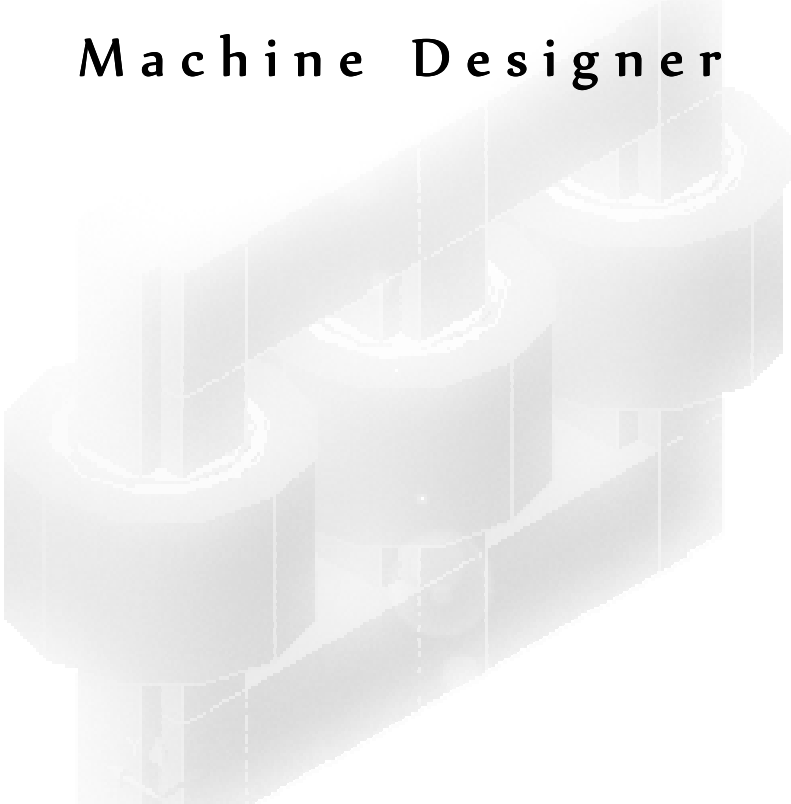

ElectroSOFT

Machine Designer



Operation Manual and Users' Guide

ElectroSOFT Machine Designer

VERSION – 1.7.3

Welcome to ElectroSOFT Machine Designer

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Introduction

ElectroSOFT Machine Designer is a very useful software for Electrical Machine Designing. It can calculate different dimensions of electrical machines based on some basic parameters (i.e. for transformer - primary and secondary voltage, KVA rating, frequency etc.) given as input. Based on those parameters, this

FUNCTIONS OF ELECTROSOFT

1. Takes input from user
 2. Calculates different dimensions and parameters
 3. Creates and saves Design Sheet
 4. Draw the machine in AutoCAD dynamically
 5. Shows "Step-by-Step View" of the machine
 6. Saves the 3D image in AutoCAD file format
-

software calculates different dimensions (of core, limbs, tank, winding etc.), isolation depth, losses, efficiency etc. and then creates a design sheet of the machine as output.

But only creating a design sheet is not sufficient to visualize the machine. Especially, beginners in this field cannot visualize the machine by seeing only the values of different parameters and dimensions which they get after a long and tedious calculation process. This software helps them to visualize the machine by drawing it on the screen with actual dimensions.

Note:

To draw the picture it uses AutoCAD software. Refer to the article "Drawing with AutoCAD" to know about the drawing process.

Installing ElectroSOFT Machine Designer

As mentioned earlier, this software uses AutoCAD (another drawing software) while drawing. So, before installing ElectroSOFT first install the AutoCAD software. Recommended version of AutoCAD is **AutoCAD 2000 or any upper version**. Lower versions of AutoCAD can also be installed, but all the features of ElectroSOFT will not be available.

Note:

Versions lower than AutoCAD R-14 should be avoided because of malfunctioning of handshaking between two different types of software.

After installing AutoCAD proceed with the installation of ElectroSOFT Machine Designer.

To install ElectroSOFT Machine Designer follow these steps:

1. Open the installation folder supplied in CD or by any other media.
2. Double click on the setup.exe file to run the installation program. (Please read the README.txt file before starting the installation program.)
3. Follow the instructions appeared on the screen.

Note:

As AutoCAD is installed before, some shared library file may be already present in the system. For those files a warning message may be displayed asking permissions for either overwriting or keeping the previous files. In that case any one of the given options can be chosen.

