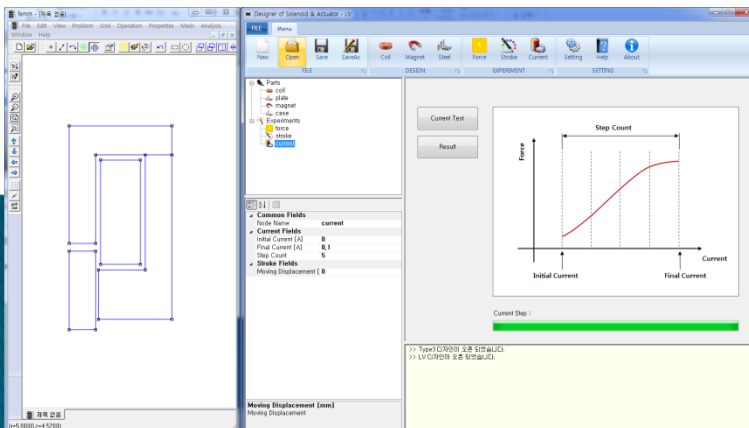


# DoSA-2D User Manual

## Solenoid Example

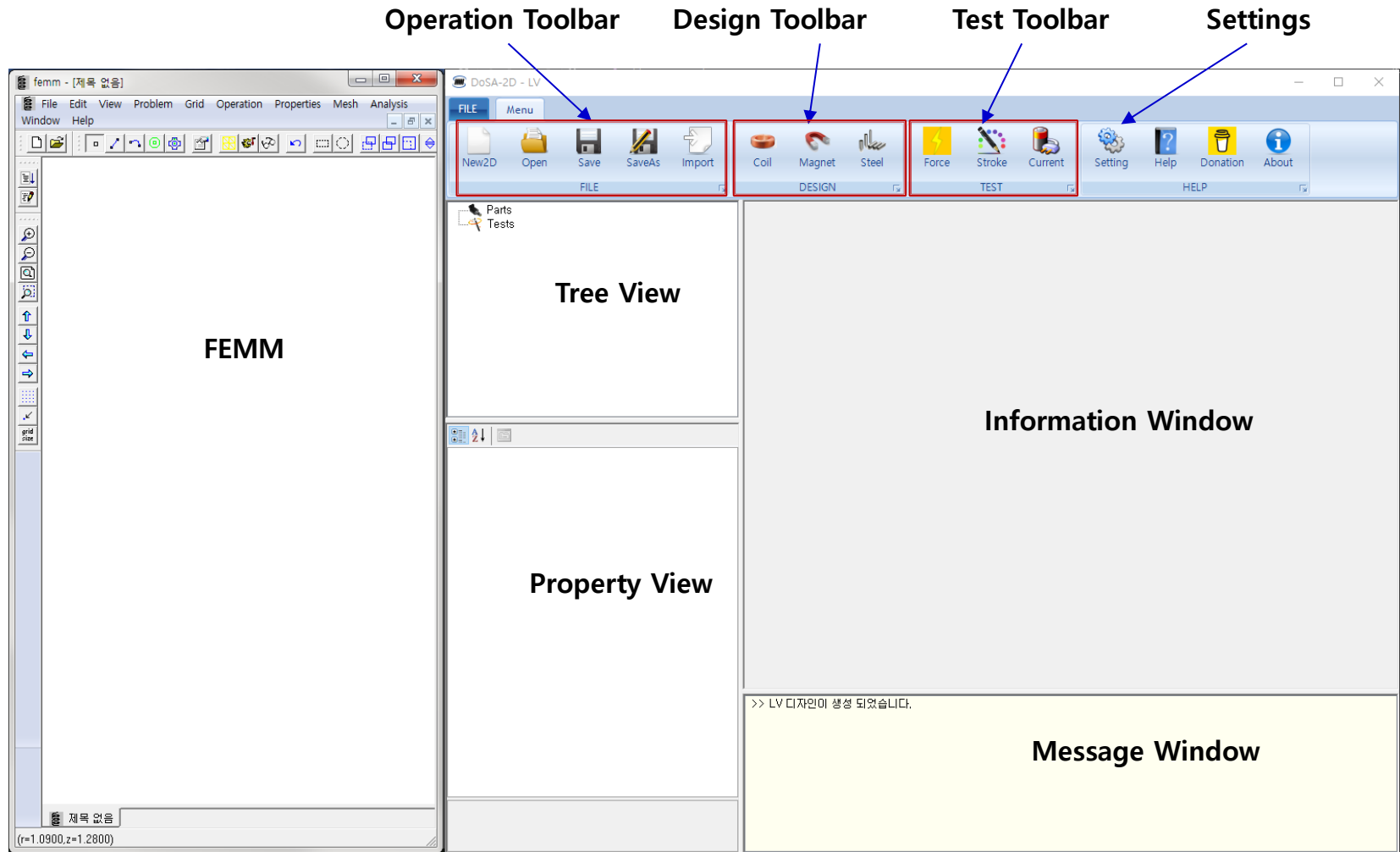
2022-05-06

GiTae Kweon (zgitae@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



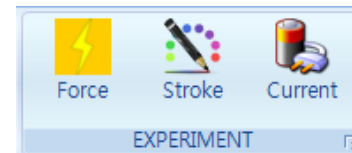
## 2. Part Design

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



## 3. Virtual Test

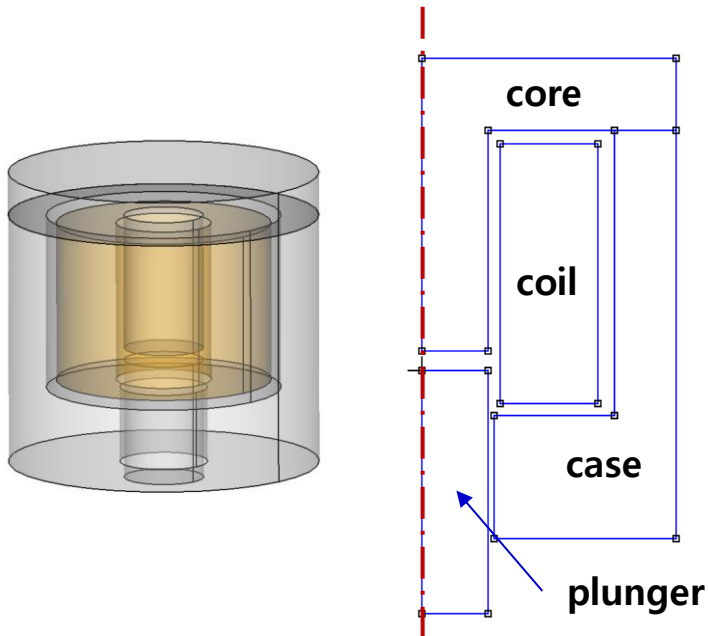
- ✓ Force : Magnetic force estimation
- ✓ Stroke : Magnetic force estimation for each stroke
- ✓ Current : Magnetic force estimation for each current



# Analysis Model

# Analysis Model

## 1. Model Shape



## 2. Product Specifications

가. Coil Turns

