Data Extra		
Opt	ions Edit			
Poir	nt H [A/m]	B[T] J[T] μ_r	<u>^</u>	
1	0	0 0		
2	21,844	0.09992 0.09989 3640.076		-
3	30,03	(m) Save Data to File		
4	36,282	Benutzer > PowerCore Explorer 2.3.0 > Materials	✓ ← Materials durchsuchen	,
5	41,968		1	
6	47,511	Dateiname: TK_250-35_A		8
-	53,649	Dateityp: mc files (*.mc)		
1		mc files (* mc)		
8	60,474	memes (anc)		
7 8 9	60,474 68,71	mca files (*.mca) All files (*.m)		

The loss data which are saved in mc/mca files are used by the simulation software smartFEM in loss calculation algorithms which were specially developed for the calculation with material data of thyssenkrupp.

FEMAG uses loss coefficients which can be calculated by FEMAG from the thyssenkrupp loss data. They can be entered manually in tab "Loss Coef.". With this can these mc/mca files used by smartFEM and by FEMAG for loss calculation.

Menu "Close Editor" opens PowerCore[®] Explorer again and the saved material data can then be exported in different formatted files for use in other simulation programs.



3.3 Export of material data

Material data can be exported as:

- tabled text file *.txt for further use in other applications
- formatted files which can be used for import of the data in the FEM software programs JMAG, MAXWELL and SPEED

File Plot Help					
New Material New Material From TK_25	Strg+N 50-35_A_50Hz.mc	ials	Select Update		
Export Material Data Strg+S Update Arterial mfs Files Exit PowerCore Explorer			TK_250-35_A_50Hz.mc		
			TK M 250-35 A		
			PowerCore® M 250-35 A by ThyssenKrupp		
TK_250-35_A.mfs	Mass Densi	ity [Kg/m3]:	7600		
IK_250-35_A_50Hz.mc IK_400-50_A.mfs IK_800-50_A.mfs	Sat. Magnet	tization [T]:	0		
	Material Tv	Material Type:	Soft Iron		
	Export Material	Data			
	Export Material	I Data PowerCore me: TK_250 turn: Text file	Explorer 2.3.0 Materials		
	Export Material	I Data PowerCore me: TK_250 typ: Text file SPED S Maxwel JMag M	Explorer 2.3.0 ➤ Materials		

After selection of the file format a window for selection of the related frequencies is displayed:

- FEMAG one file *"MaterialName_Frequenz.mc*" or *".mca*" per selected frequency will be saved.
- JMAG one file *"MaterialName.jcm"* will be saved which contains all data of all selected frequencies
- MAXWELL one file *"MaterialName_Frequenz_BH.tab"* per selected frequency which contains B(H) data and one file *"MaterialName_Frequenz.tab"* per selected frequency which contains loss data will be saved.
- SPEE: one file *"MaterialName_Frequenz.stl"* per selected frequency which contains B(H) data and one file *"MaterialName.dat"* which contains loss data of all selected frequency will be saved.





3.3.1 Export into tabled text file

The tabled text file (*.txt) contains all public material data of the related mfs or mc/mca file.

TK_250-35_A_50Hz - Editor
Datei Bearbeiten Format Ansicht ?
Material Name: TK M 250-35 A Comment: PowerCore® M 250-35 A by ThyssenKrupp Expire Date: 01.01.17 Mass Density: 7600 kg/m^3 Temperature: 20 °C Specific Electrical Resistance: 0,552 μΩm at 20°C Specific Electrical Resistance Temp Coeff: 0,001 1/K Thermal Conductivity: 0,552 W/(m·K) at 20°C Thermal Conductivity Temp Coeff: 0,0019 1/K
f=50,00 Hz H[A/m] B[T] J[T] 0 0 0 21,844 0,09992 0,09989255 30,03 0,19993 0,1998923 36,282 0,29994 0,2998944 41,968 0,3997 0,3996472 47,511 0,50002 0,4999603 53,649 0,60006 0,5999926 60,474 0,69999 0,699914 68,71 0,80002 0,7999336 79,279 0,89995 0,8998504 94,189 1,00013 1,000012 115,914 1,10004 1,099894 155,115 1,19997 1,199775 247,956 1,30024 1,299928 570,539 1,40037 1,399653 1678,561 1,50193 1,499821 3940,688 1,60467 1,599718 7381,408 1,70895 1,699674 12678,53 1,81548 1,799548 22830,72 1,92852 1,89983
f=1 Hz B[T] P[W/kg] 0,29909 0,00198 0,39027 0,00305 0,48694 0,00432 0,58575 0,00576 0,69393 0,00725



3.3.2 Export into JMAG formatted file

The material data are saved as text in jcm files and contain B(H) and loss data.