4. After the end of the installation an “Installation Complete” message will appear.

Hardware / Software Requirements

ElectroSOFT Machine Designer is very simple software which hardly has any criteria like other software about processor speed or RAM size etc. The only requirement is that, version 1.7.3 of ElectroSOFT needs the operating system:

Microsoft XP – with service pack - 2 or any upper versions.

Note:

Considering the limitations of not running in the lower versions of Microsoft XP operating system, we decided to release the next versions of ElectroSOFT with the capacity of running in any platform.

Since this software uses AutoCAD, as mentioned earlier, the requirements of AutoCAD

have to be fulfilled. For the requirements of AutoCAD please go through the AutoCAD manual or README file of AutoCAD.

Operational Details of ElectroSOFT Machine Designer

Before describing its amazing features, let's first explain its basic operation in brief. ElectroSOFT is mainly used to design electrical machines (like transformer, motor, generator or other instruments).

It is done by the following steps:

1. First it takes some basic parameters of the machine (for transformer - primary and secondary voltage, KVA rating, frequency etc.) in the form (window) shown in the following figure.

ElectroSOFT Machine Designer: Transformer Parameters

Enter the parameters of transformer according to your criteria and then press the NEXT button.

Load Previous Values: Design Sheet.txt

Mandatory parameters	Optional parameters
* Primary Voltage (Vp) [Volt]: 11000	Tapping in %: ± 5
* KVA Rating (Q): 30	Frequency (f) [Hz]: 50
* Secondary Voltage (Vs) [Volt]: 250	Connection Type: Star-Delta
	Window Type: Core Type
	Phase: Three

Back Next [Red Stop Button]

Fig 1: Picture of the form (window) for taking transformer parameters

2. After entering suitable values in proper text box, press the next button.
3. Depending on these values the calculation will be done. The calculation process is very first. It takes few milliseconds (depends on the processor speed) to calculate the values of all the parameters and dimensions. While calculating it takes care of some ISO standards to give the best result according to the standard.
4. After the calculation, the design sheet is ready to save. So in the next form (window), an option of saving the design sheet will be given (shown in fig. 2). Here is a sample design sheet which conveys all the details about the machine. This design sheet is made according to the dataset entered in the form shown in fig. 1.

A SAMPLE DESIGN SHEET			
KVA 30	Phase 3	Frequency--50Hz	Star-Delta
Line Voltage:			
H.V. - 11000 V,			
L.V. - 250 V			
Phase Voltage:			
H.V. - 6350.853 V,			
L.V. - 250 V			
Line Current:			
H.V. - 1.5746 A,			
L.V. - 69.282 A			
Phase Current:			
H.V. - 1.5746 A,			
L.V. - 40 A			
Type - core			

Core			

Material			0.35 mm thick 92 Grade
Output constant	K		0.435
Voltage per turn	Et		2.3826 V
Circumscribing circle dia.	d		131.9952 m
Number of steps			2

Dimensions	a	112.1959 mm
	b	69.9574 mm
Net iron area	Ai	9756.7286 Sq.mm
Flux density	Bm	1.1 Wb/Sq.m
Flux	Øm	0.0107 Wb
Weight		66.4493 Kg
Specific iron loss		1.3 W/Kg
Iron loss		86.3841 W

Yoke		

Depth of yoke	Dy	112.1959mm
Height of yoke	Hy	112.1959mm
Net yoke area		11708.0743 Sq.mm
Flux density		0.9167 Wb/Sq.m
Flux		0.0107 mWb
Weight		109.4747 Kg
Specific iron loss		1
Iron loss		109.4747 W

Windows		

Number		2
Window space factor	Kw	0.2195
Height of Window	Hw	298.7112mm
Width of Window	Ww	119.4845mm
Window area	Aw	35691.357 Sq.mm

Frame		

Dist. between adjacent limbs	D	251.4797 mm
Height of frame	H	523.103 mm
Width of frame	W	615.1553 mm
Depth of frame	Dy	112.1959 mm