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

나. Power

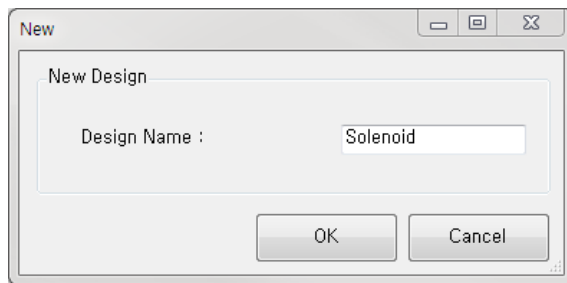
- Voltage : 14.5V

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

# New design

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

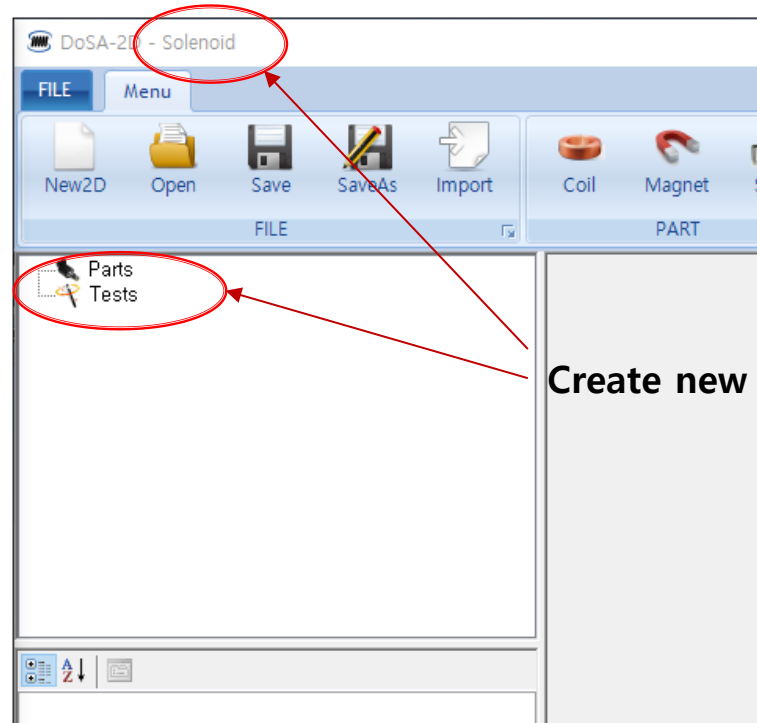
2



1



3



Create new design

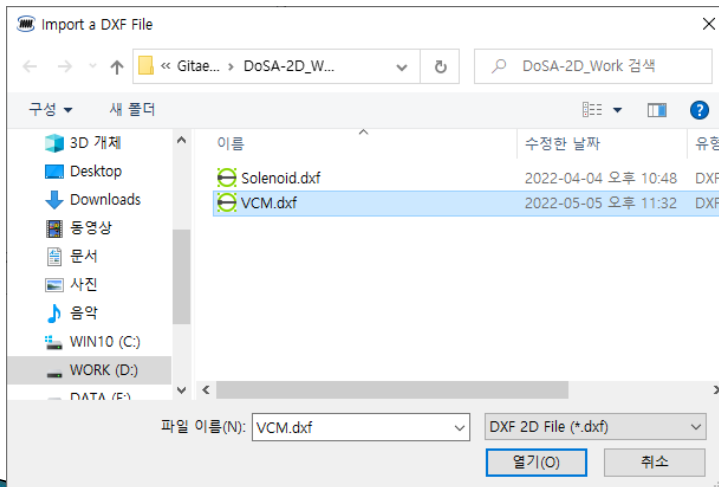
# Import shapes

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

## [ Caution ]

- Part must be written in Polyline
- Please refer to "Shape operation guide before simulation.pdf"

