DoSA Use Manual

Solenoid Example

2017-11-18

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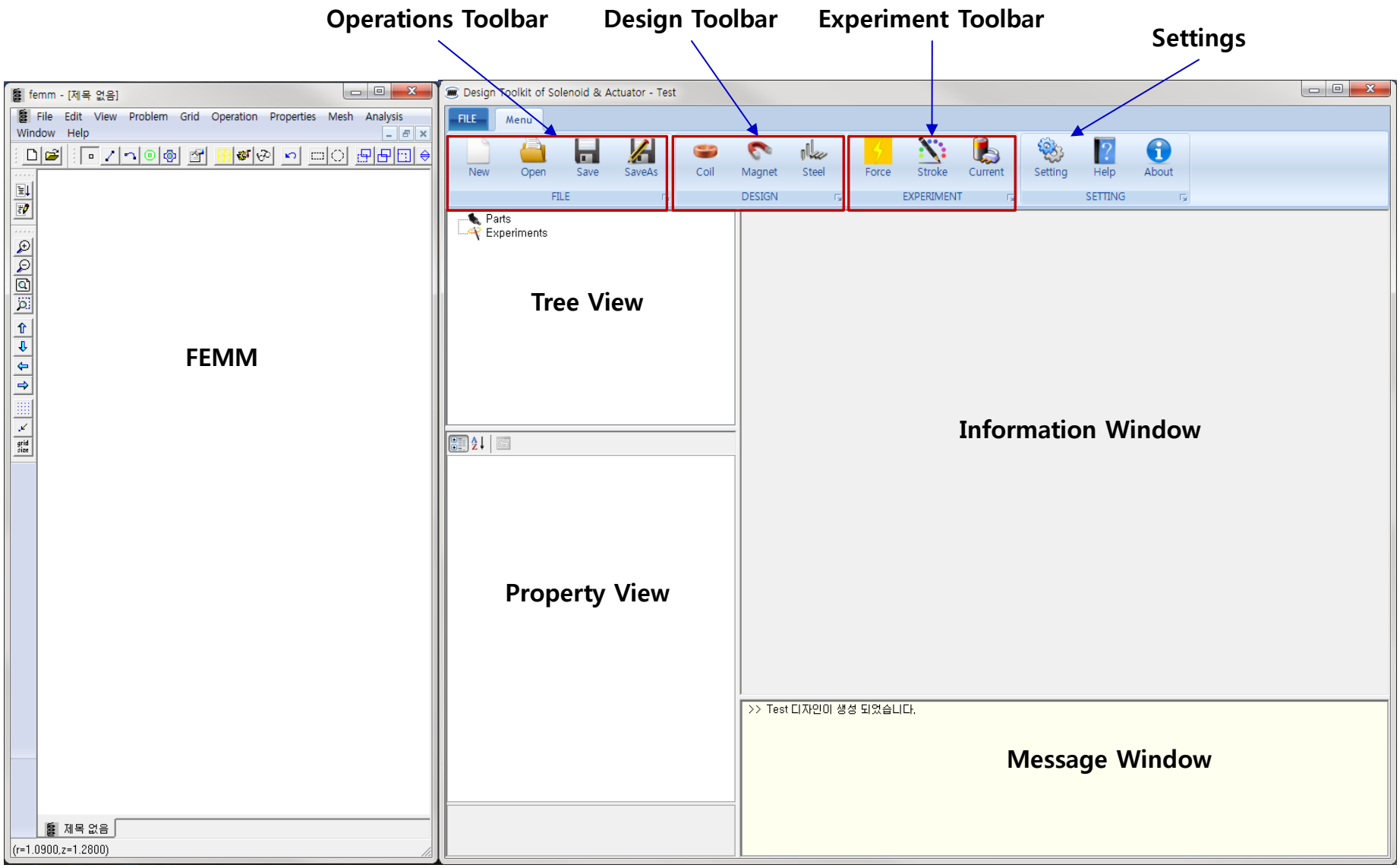
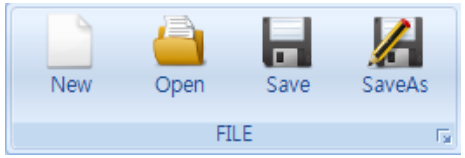
Program Composition



