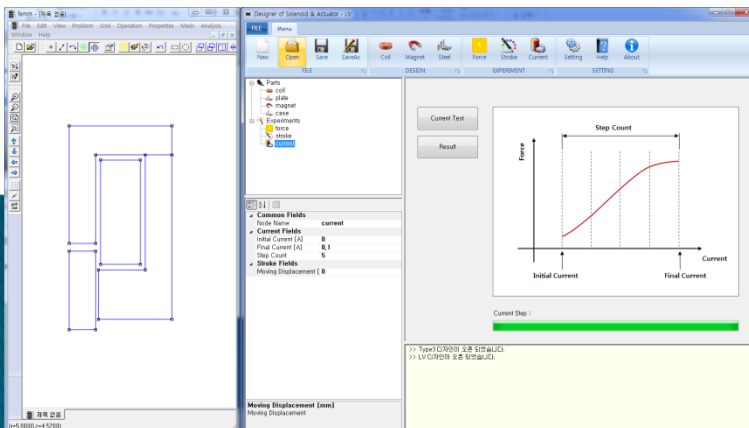


DoSA-2D User Manual

Solenoid Example

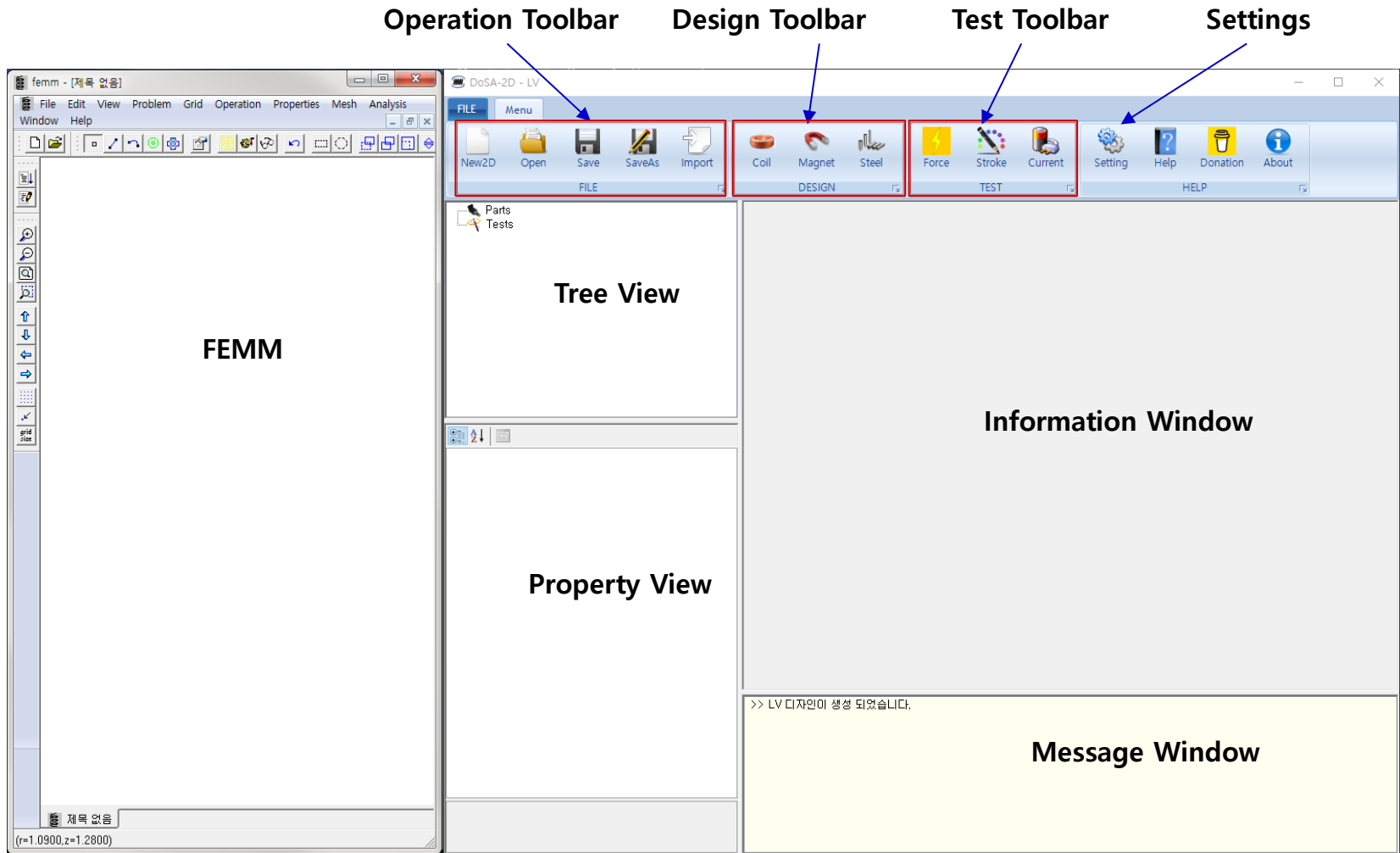
2022-05-06

zgita@gmail.com



DoSA Structure

Program Structure



Toolbar

1. Operations

- ✓ New : Create a new design
- ✓ Open : Open previous design
- ✓ Save : Save the design
- ✓ SaveAs : Save in different name
- ✓ Import : DXF Import



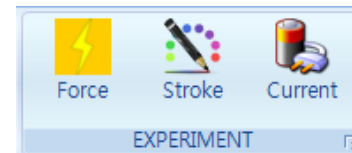
2. Part Design

- ✓ Coil : Add a coil and specification design
- ✓ Magnet : Add a magnet and determine specifications
- ✓ Steel : Add a steel and determine specifications



3. Virtual Test

- ✓ Force : Magnetic force estimation
- ✓ Stroke : Magnetic force estimation for each stroke
- ✓ Current : Magnetic force estimation for each current