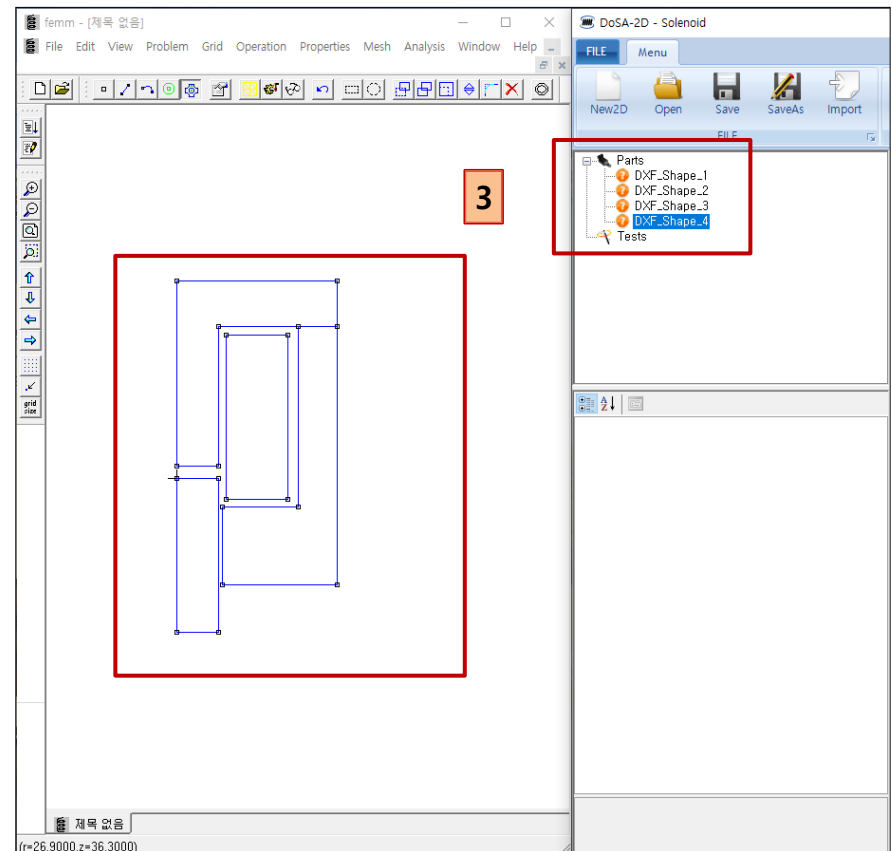
2



1



3

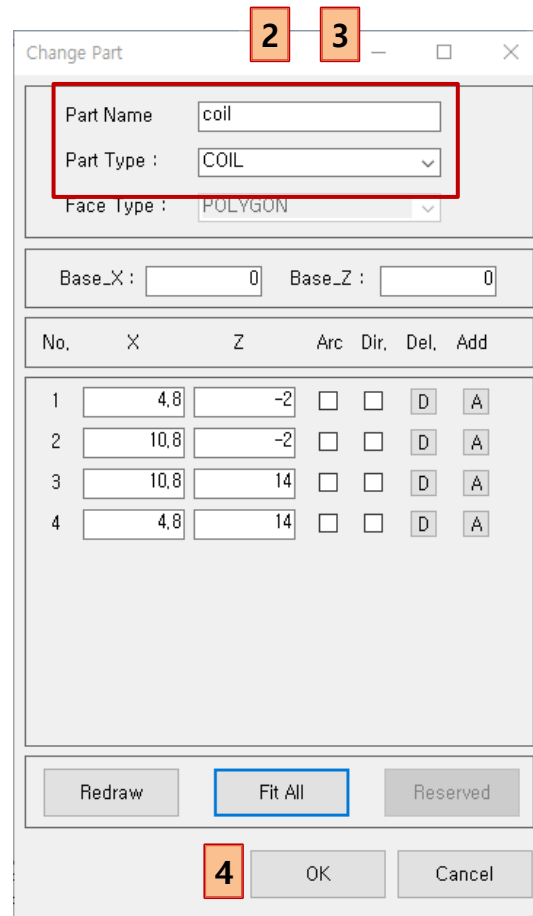
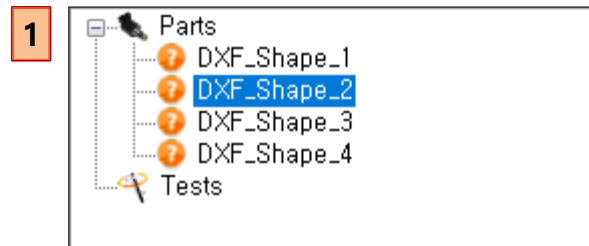
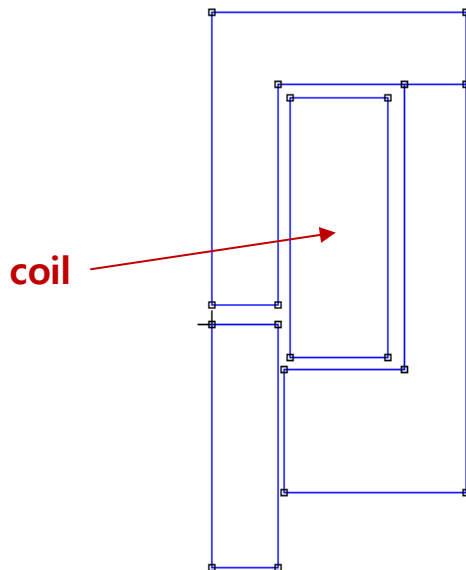