Program Toolbar

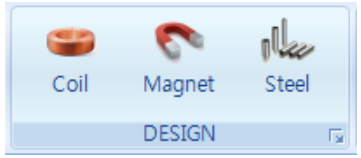
1. Operations

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



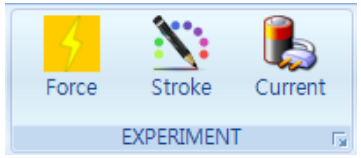
2. Design

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



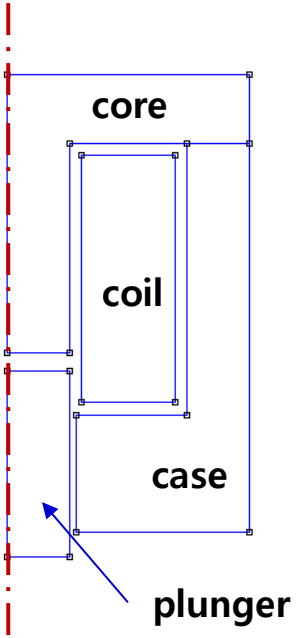
3. Experiment

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



Analysis Model Explanation

1. Model Shape



2. Product Specifications

가. Coil Turns

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

나. Power

- Voltage : 14.5V

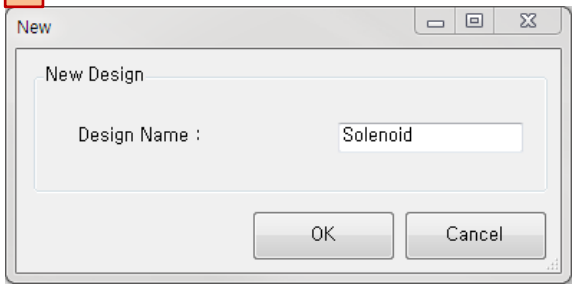
(Work Example File : DoSA Install Directory > Samples > Solenoid)

Design Creation

1. Toolbar > Click New Button 

2. Design Name : "Solenoid"
3. Click OK

2



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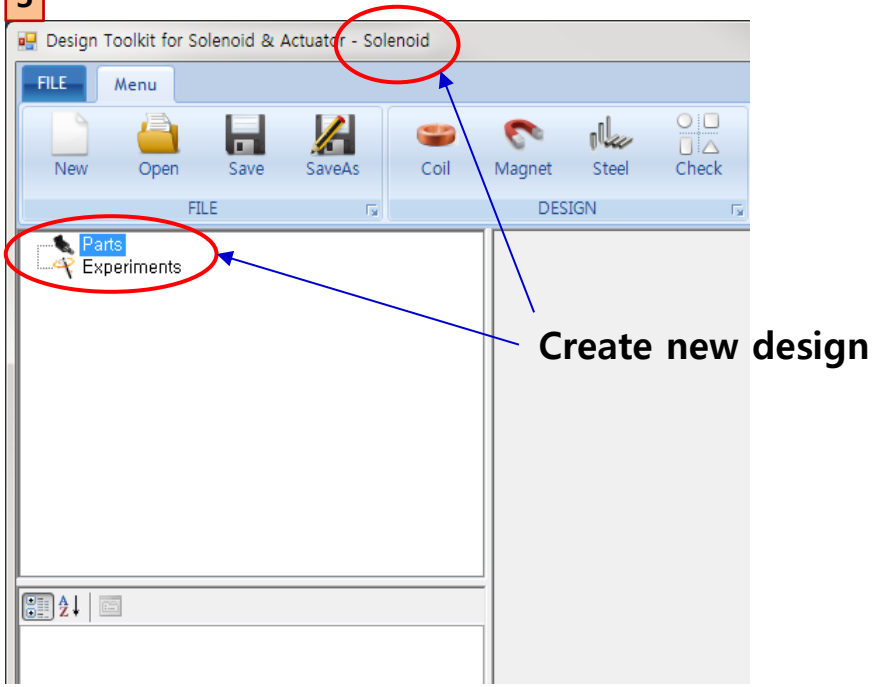
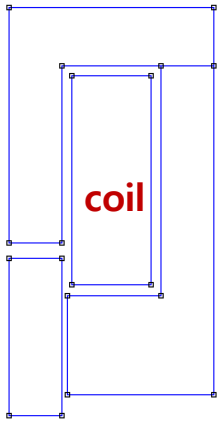


Coil Creation

1. Toolbar > Click Coil button 

2. Coil Name : "coil"
3. Coil Shape Input
   - ✓ Coil Location : Base_X 4.8, Base_Y -2
   - ✓ Left-Down Point : X 0, Y 0
     (Relative Coordinates)
   - ✓ Right-Upper Point : X 6, Y 16
     (Relative Coordinates)
4. Screen Adjustment : Use Fit All Button
5. Click OK Button
6. Check Shape (FEMM Window))