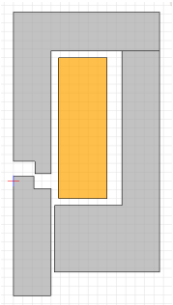


Work process

Product Design

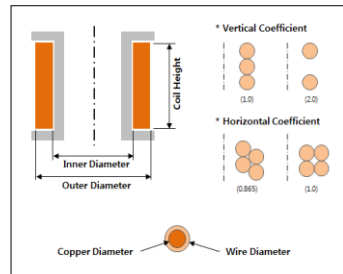
1. Geometry design

Geometry



2. Part design

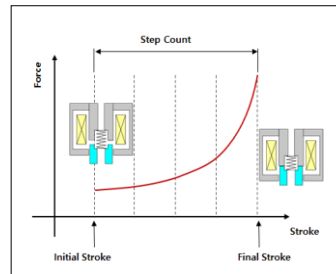
Components



Virtual Test

3. Test condition

Test Condition

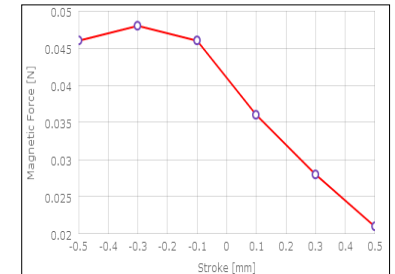


4. Virtual Test (Autorun)

Virtual Test

5. Results

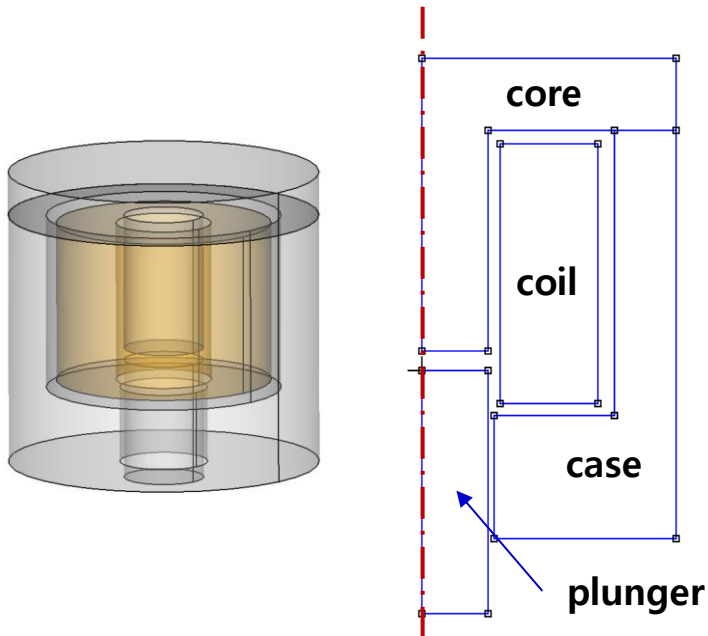
Results



Analysis Model

Analysis Model

1. Model Shape



2. Product Specifications

가. Coil Turns

- Coil Turns : 1040 turns
- Coil Resistance : 15.2 Ohm

나. Power

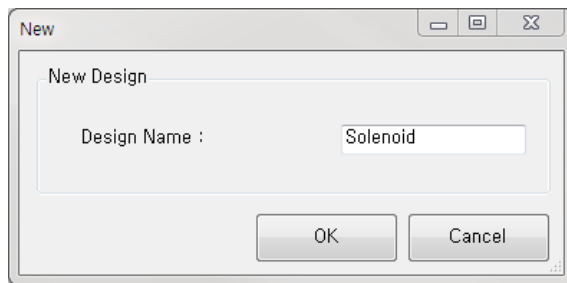
- Voltage : 14.5V

(Work Example Files : DoSA-2D Install Directory > Samples > Solenoid)