# Parts Design

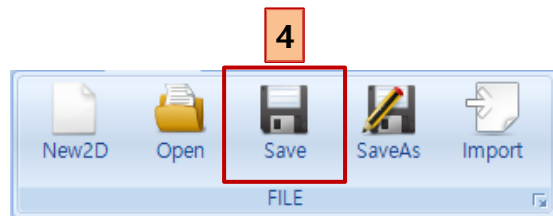
# Set as Coil

1. Treeview > "DXF\_Shape\_2" double click
2. Change name : "coil"
3. Change part type : COIL
4. Click OK button

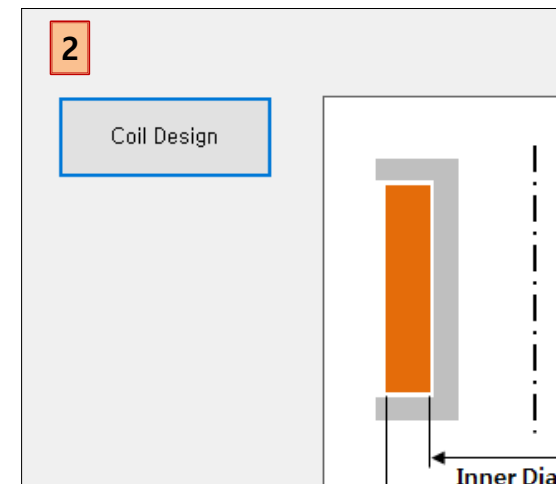


# Coil Design

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

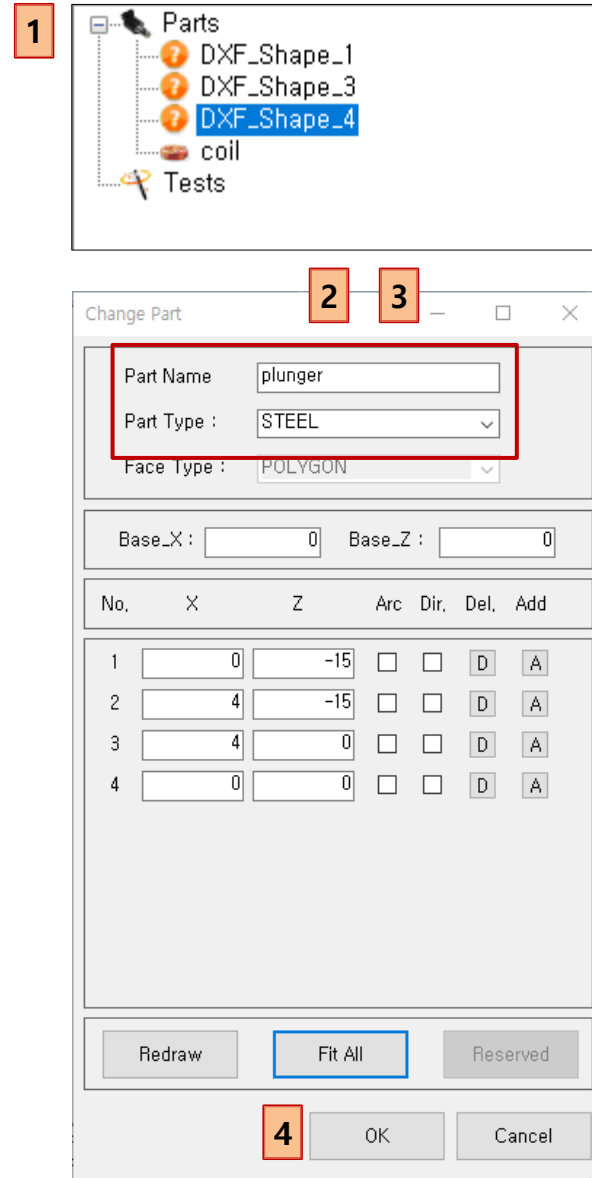
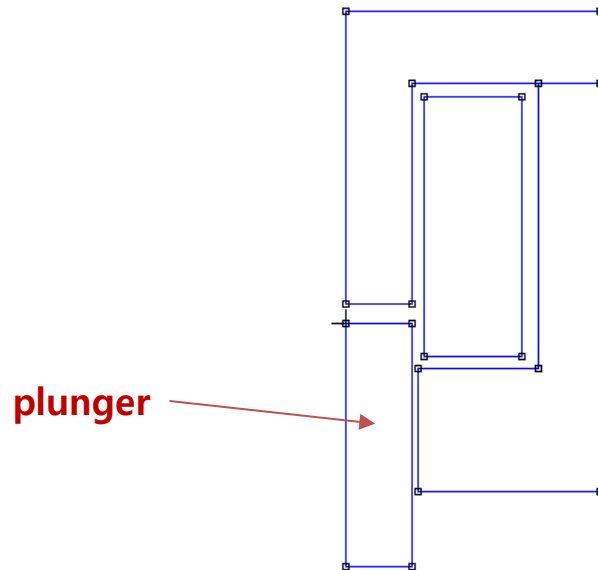


▼ <b>Common Fields</b>	
Node Name	coil
▼ <b>Specification Fields</b>	
Part Material	Copper
Current Direction	IN
Moving Parts	FIXED
▼ <b>Calculated Fields</b>	
Coil Turns	1040
Coil Resistance [ $\Omega$ ]	15.20945
Coil Layers	20
Turns of One Layer	52
▼ <b>Design Fields (optional)</b>	
Coil Wire Grade	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 [ $^{\circ}\text{C}$ ]	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

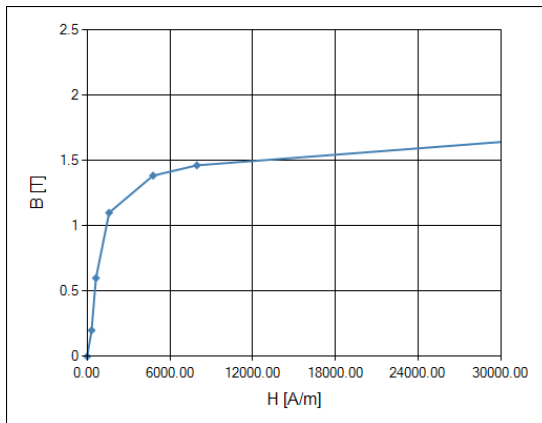


# Plunger Settings

## 1. Plunger setting

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

[ BH curve ]