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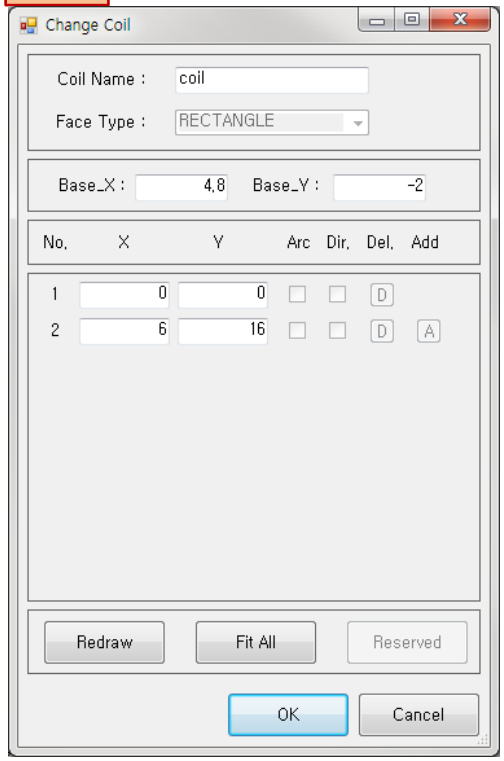

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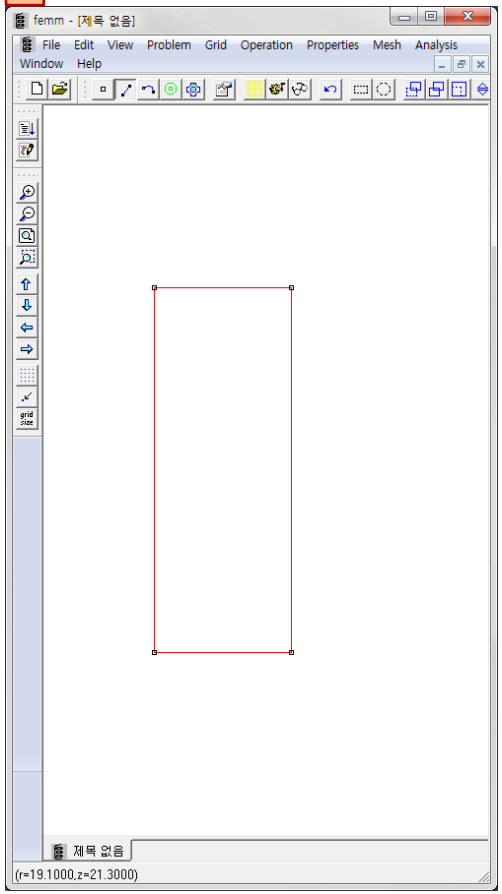


Coil Design

1. Input Coil specifications
   - ✓ Part Material : Copper Selection
   - ✓ Current Direction : IN Selection (Inner Direction)
   - ✓ Moving Parts : FIXED Selection (Fixed Parts)
   - ✓ Coil Wire Grade : Enameled_IEC_Grade_2 Selection
   - ✓ Copper Diameter : Enter 0.27 mm
   - ✓ Horizontal Coefficient : Base Value
   - ✓ Vertical Coefficient : Base Value
   - ✓ Resistance Coefficient : Base Value

2. Coil Specification calculation
   - ✓ Click Coil Design Button

2

Coil Design

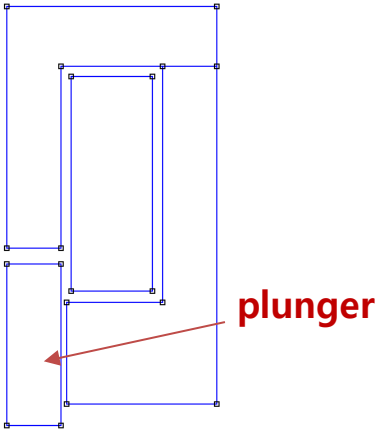
1

Common Fields	
Node Name	**coil**
Specification Fields	
Part Material	**Copper**
Curent 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 [℃]	**20**
Horizontal Coefficient	**0.9**
Vertical Coefficient	**0.98**
Resistance Coefficient	**1**