New design

1. Toolbar > Click New Button
2. Design Name : "Solenoid"
3. Click OK

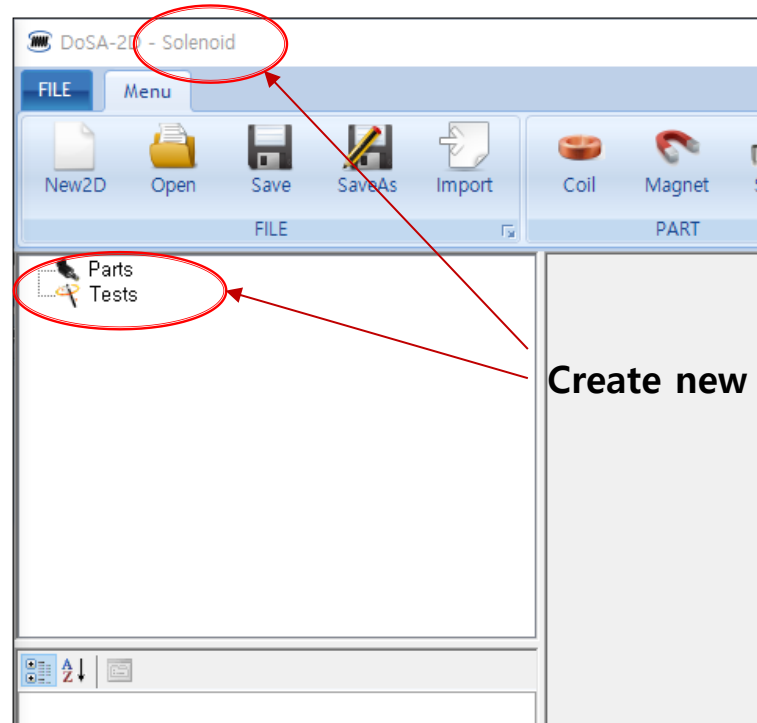
2



1



3



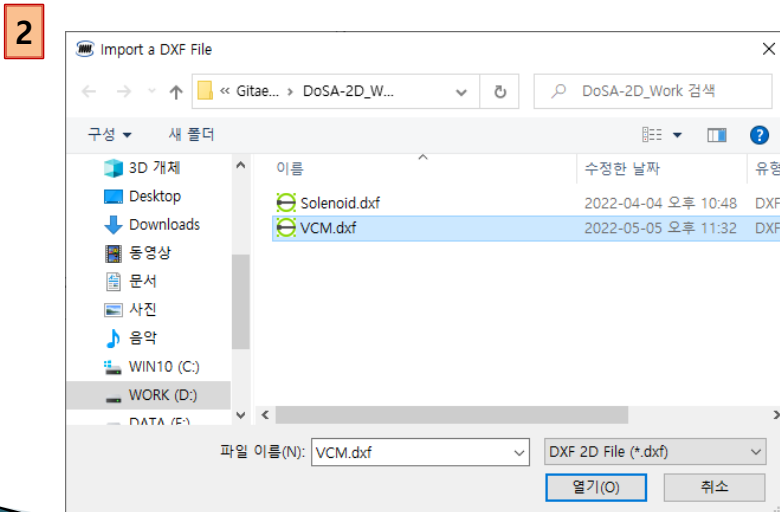
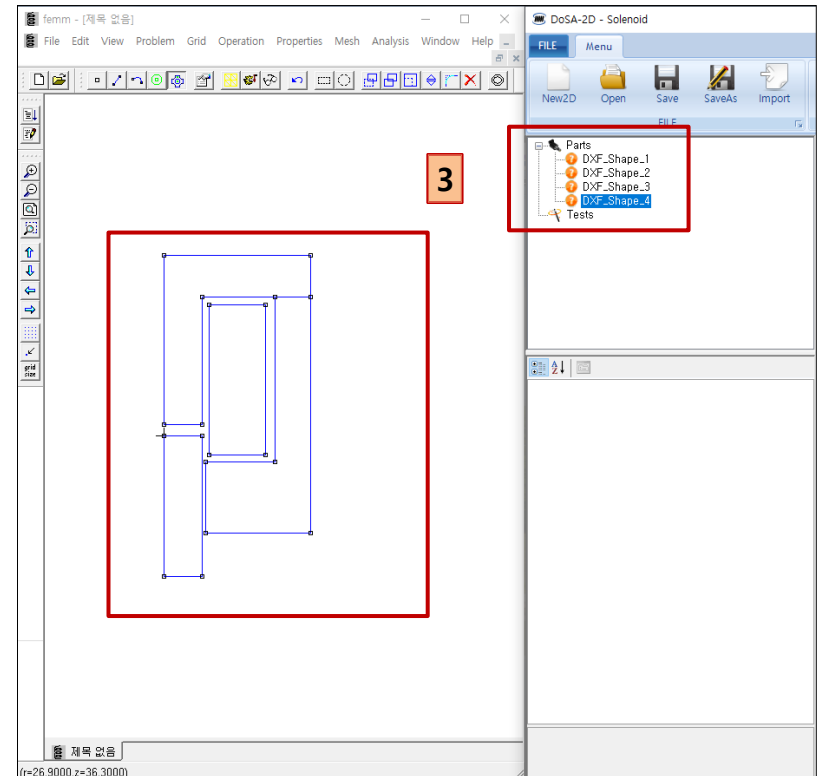
Create new design

Import shapes

1. Toolbar > Click New button
2. Select "Solenoid.dxf" and click the Open button
3. Check part shapes

[Caution for the Shape Model]

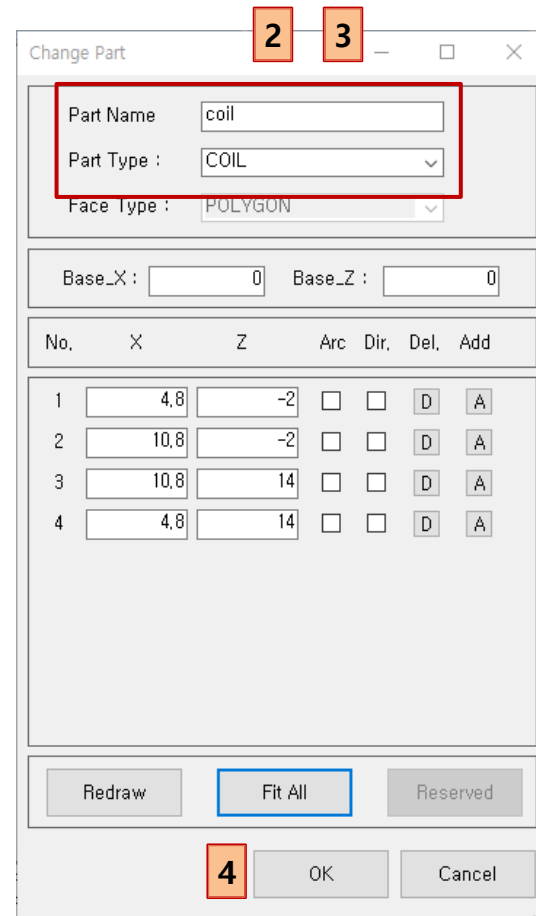
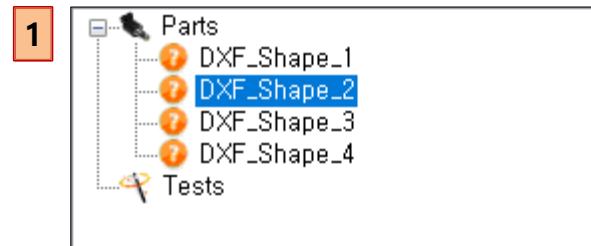
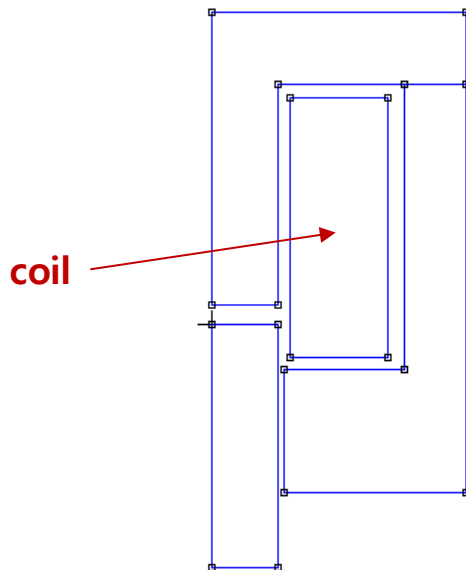
- Part must be written in Polyline
- Please refer to "Drawing Guide"
- https://solenoid.or.kr/data/Drawing_Guide_ENG.pdf



Parts Design

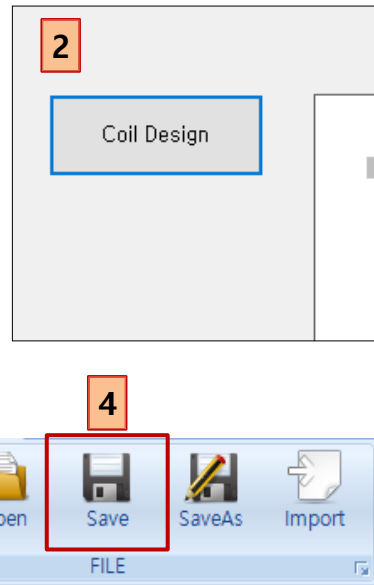
Set as Coil

1. Treeview > "DXF_Shape_2" double click
2. Change name : "coil"
3. Change part type : COIL
4. Click OK button

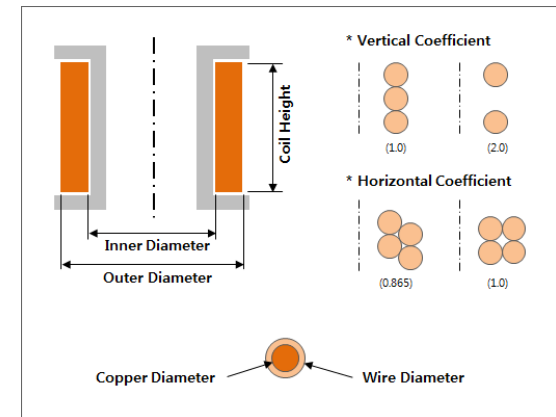


Coil Design

1. Input Coil specifications
 - ✓ Copper Diameter : 0.27
2. Calculate the coil specification
 - ✓ Click "Coil Design" button
3. Check the coil specification
4. Ribbon Bar > Save