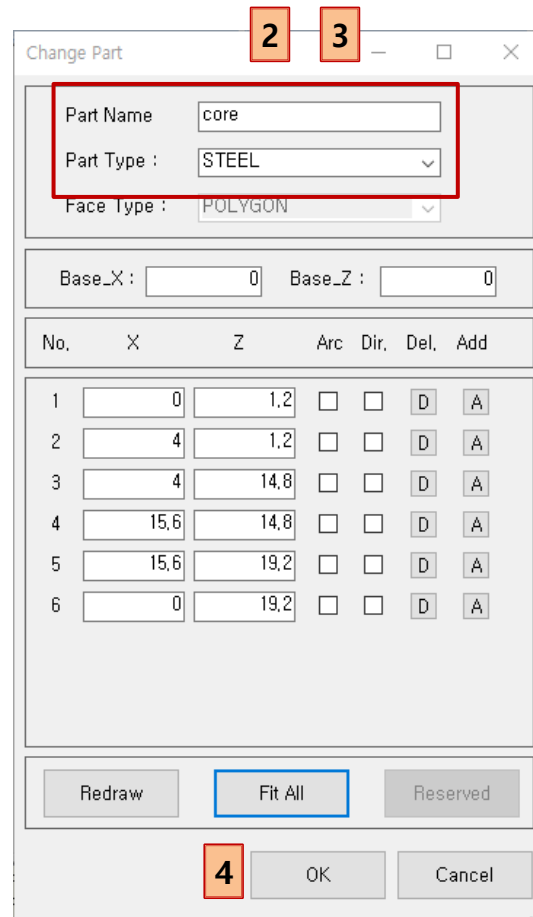
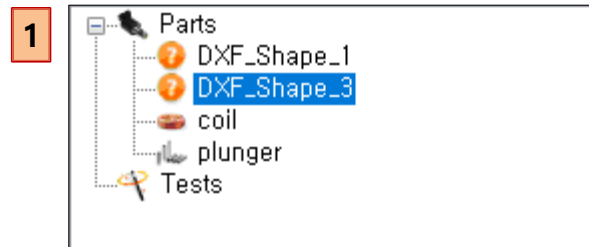
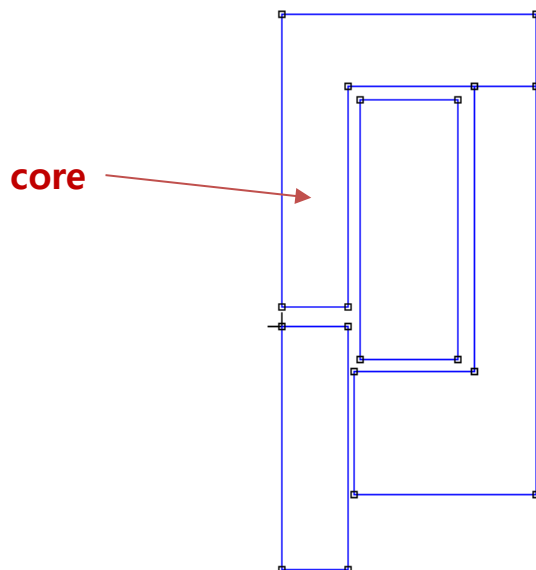


1

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

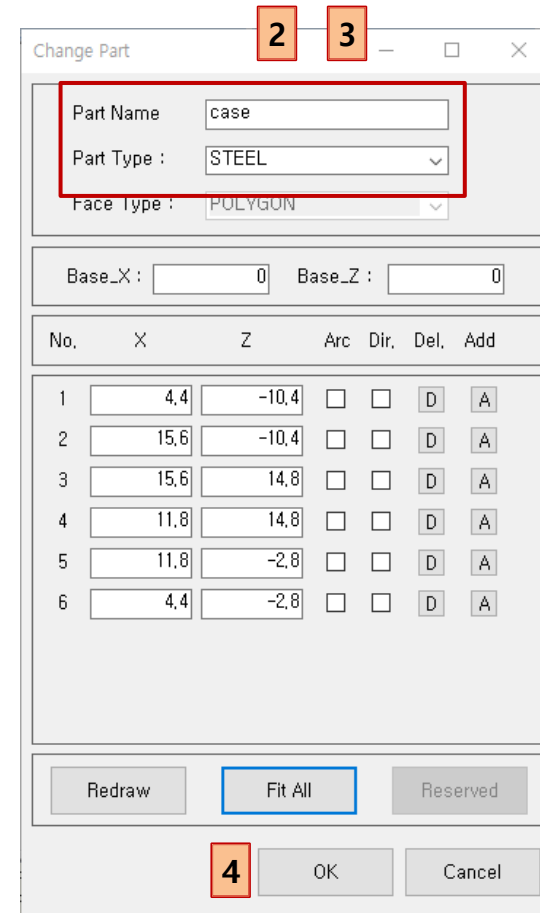
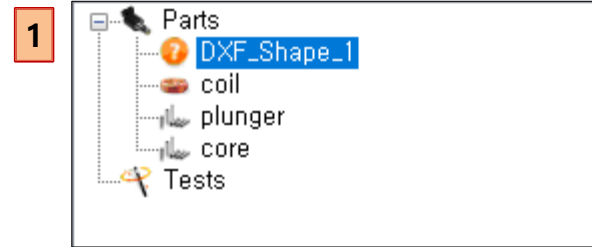
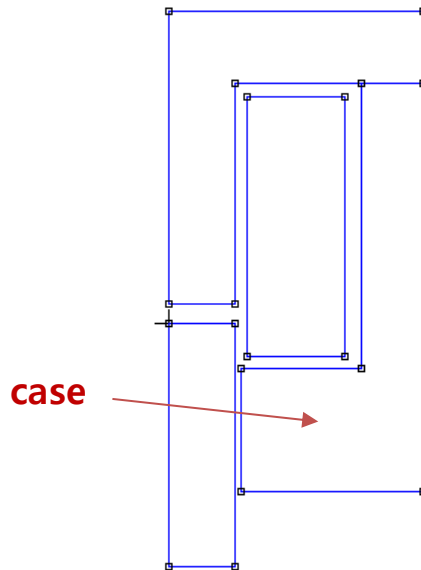
# Set as Core

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

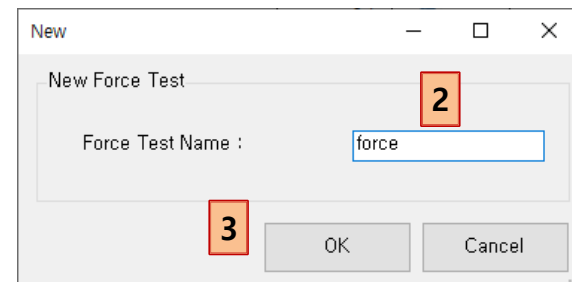
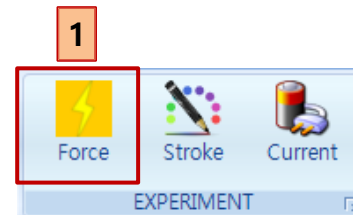