Plunger Creation

1. Toolbar > Click Steel Button 

2. Steel Name : “plunger”
3. Face Type : RECTANGLE
4. Plunger Shape Input
   - ✓ Plunger Location : Base_X 0, Base_Y -12
   - ✓ Left-Down Point : X 0, Y 0
     (Relative Coordinates)
   - ✓ Right-Upper Point : X 4, Y 12
     (Relative Coordinates)
5. Screen Adjustment : Use Fit All Button
6. Click OK Button
7. Check Shape (FEMM Window))



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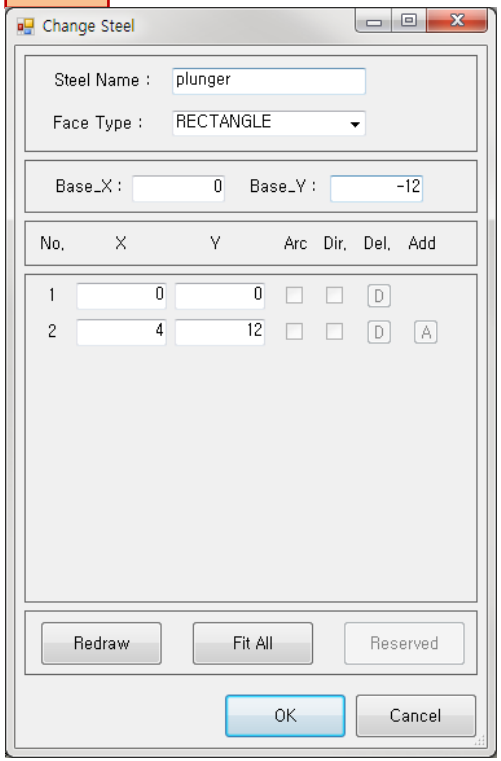

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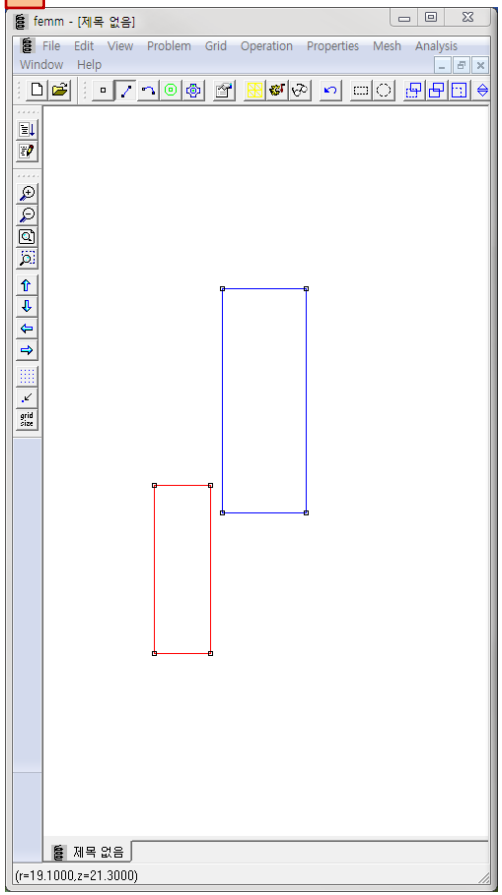
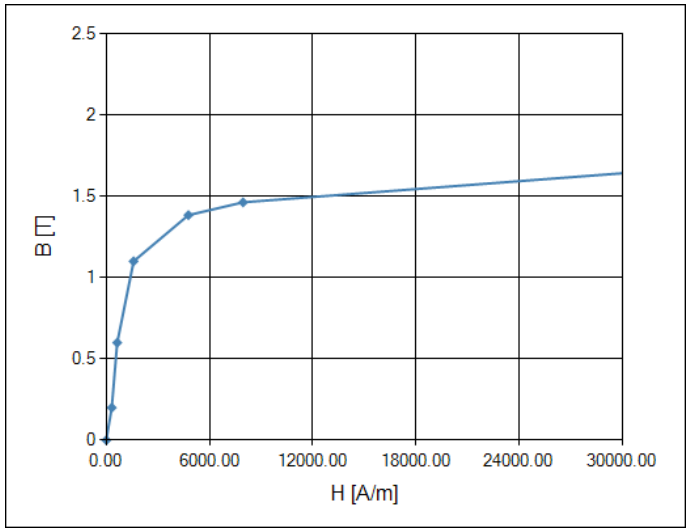


Plunger Settings

1. Plunger Specification setting
   - ✓ Part Material : 430 Stainless Steel Selection
   - ✓ Moving Parts : Moving Selection (Moving Parts)