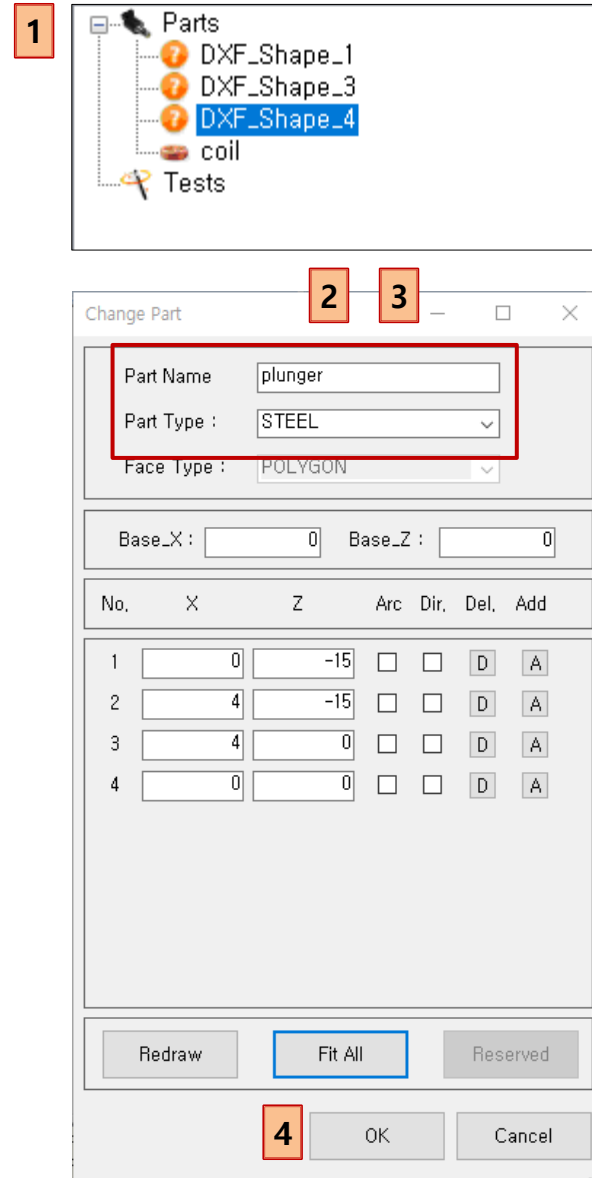
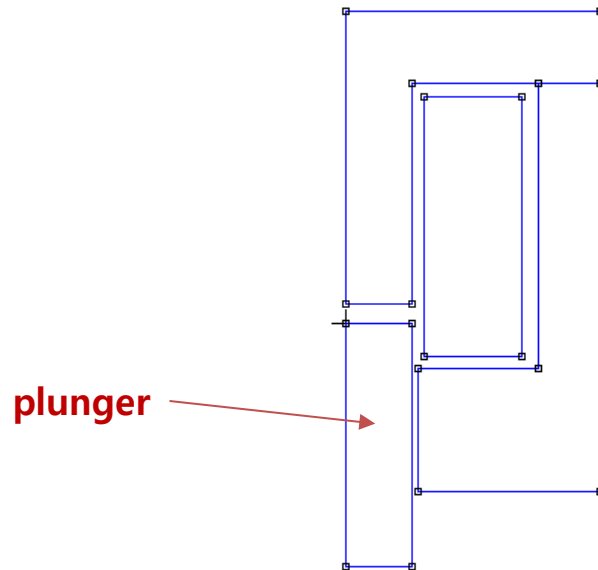


▼ Common Fields	
Node Name	coil
▼ Specification Fields	
Part Material	Copper
Current Direction	IN
Moving Parts	FIXED
▼ Calculated Fields	
Coil Turns	1040
Coil Resistance [Ω]	15.20945
Coil Layers	20
Turns of One Layer	52
▼ Design Fields (optional)	
Coil Wire Grade	Enameled_IEC_Grade_2
Inner Diameter [mm]	9,6
Outer Diameter [mm]	21,6
Coil Height [mm]	16
Copper Diameter [mm]	0,27
Wire Diameter [mm]	0,31072
Coil Temperature [°C]	20
Horizontal Coefficient	0,9
Vertical Coefficient	0,98
Resistance Coefficient	1



Set a plunger

1. Treeview > "DXF_Shape_4" double click
2. Change name : "plunger"
3. Change part type : STEEL
4. Click OK button



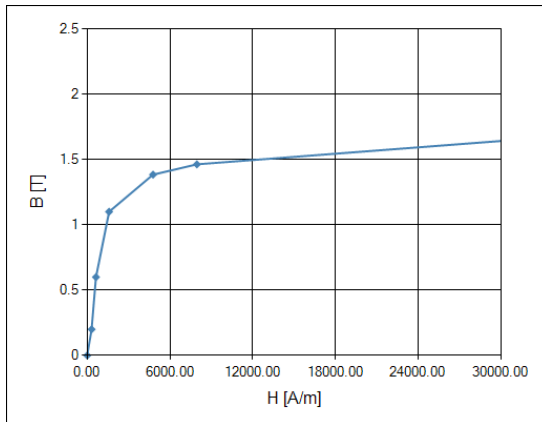
Plunger Settings

1. Plunger setting

- ✓ Part Material : 430 Stainless Steel
- ✓ Moving Parts : **MOVING**

Select the magnetic force calculation part

[BH curve]