Windings	L.V.	H.V
Type of winding	Helical	Cross-over
Connections	Delta	Star
Conductor Dimensions:		
- Radial depth	1.1 mm	
- Axial depth	16 mm	
Area	17.6 Sq.mm	0.6846 Sq.mm
Current density	2.3 A/Sq.mm	
Turns per phase	104.9277	2798.7975
Turns per coil	104.9277	4
Turns per layer	35.9759	27
Number of layers	3	26
Height of winding	575.6144 mm	149.1635 mm
Depth of winding	4.3 mm	38.2744 mm
Insulation between layers	0.3mm press board	0.3mm paper
Insulation between coils		5.0 mm spacer
Coil Diameters - Inside	134.9952 mm	165.0267 mm
Coil Diameters - Outside	143.5952 mm	241.5755 mm
Length of mean turn	0.4376 m	0.6387 m
Resistance at 75°C	0.0548 ohm	52.2217 ohm
Insulation		
Between l.v. and core = press board wraps 1.5 mm		
Between l.v. and h.v. winding = bakelized paper 10.7158 mm		
Width of duct between l.v. and h.v = 5 mm		
Tank		
Dimensions		
- height	Ht	0.9231 m
- length	Lt	0.8245 m

- width	Wt	0.3416 m
Oil Level		0.1622 m

Impedance		

P.U. Resistance		0.0217
P.U. Reactance		0.0283
P.U. Impedance		0.0356

Losses		

Total core loss		195.8588 W
Total copper loss		749.1176 W
Total losses at full load		944.9765 W
Efficiency at full load & u.p.f		96.9463 %

5. Another option of drawing that machine depending on the calculated values is also given. This form is as shown below:



Fig 2: Picture of the form giving options of saving Design Sheet and viewing the electrical machine

6. To view the transformer in AutoCAD, click on the “View Transformer” button and another form will appear. This form contains all the tools and buttons to draw and manipulate the picture of the machine. Here is a snapshot of that form:



Fig 3: Picture of the form giving drawing and manipulating options of the electrical machine

By clicking on the “Draw” button, the three dimensional picture of the machine can be drawn in AutoCAD. Once the picture is completely drawn in AutoCAD, it can be manipulated using other buttons present in this form.

The “Step by Step View” is an exciting feature by using which we can get the picture of the machine part by part, as it is being made in the factory (like for transformer first step is the picture of the transformer limbs, secondly the view of complete core only; and in this way we come to the complete view of transformer). It helps us to understand how it is being made from the very beginning.

Once the picture is being drawn we can use the “AutoCAD Tools” to zoom the picture, to rotate the picture dynamically and to make the dimensions of any length of the image.

Drawing in AutoCAD

This software is very efficient in drawing dynamically the three dimensional picture of any machine. It uses AutoCAD (drawing software) to draw the 3D picture with its actual dimensions. The picture after drawing will be identical to the original factory made machine. Also this software has some amazing features which help us get the

FEATURES IN BRIEF

- ✓ Can draw 3D image
- ✓ Zooming option
- ✓ Static & dynamic rotation of the machine (3D image)
- ✓ All possible viewing angles
- ✓ Step-by-Step view of machine
- ✓ Distinguishable color combination
- ✓ Image saved as AutoCAD file

best view of the drawing. For example: we can get the upper view, bottom view, front view and side views also. If these views are not sufficient to visualize the machine, we could use another feature of this software which helps us get the view from any angle. There is another exciting feature by which we can get the rotating view of the machine to have a complete idea about the machine. All these features are available in the form shown in fig 3 (within “AutoCAD tools” frame). We can get this form

after clicking on the “View Transformer” button in the form shown in fig 2. To give an idea to the beginner about how it is made in factory, we can use the “Step-by-Step View” feature off this software which is also available in the same window in the frame named “Step-by-Step View”. Here is a snapshot of a transformer after clicking on the “Draw” button in the form shown in fig 3:

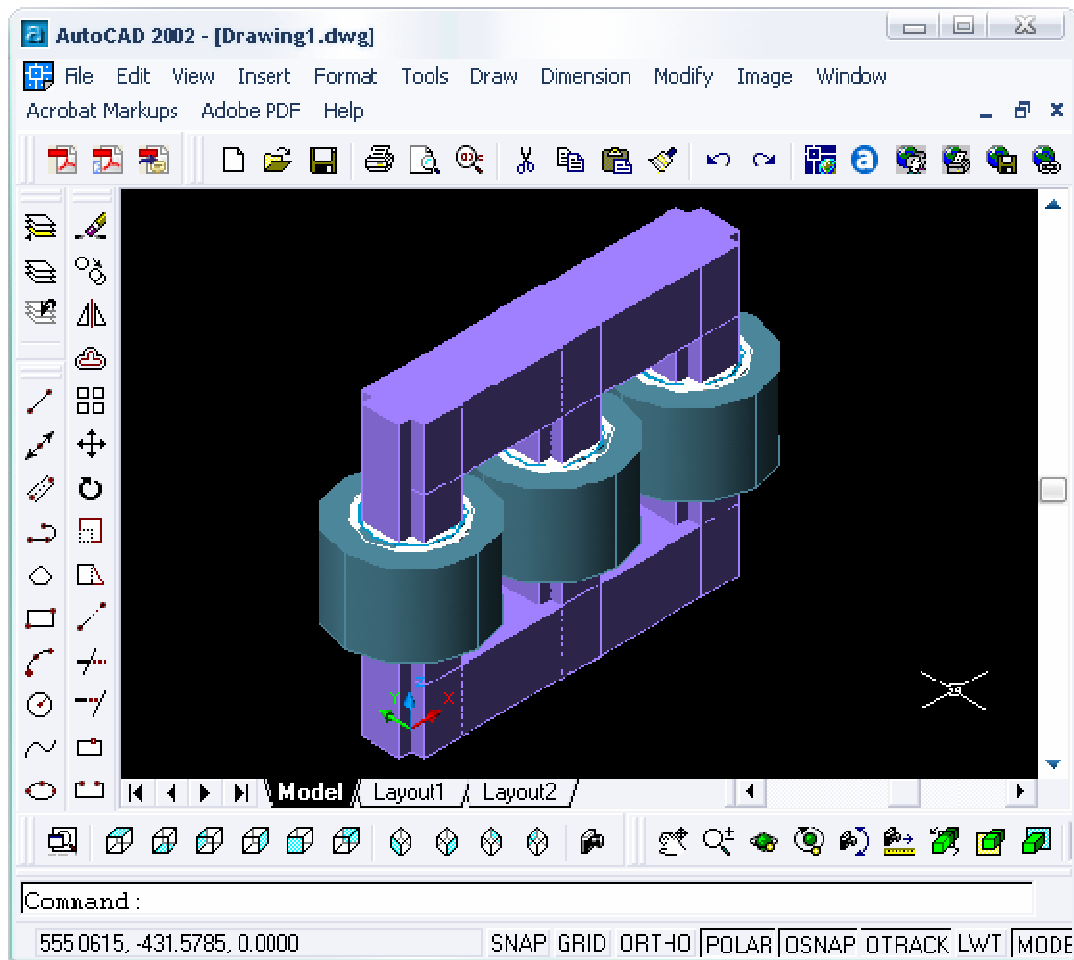


Fig 4: Picture of transformer core & winding automatically drawn in AutoCAD window

As this picture is drawn in AutoCAD we can also use the features of AutoCAD to manipulate the picture; like penetrating the three dimensional image to see the inner view, we can see the picture by selecting part by part of the machine.

After drawing the 3-D picture in AutoCAD window, we may use the “Step-by-Step View” feature. Here is a magnified view of both the “Step-by-Step View” and “AutoCAD tools”