[BH Curve]



1

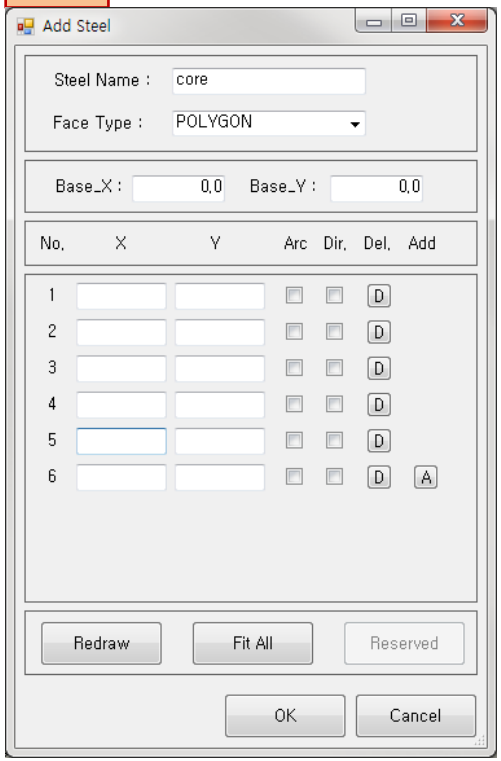
Common Fields	
Node Name	plunger
Specification Fields	
Part Material	430 Stainless Steel
Moving Parts	MOVING

Core Creation

1. Toolbar > Click Steel Button 

2. Steel Name : “core”
3. Add Coordinate (Total 6) : Click 'A' Button
4. Input Core Shape
   - ✓ Core Location : Base_X 0, Base_Y 1.2
   - ✓ 1 점 : X 0, Y 0
   - ✓ 2 점 : X 4, Y 0
   - ✓ 3 점 : X 4, Y 13.6
   - ✓ 4 점 : X 15.6, Y 13.6
   - ✓ 5 점 : X 15.6, Y 18
   - ✓ 6 점 : X 0, Y 18
5. Screen Adjustment : Use Fit All Button
6. Click OK Button

2~3



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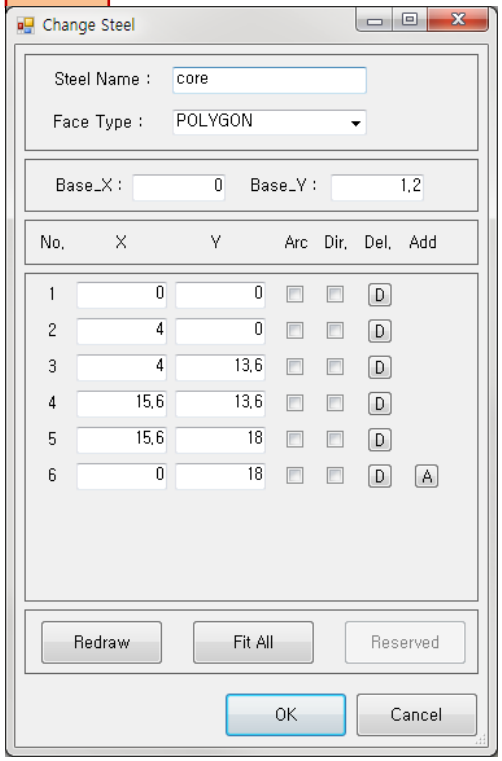
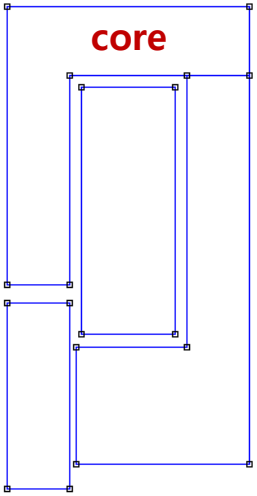