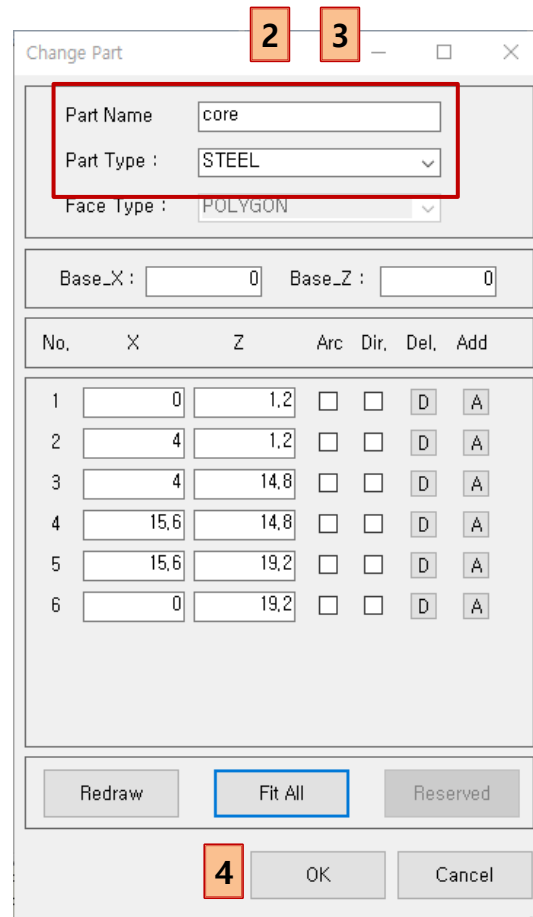
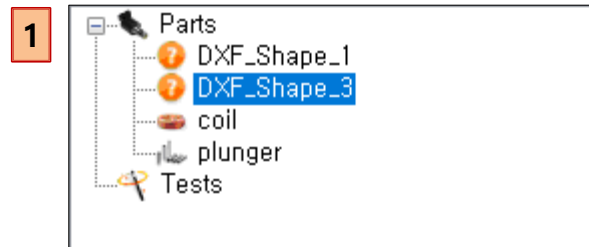
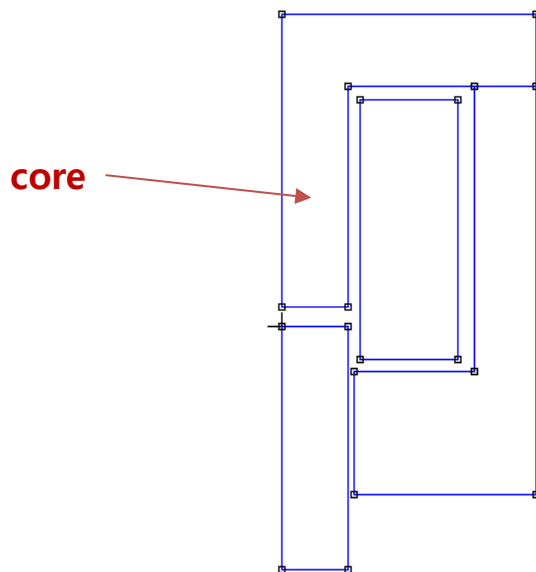


1

Common Fields	
Node Name	plunger
Specification Fields	
Part Material	430 Stainless Steel
Moving Parts	MOVING

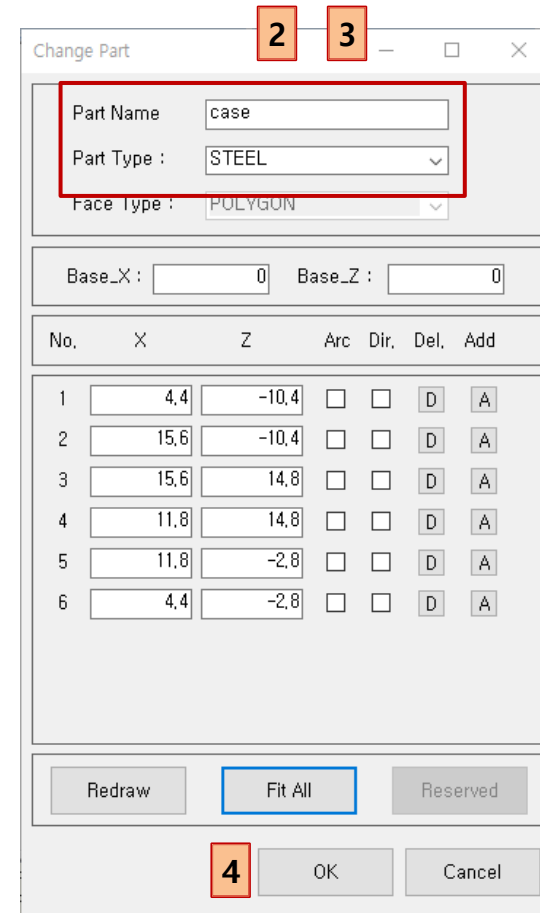
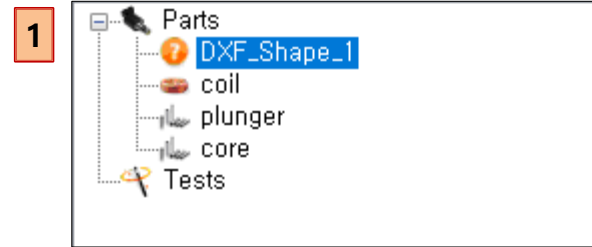
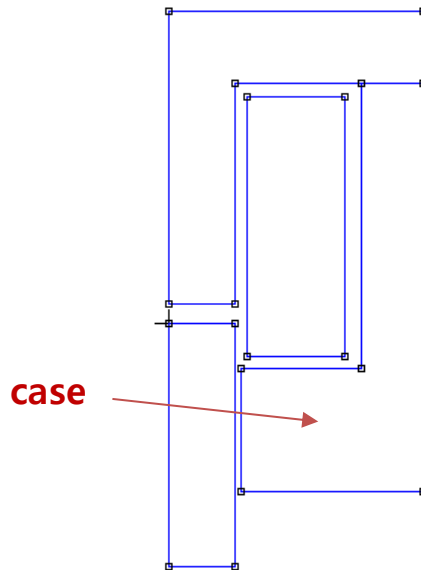
Set as Core

1. Treeview > "DXF_Shape_3" double click
2. Change name : "core"
3. Change part type : STEEL
4. Click OK button



Set as Case

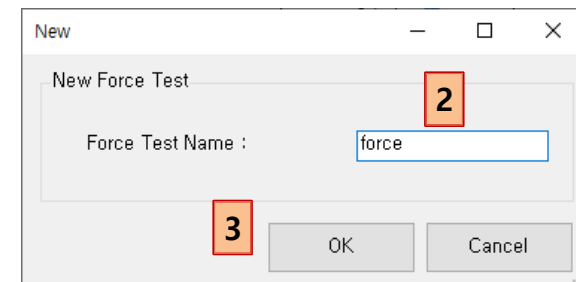
1. Treeview > "DXF_Shape_1" double click
2. Change name : "case"
3. Change part type : STEEL
4. Click OK button