# Virtual Test

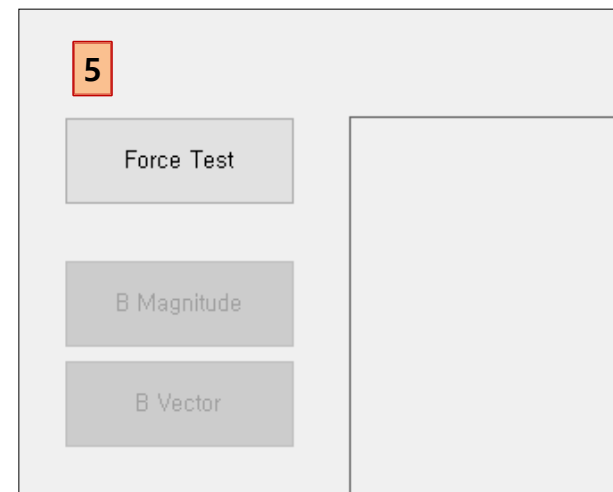


# Test of the magnetic force

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



✓ <b>Common Fields</b>	
Node Name	force <span style="border: 1px solid red; padding: 0 2px;">4</span>
✓ <b>Current Fields</b>	
Voltage [V]	14.5
Max. Current [A]	0,95335
✓ <b>Stroke Fields</b>	
Moving Stroke [mm]	0
✓ <b>Condition Fields</b>	
Mesh Size [%]	2



# Results of the magnetic force

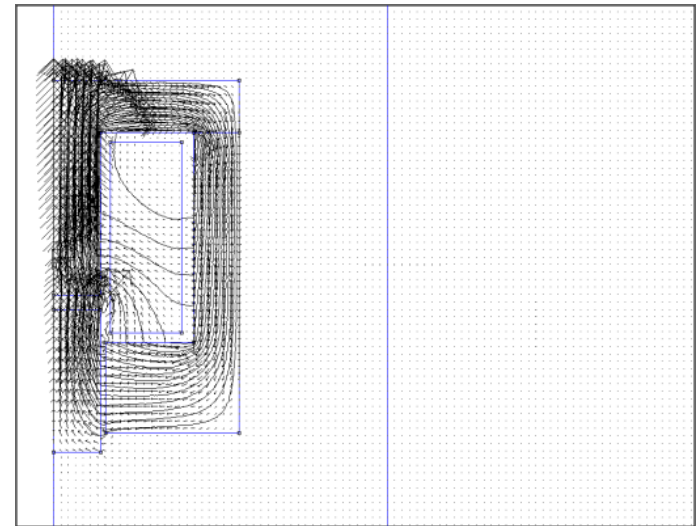
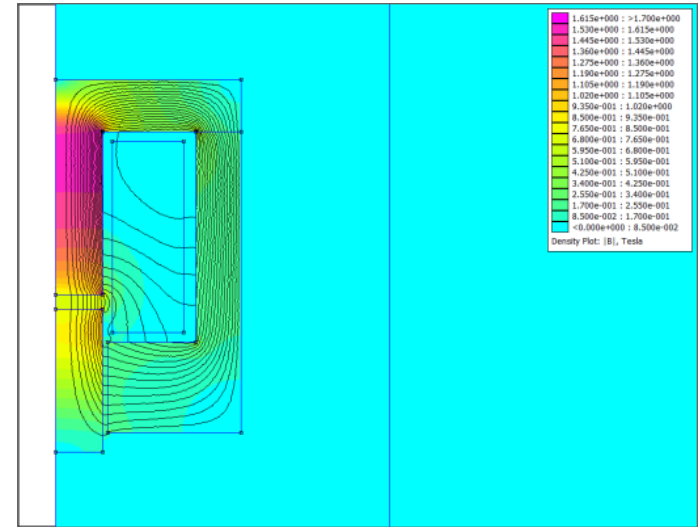
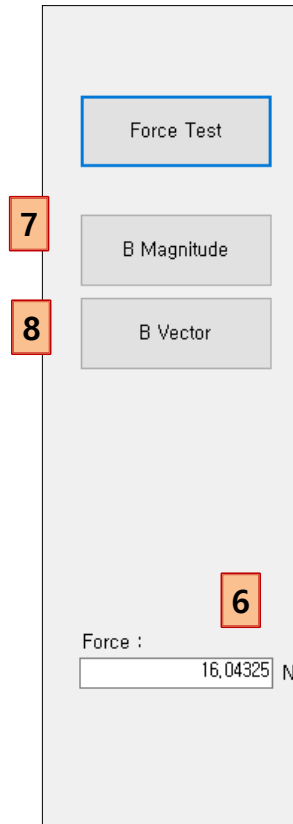
6. Force : 16.04 N

7. Magnetic Density

✓ Click the B Magnitude button

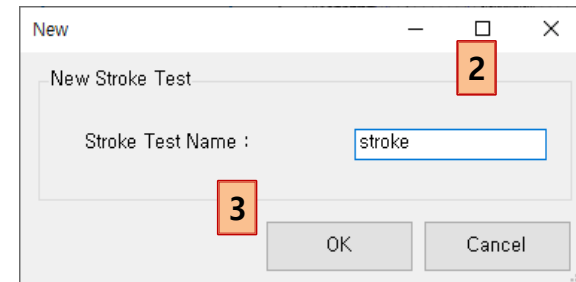
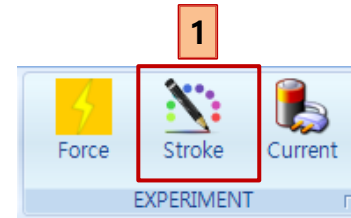
8. Vector of Magnetic Density