Core Settings

7. Check Shape (FEMM Window)

8. Core Specification setting
   - ✓ Part Material : 430 Stainless Steel
   - ✓ Moving Parts : FIXED



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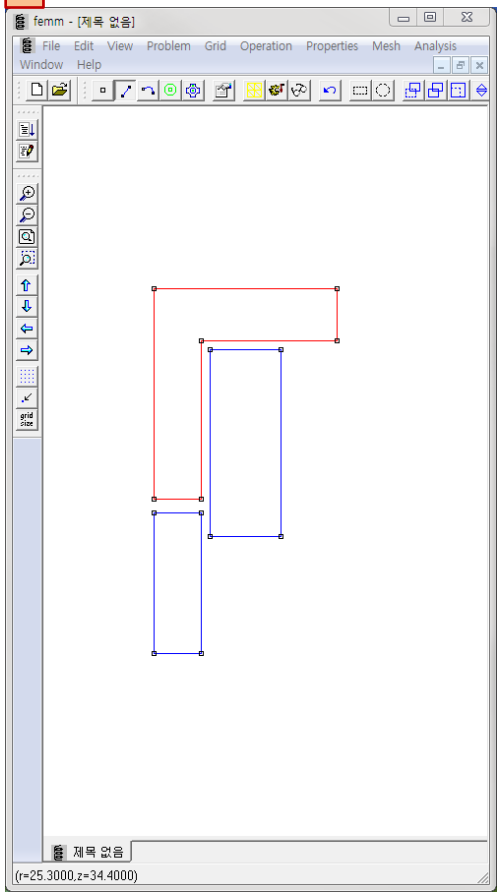


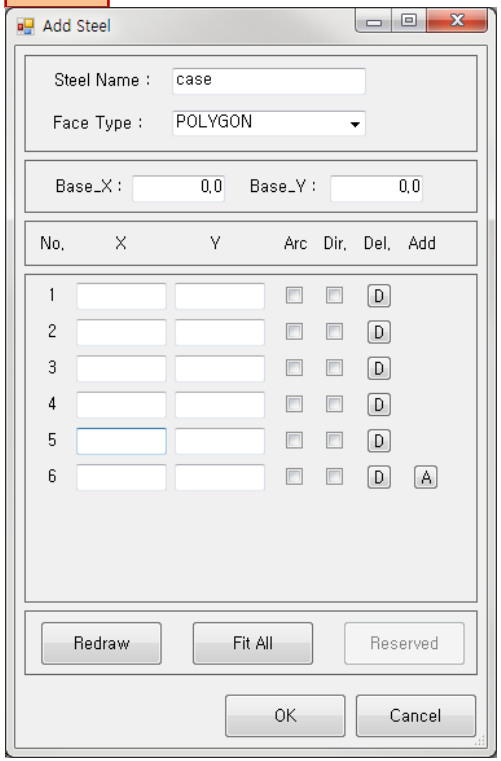
7

Case Creation

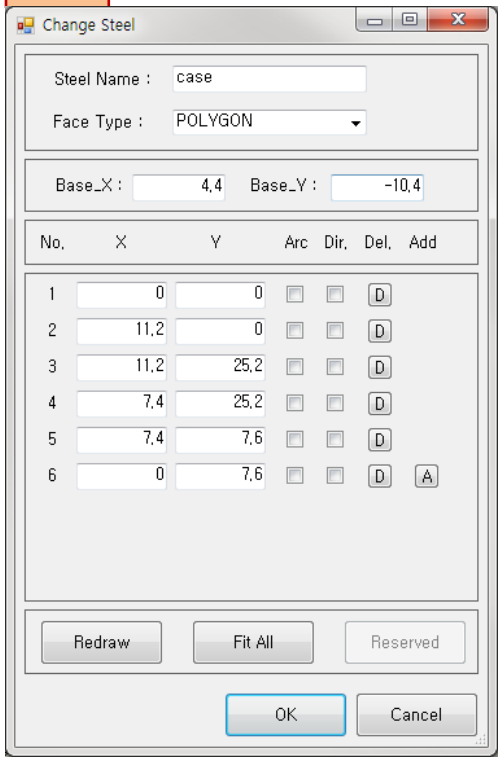
1. Toolbar > Click Steel Button 

2. Steel Name : "case"
3. Add Coordinate (Total 6) : Click 'A' Button
4. Input Case Shape
   - ✓ Case Location : Base_X 4.4, Base_Y -10.4
   - ✓ 1 점 : X 0, Y 0
   - ✓ 2 점 : X 11.2, Y 0
   - ✓ 3 점 : X 11.2, Y 25.2
   - ✓ 4 점 : X 7.4, Y 25.2
   - ✓ 5 점 : X 7.4, Y 7.6
   - ✓ 6 점 : X 0, Y 7.6
5. Screen Adjustment : Use Fit All Button
6. Click OK Button