Desktop ► Computer ► System (C:) ► Benutzer ► Po	verCore Explorer 2.3.0 + Materials + JMAG	Material files 🕨				
E Desktop	▲ Name	Größe	Geändert	Тур		
Bibliotheken			01.06.2016 18:48	Dateiordner		
Heimnetzgruppe	TK 250-35 A.icm	7.682	01.06.2016 18:48	ICM-Datei		
D B gh		1002	0110012010 10110	Jen Bater		
Computer						
a System (C:)						
A Benutzer						
PowerCore Explorer 2.3.0						
Materials						
Mag Material files						
Maxwell TK 250-35 A	TK_250-35_A - Editor					
SPFED Steel files		-				
	Datei Bearbeiten Format Ansicht	۲ -				
	Material Name: TK M 250-3	5 A	by Thursentin	A .		
	Expire Date: 01.01.17	M 250-55 A	by myssenkri	abb elle		
	Manufacturer: Thyssen-Kr	upp Steel Eu	rope AG			
	Category: Steel	(
	Mass Density: 7600 kg/m^3					
	remperature. 20 c					
	f=1 Hz					
	H[A/m] B[T] J[T]					
	34,981 0,29909 0,29905					
	40,024 0,39027 0,39022					
	45,309 0,48694 0,48688					
	50,539 0,58575 0,58569					
	66 442 0.78697 0.78689					
	77,275 0,88945 0,88935					
	92,22 1,00055 1,00043					
	112,931 1,09468 1,09454					
	245.75301 1.29715 1.	29684				
	569,24298 1,39893 1,	39821				
	1671,42395 1,50165 1,4	49955				
	3886,/5488 1,60399 1,	59911				
	5000 1.6434 1.63712	00390				
	8000,00098 1,728 1,	71795				
	10000 1,76937 1,7568	00045				
	1,8523 1,	83345 88312				
	25000,00391 1,94401 1.	91259				
	30000,00391 1,96371 1,	92601		+		
	L					



3.3.3 Export into MAXWELL formatted file

The exported files are saved in a directory named "Maxwell materialname". The files are named as "materialname_BH.tab" for the B(H) data and "materialname_nnnHz.tab" for the loss data per frequency. Only B(H) and loss data are exported.

Desktop	Name	Größe	Geändert	Тур
📜 Bibliotheken			01.06.2016 18:45	Dateiordne
No. Heimnetzgruppe	TK 250-35 A 1HZ.tab	241	01.06.2016 18:45	TAB-Datei
B gn	TK 250-35 A 1HZ BH.tab	375	01.06.2016 18:45	TAB-Datei
System (C)	TK 250-35 A 50HZ.tab	325	01.06.2016 18:45	TAB-Datei
Banatara	TK 250-35 A 50HZ BH.tab	315	01.06.2016 18:45	TAB-Datei
Denutzer Denutzer Denutzer	TK 250-35 A 60HZ.tab	322	01.06.2016 18:45	TAB-Datei
Materials	TK 250-35 A 60HZ BH.tab	312	01.06.2016 18:45	TAB-Datei
IMAG Material files	TK 250-35 A 100HZ.tab	326	01.06.2016 18:45	TAB-Datei
Maxwell Material files	TK 250-35 A 100HZ BH.tab	313	01.06.2016 18:45	TAB-Datei
Maxwell TK_250-35 A	TK_250-35_A_200HZ.tab	315	01.06.2016 18:45	TAB-Datei
SPEED Steel files	TK_250-35_A_200HZ_BH.tab	299	01.06.2016 18:45	TAB-Datei
-	TK 250-35 A 400HZ.tab	277	01.06.2016 18:45	TAB-Datei
Datei Bearbeiten Format 0 0 0 21.844 0.09992 30.03 0.19993 36.282 0.29994 41.968 0.3997 47.511 0.50002 53.649 0.60006 60.474 0.69999 68.71 0.80002 79.279 0.89995 94.189 1.00013 115.914 1.10004 155.115 1.19997 247.956 1.30024 570.539 1.4037 1678.56 1.50193 3940.69 1.60467 7381.41 1.70885 1.69457	Ansicht ? Datei 0 0.0999 0.2999 0.3999 0.5000 0.6099 0.8000 0.8090 1.1000 1	Bearbeiten 0 92 0.0163 93 0.0633 94 0.1283 94 0.1283 97 0.2099 02 0.3042 06 0.4100 99 0.5283 02 0.6593 95 0.8033 13 0.9644 04 1.1466 97 1.3588 24 1.6224 1.6227 1.9477 93 2.3111 67 2.6177 95 2.899	Format Ansicht 74 11 98 94 24 65 52 1 25 06 07 64 01 28 81 81 83 7	: ?



3.3.4 Export into SPEED formatted file

The exported material data are named "materialname_nnnHz.stl" for the B(H) curve and "materialname.dat" for the loss data.

The exported data must be adapted accordingly to the specification in the user guide of SPEED before these files are imported by SPEED.