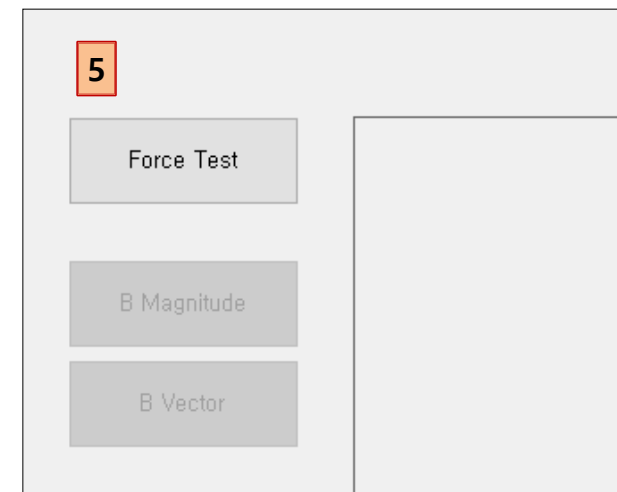
Virtual Test

Test of the magnetic force

1. Toolbar > Click Force Button
2. Force Test Name : "force"
3. Click OK Button
4. Test Setting
 - ✓ Voltage : 14.5 V
5. Click "Force Test" Button



✓ Common Fields	
Node Name	force 4
✓ Current Fields	
Voltage [V]	14.5
Max. Current [A]	0,95335
✓ Stroke Fields	
Moving Stroke [mm]	0
✓ Condition Fields	
Mesh Size [%]	2



Results of the magnetic force

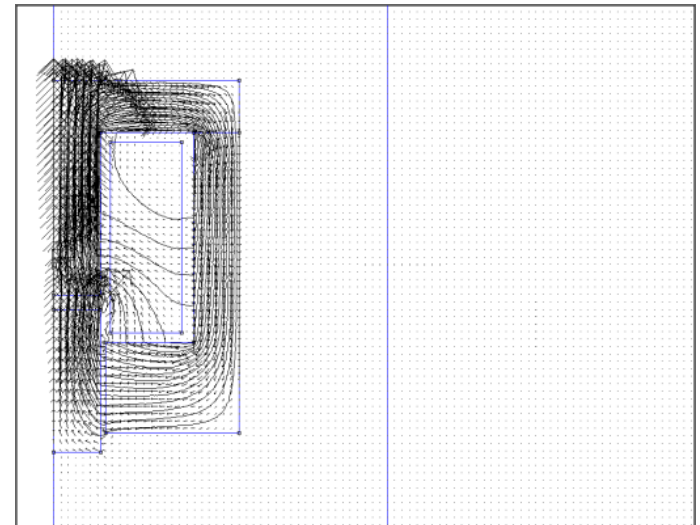
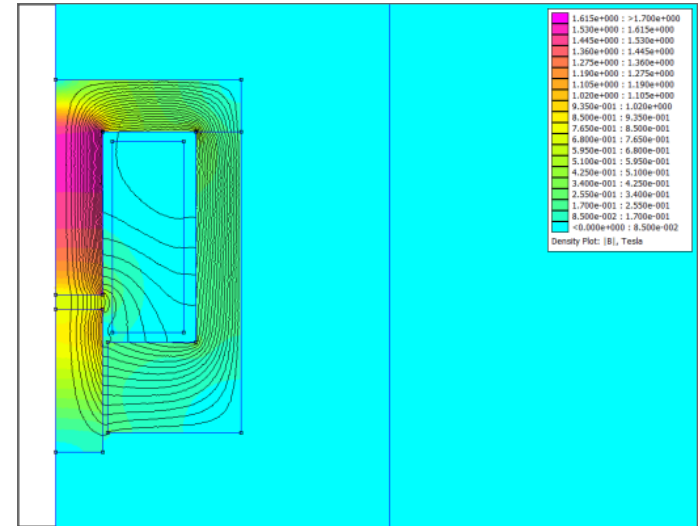
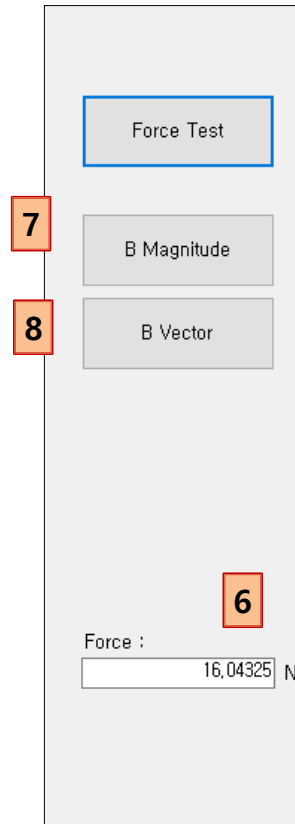
6. Force : 16.04 N

7. Magnetic Density

✓ Click the B Magnitude button

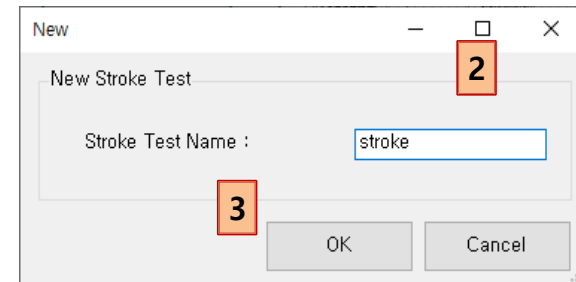
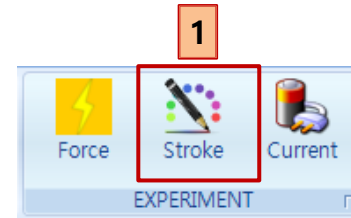
8. Vector of Magnetic Density

✓ Click the B Vector button



Test of the stroke-magnetic force

1. Toolbar > Click Stroke Button
2. Stroke Test Name : "stroke"
3. Click OK Button
4. Test Settings
 - ✓ Voltage : 14.5
 - ✓ Initial Stroke : 0.0
 - ✓ Final Stroke : 1.0
 - ✓ Step Count : 5