2~3



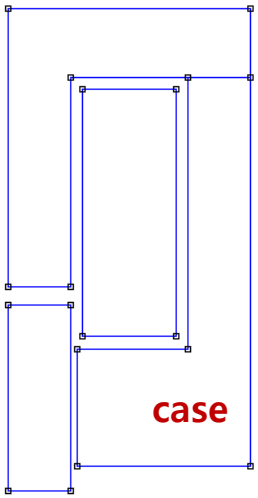
4~5



Case Setting

7. Check Shape (FEMM Window)

8. Case Specification setting
   - ✓ Part Material : 1010 Steel
   - ✓ Moving Parts : FIXED



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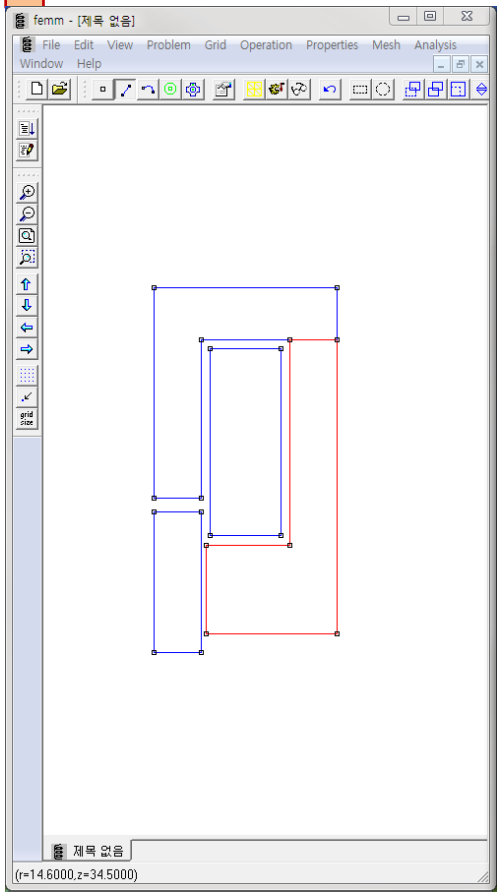


7

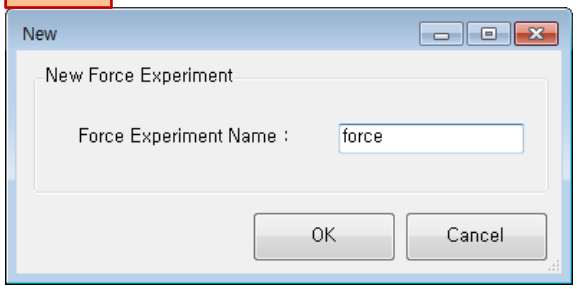
Common Fields	
Node Name	case
Specification Fields	
Part Material	1010 Steel
Moving Parts	FIXED

Magnetic Force Experiment

1. Toolbar > Click Force Button 

2. Force Experiment Name : "force"
3. Click OK Button
4. Magnetic Force Experiment Settings
   ✓ Voltage : 14.5 V
5. Run Magnetic Force Experiment