Desktop → Computer → System (C:) → Benutzer → PowerCore Explorer 2.3.0 → Materials → SPEED Steel files →	
Desktop ^ Name Größe Geändert Typ	
Disploit and a second s	
Note TK 250-35 A.dat 5.695 01.06.2016 18:45 DAT-Date	
TK 250-35 A 1HZ.stl 1.499 01.06.2016 18:45 STL-Date	
Computer (1) TK 250-35 A 50HZ.stl 1.249 01.06.2016 18:45 STL-Date	
TK_250-35_A 60HZ.stl 1.249 01.06.2016 18:45 STL-Datei	
TK 250-35 A 100HZ.stl 1.249 01.06.2016 18:45 STL-Datei	
TK_250-35_A_200HZ.stl 1.199 01.06.2016 18:45 STL-Datei	
TK_250-35_A_400HZ.stl 1.099 01.06.2016 18:45 STL-Datei	
TK_250-35_A_500HZ.stl 1.049 01.06.2016 18:45 STL-Datei	
Maxwell TK 250-35 A	
TK_250-35_A_1000HZ.stl 899 01.06.2016 18:45 STL-Datei	
TK_250-35_A_2000HZ.stl 849 01.06.2016 18:45 STL-Datei	
TK_250-35_A - Editor	
Datei Bearbeiten Format Ansicht ? Datei Bearbeiten Format Ansicht ?	
TK M 250-35 A	*
PowerCore® M 250-35 A by 0.0000000000000E+0000 0.000000000	0000E+0000
Unyssenkrupp 9.991999/1556664E-0002 2.1843999862	5/09E+0001 6455E+0001
0.1 2.99939990043640E-0001 3.6282001495	3613E+0001
50 0.0167399998754263 3.99699985980988E-0001 4.1967998504	6387E+0001
00 0.020899998867512 5.0002002/160645E-0001 4./511001586	9141E+0001
200 0.0959300026297569 6.999899744987498-0001 6.0473999023	4375E+0001
400 0.259710013866425 8.00019979476929E-0001 6.8709999084	4727E+0001
500 0.362/6000/381439 8.9995002/465820E-0001 /.92/8999328	5133E+0001
1000 1.05480003356934 1.100039059386E+0000 1.1591400146	4844E+0002
2000 3.22874999046326 1.19997000694275E+0000 1.5511500549	3164E+0002
0 0.2 1.30024003982544E+0000 2.479559365	2344E+0002
60 0.078479978137016 1.501929989783578016 1.5019299839783540000 1.6785610351	5625E+0003
100 0.146449998021126 1.60467004776001E+0000 3.9406879882	8125E+0003
200 0.363640010356903 1.70895004272461E+0000 7.3814082031	2500E+0003
400 0.9/12/99/8/22130 1.8154/999382019E+0000 1.26/85302/3 500 1.34841001033783 1.9251066/2181/E-0000 2.28307/8750	13/5E+0004
700 2.2425108033752 0.00000000000000000000000000000000000	000E+0000
1000 3.88438010215759 0.00000000000000000000000000000000000	00E+0000
2000 11.3865604400635 0 0.00000000000000E+0000 1.0000000000000000E+0000 1.00000000000000000000000000000000	00005.0000
	J000E+0000
50 0.128979995846748 2.736000000000E-0001	
60 0.16066999733448	
100 0.302/49991416931 A/m 200 0.758229070932007 A/m 250.25 A	
400 2.02704000473022	
500 2.8158700466156	-
[700 4.64114999771118 ·])



3.4 Comparison of different material data files

PowerCore® Explorer offers convenient possibilities to select different material data files and display the graphs for comparison in the same plots.

Different materials are displayed with different line patterns and different frequencies are displayed with different colors. Colors and additional parameter can be selected after click with right mouse button into the plot windows and adapted individually for all selected plots at the same time.





4 User Guide

User can open the UserGuide by "Help" menu in case that Adobe Reader[®] is installed on the computer. All pdf documents will be displayed which are saved in the same directory as "PowerCore Explorer.exe". User can therefore additionally save own documents and open them by PowerCore® Explorer.

PowerCore E	Explorer					×
File Plot	Help		1849			
Material Fold	EULA	-	3.0\Materials	Select 0	Update	
Filter: TK 235-35 Am	Load K	Signature Sey Strg+K	name:	TK_250-35_A.mfs		
TK 250-35 A.m TK 250-35 A.f	User G	uide 2.3.0 de	erial Name: TK M 250-35 A			
TK_400-50_A.m	User G	uide 2.3.0 en	iment:	PowerCore® M 250-35 A by Thyssen Krup	рр	
110_000 30_70.00	About		ire Date:	01.01.17		
		M	ass Density [Kg/m3]:	7600		
ſ	🔁 User Gui	ide 2.3.0 de.pdf -	Adobe Reader			X
	Datei Bea	arbeiten Anzeige	Fenster Hilfe			×
	4			/ 24 75,4% 💌 📝 🐺	Werkzeuge	Kommentar
To define n			Benutz	zeranleitung und Nutzungsbed	Powerscorr	ŝ
				"PowerCore® Explorer"		
		i	zur Erzeugung der benötigten Materi	für FEM Berechnungen von ele ialdaten aus TKSE spezifischer Elektrobandsorten	ektrischen Maschinen n Materialdateien für	
				thyssenkrupp Steel Europe A	G	



5 Terms of use

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