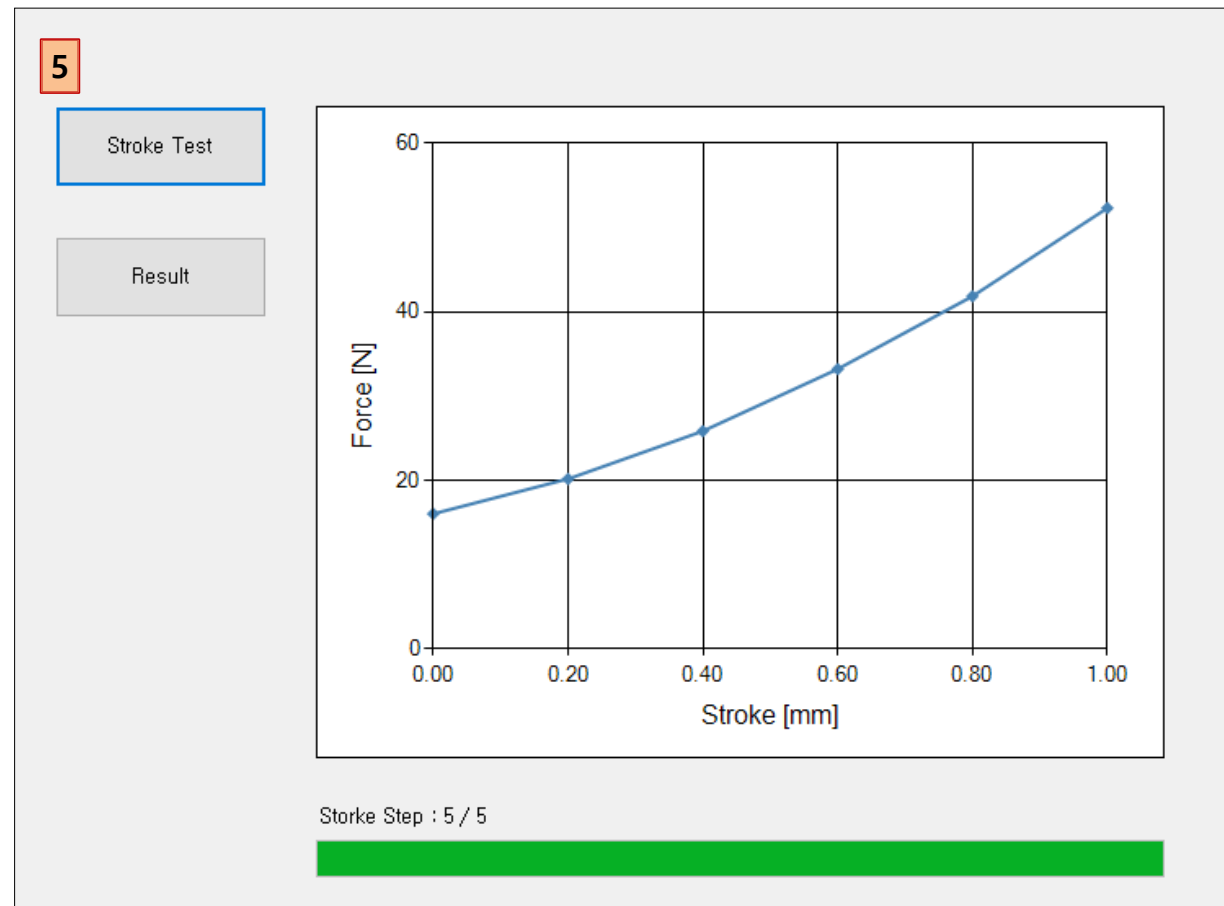


The image shows a table of test settings. A red rectangular box highlights the 'Current Fields' and 'Stroke Fields' sections. A red square with the number '4' is to the left of the box.

▼ Common Fields	
Node Name	stroke
▼ Current Fields	
Voltage [V]	14.5
Max. Current [A]	0,95335
▼ Stroke Fields	
Initial Stroke [mm]	0
Final Stroke [mm]	1
Step Count	5
▼ Condition Fields	
Mesh Size [%]	2

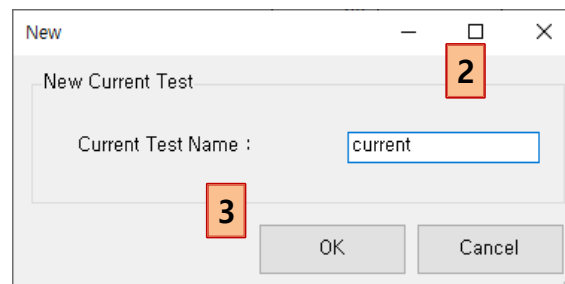
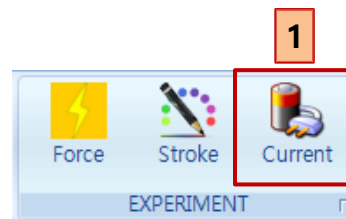
Results of the stroke-magnetic force

5. Click "Stroke Test" button



Test of the current-magnetic force

1. Toolbar > Click Current Button
2. Current Test Name : "current"
3. Click OK Button
4. Test Settings
 - ✓ Initial Current : 0.0
 - ✓ Final Current : 1.5
 - ✓ Step Count : 5