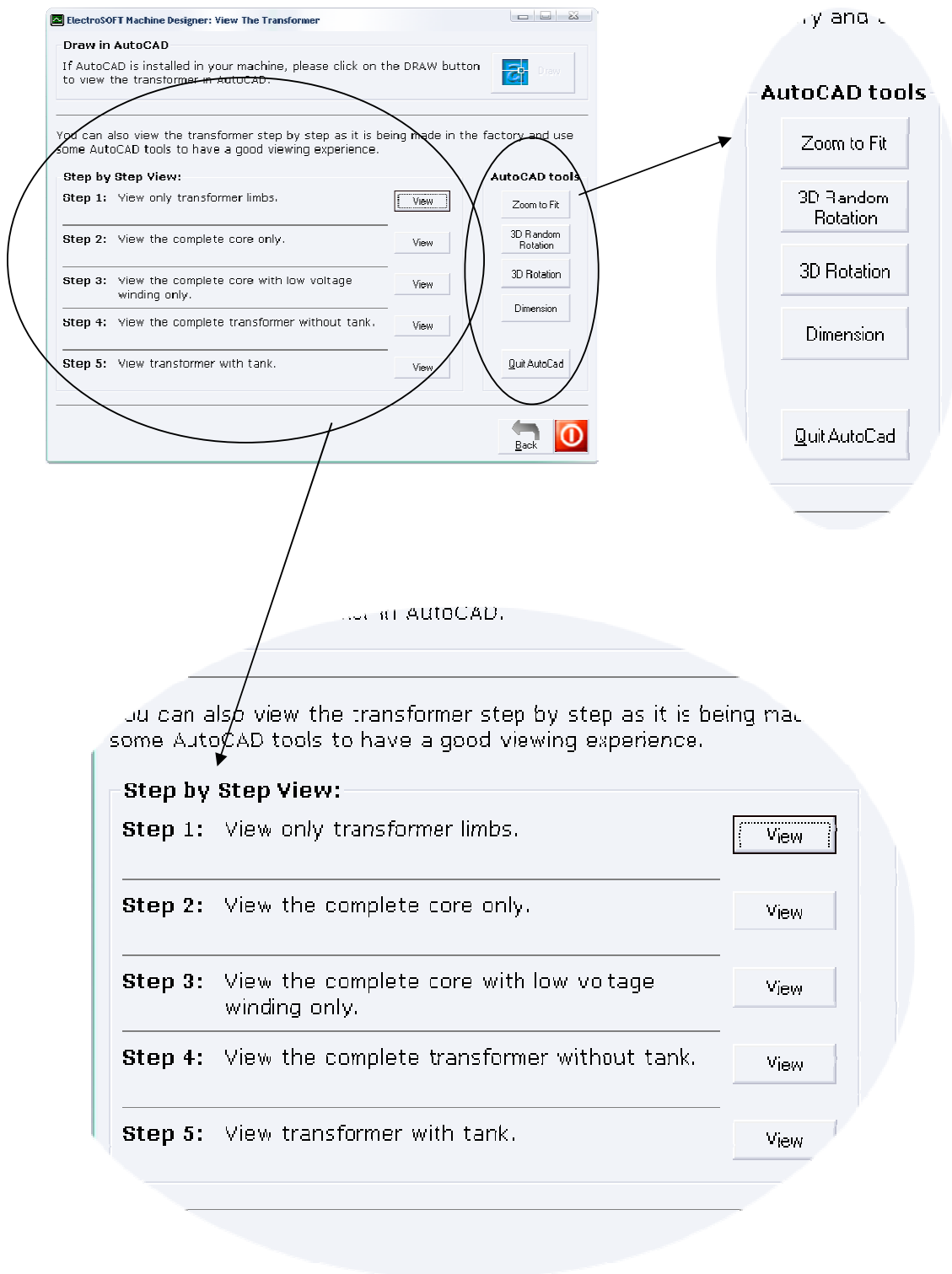


Fig 5: Magnified view of "Step-by-Step View" and "AutoCAD tools"

“AutoCAD tools” contains:

1. **Zoom to Fit:** Click on this button to enlarge the image as much as possible to give the complete view in AutoCAD window.
2. **3D Random Rotation:** This tool is used to randomly rotate the 3D picture of the machine. After clicking on this button, AutoCAD window will be activated automatically. Then just move the mouse pointer a little bit pressing the left mouse button in the AutoCAD window. The image will continue to rotate.
3. **3D Rotation:** This tool is also used for the same purpose, except the random behavior of the rotation. Do the same clicking and moving of mouse pointer. The image will rotate with the mouse movement.
4. **Dimensions:** Used to measure the length, width, height, radius and different dimensions of the image (machine). Just click on this button and again click for two times on the two points of the image to measure the distance between two points.
5. **Quit AutoCAD:** Click to quit AutoCAD window. If the image of the machine is not saved, a reminder of saving the image will be given to the user.

“Step-by-Step View” contains:

As stated earlier, it can be used to view the machine being made in a step by step process. It has five steps, which can be viewed in fig 5. Each step has a “View” button beside it. Click on any “View” button and the AutoCAD window will be activated with the desired view automatically.

Uninstalling ElectroSOFT Machine Designer

Like other software, uninstalling ElectroSOFT is very easy process. To uninstall follow these steps:

1. Go to Control Panel.
2. Double click on “Add or Remove Programs”.
3. Find out ElectroSOFT Machine Designer and select it.
4. Click on the “Change/Remove” button. [In some OS it is named as “Remove” only]
5. The “Uninstallation” program will start running.
6. Follow the instructions shown on the screen to uninstall the software completely.

Contact Us

For further queries or to get more information please contact us via email or phone. Also, we want your honest feedback and opinion about the usage, features and advantages of this software.

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