✓ Click the B Vector button



# Test of the stroke-magnetic force

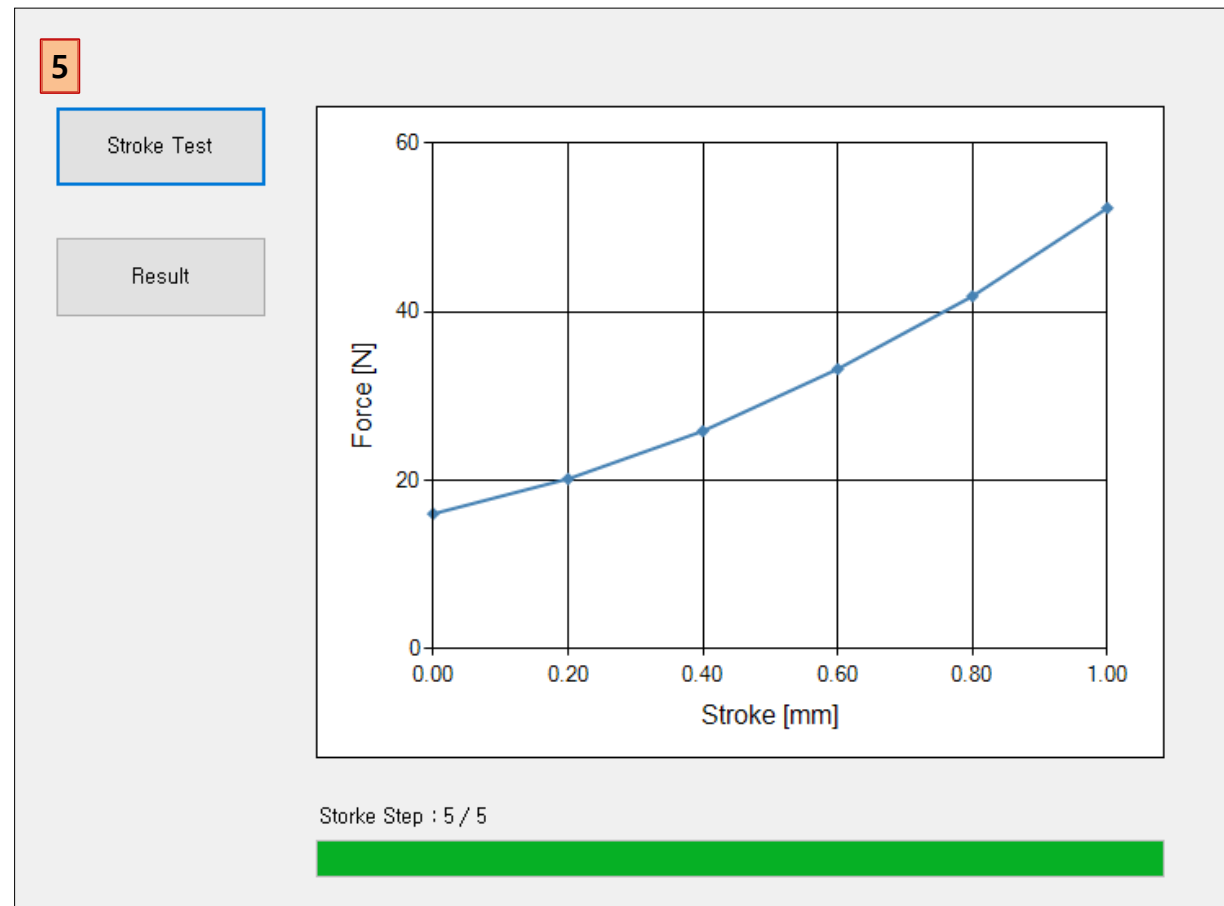
1. Toolbar > Click Stroke Button
2. Stroke Test Name : "stroke"
3. Click OK Button
4. Test Settings
  - ✓ Voltage : 14.5
  - ✓ Initial Stroke : 0.0
  - ✓ Final Stroke : 1.0
  - ✓ Step Count : 5



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

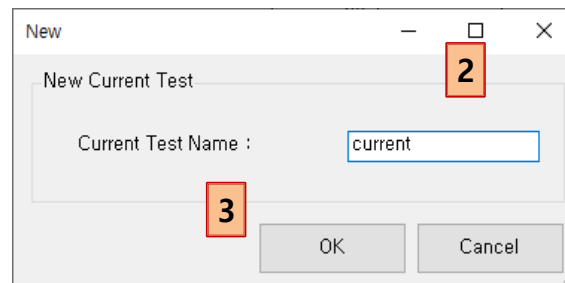
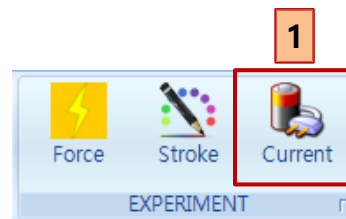
# Results of the stroke-magnetic force