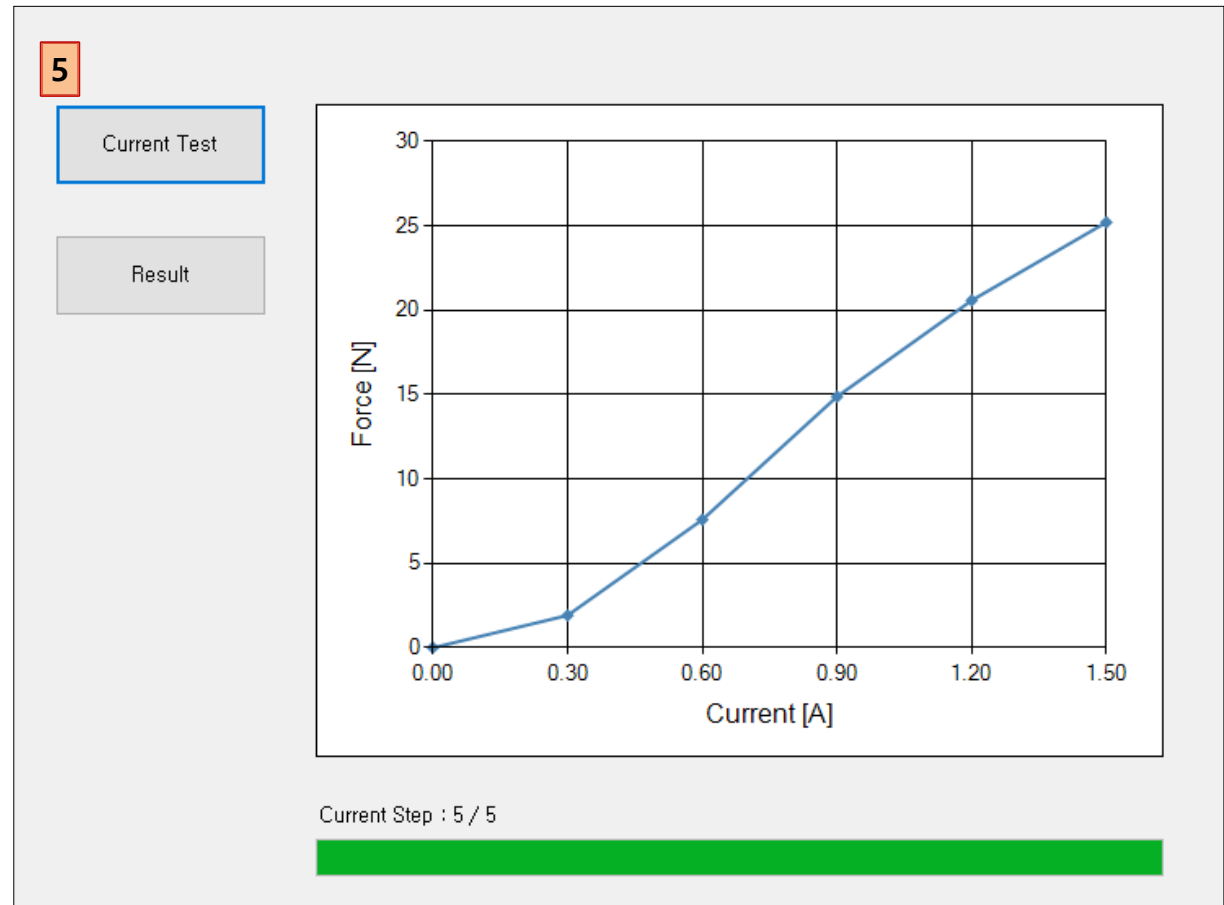


A screenshot of a 'Test Settings' panel. It contains several expandable sections: 'Common Fields', 'Current Fields', 'Stroke Fields', and 'Condition Fields'. The 'Current Fields' section is highlighted with a red rectangular box, and a red square with the number '4' is to its left. The 'Current Fields' section contains three rows of settings: 'Initial Current [A]' with value '0', 'Final Current [A]' with value '1.5', and 'Step Count' with value '5'. The 'Stroke Fields' section contains one row: 'Moving Stroke [mm]' with value '0'. The 'Condition Fields' section contains one row: 'Mesh Size [%]' with value '2'.

▼ Common Fields	
Node Name	current
▼ Current Fields	
Initial Current [A]	0
Final Current [A]	1.5
Step Count	5
▼ Stroke Fields	
Moving Stroke [mm]	0
▼ Condition Fields	
Mesh Size [%]	2

Results of the current-magnetic force

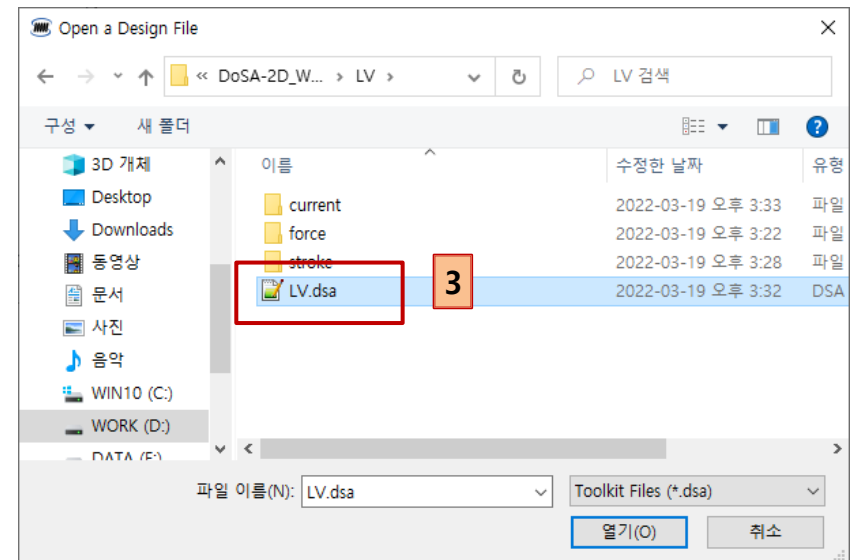
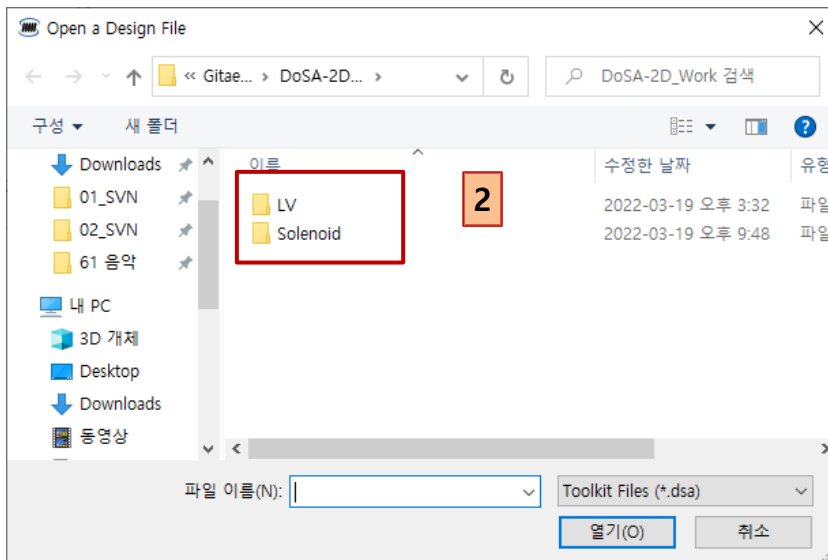
5. Click "Current Test" button



Tips

Open design

1. Toolbar > Click Open Button
2. Double click the design directory.
3. Double click the design file.



Thank You

Email : zgitae@gmail.com

Homepage : <http://openactuator.org>