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

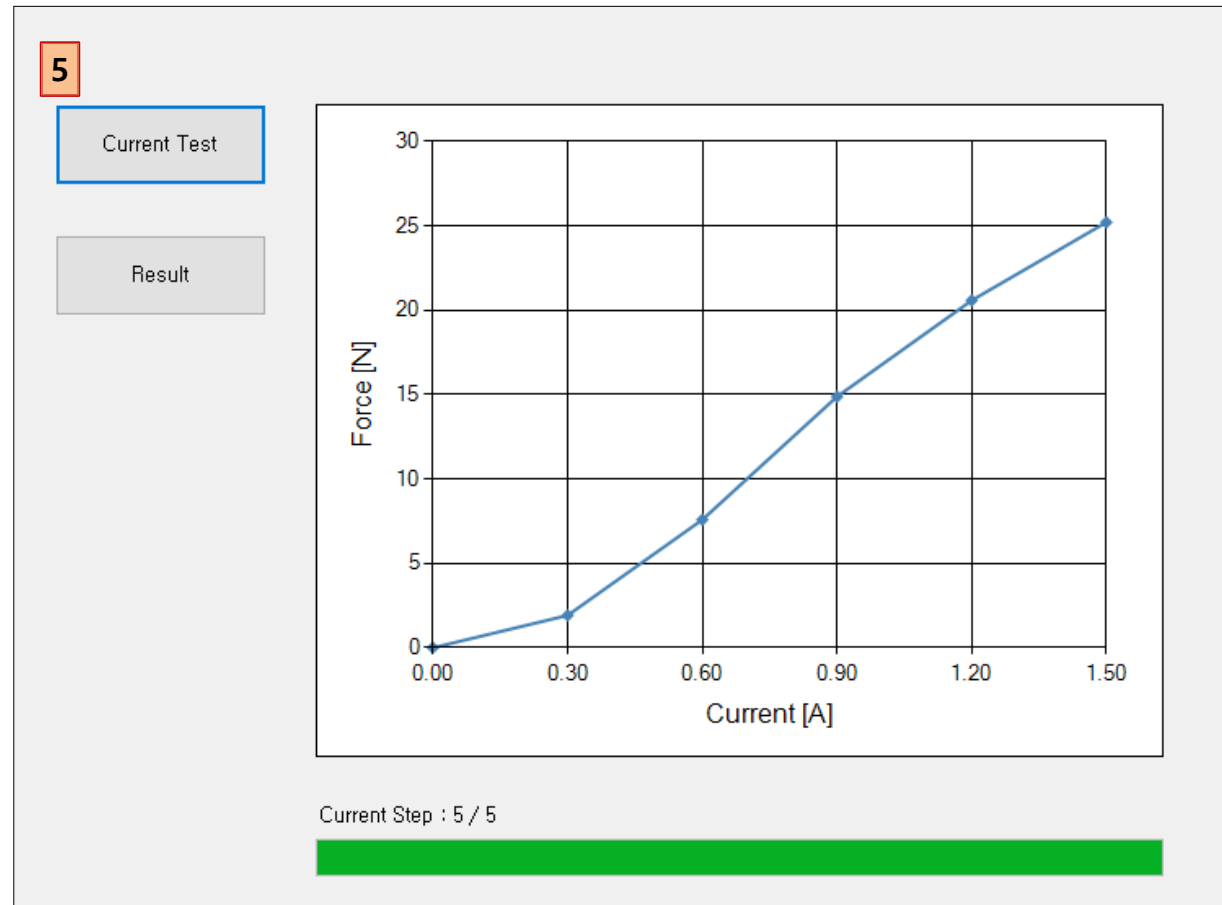


A screenshot of a 'Test Settings' panel. It contains several expandable sections: 'Common Fields', 'Current Fields', 'Stroke Fields', and 'Condition Fields'. The 'Current Fields' section is highlighted with a red rectangular box, and a red square with the number '4' is to its left. The 'Current Fields' 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'.

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

# Results of the current-magnetic force

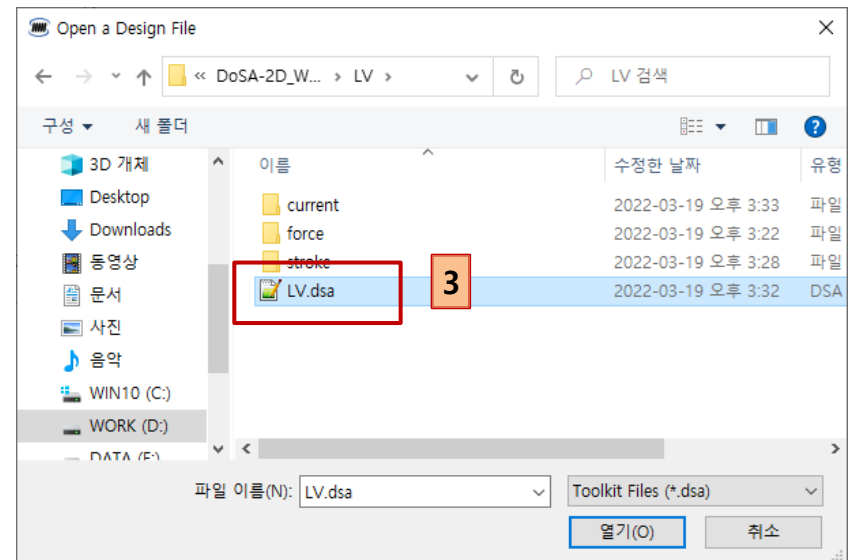
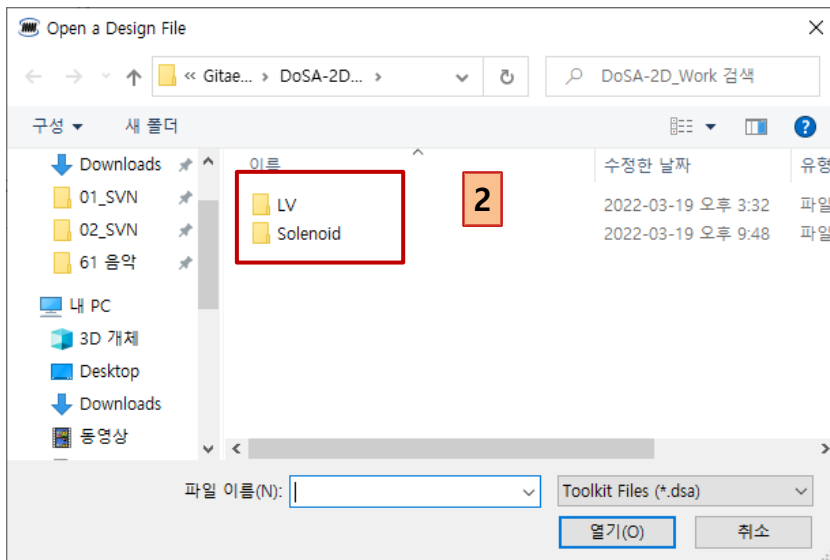
5. Click "Current Test" button



Tips

# Open design

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





# Thank You

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Homepage : <http://openactuator.org>