2~3



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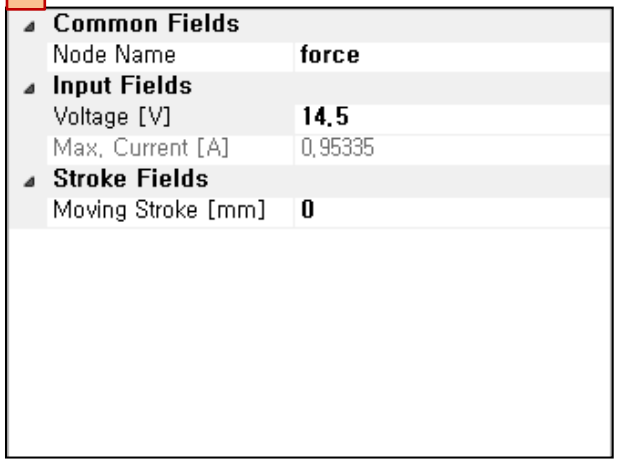
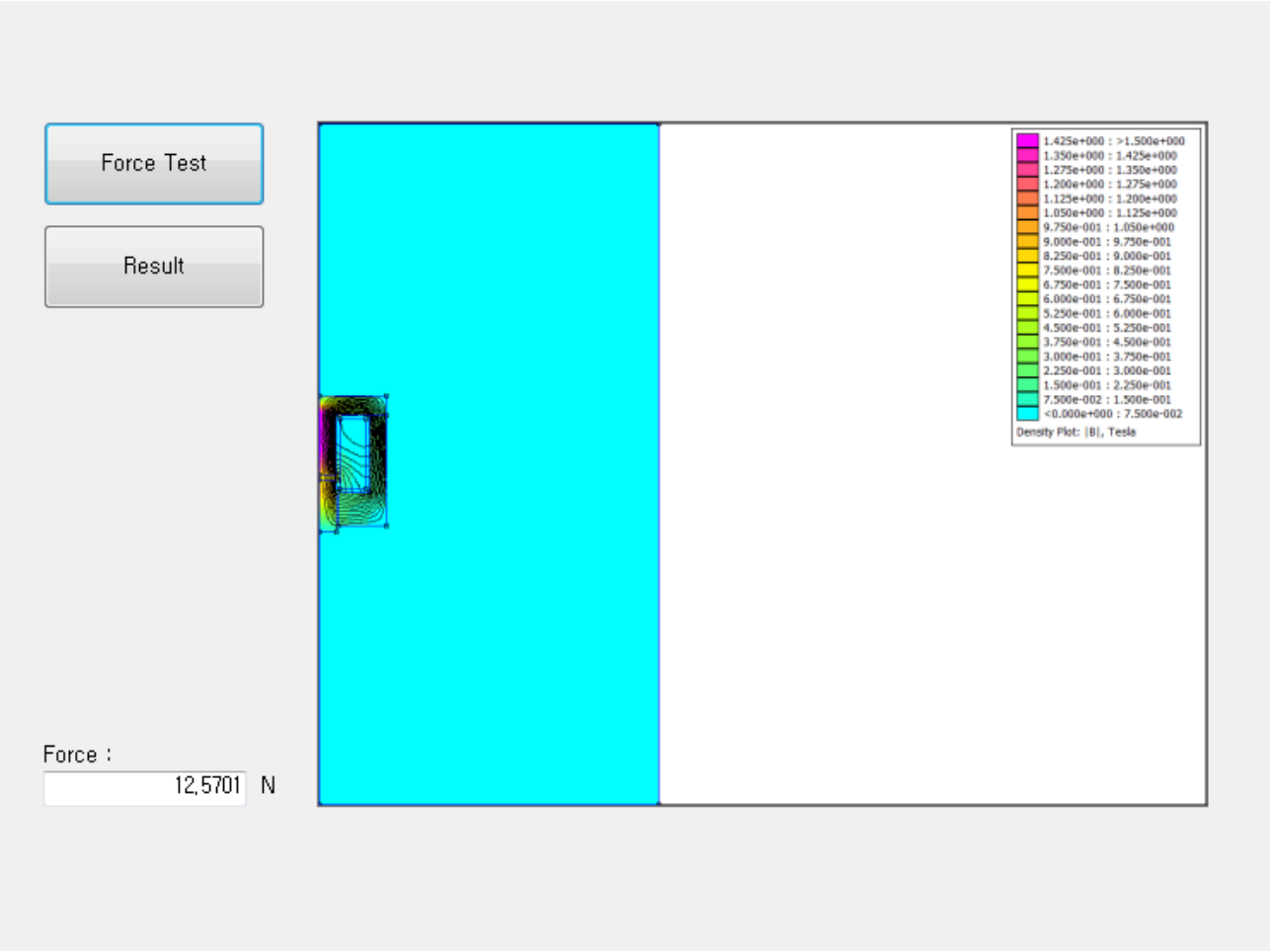


5

Magnetic Force Experiment Results

1. Force : 12.57 N

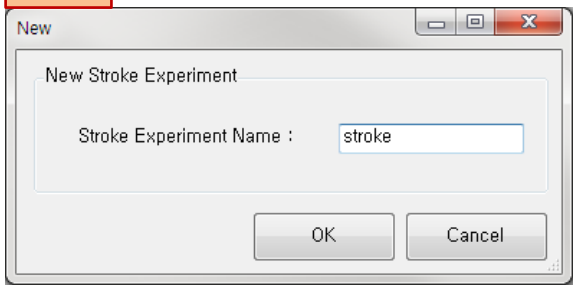


Displacement-Magnetic Force Experiment

1. Toolbar > Click Stroke Button 

2. Stroke Experiment Name : "stroke"
3. Click OK Button
4. Magnetic Force-Current Experiment Settings
   - ✓ Voltage : 14.5 V
   - ✓ Initial Stroke : 0.0 mm
   - ✓ Final Stroke : 1.0 mm
   - ✓ Step Count : 5

2~3

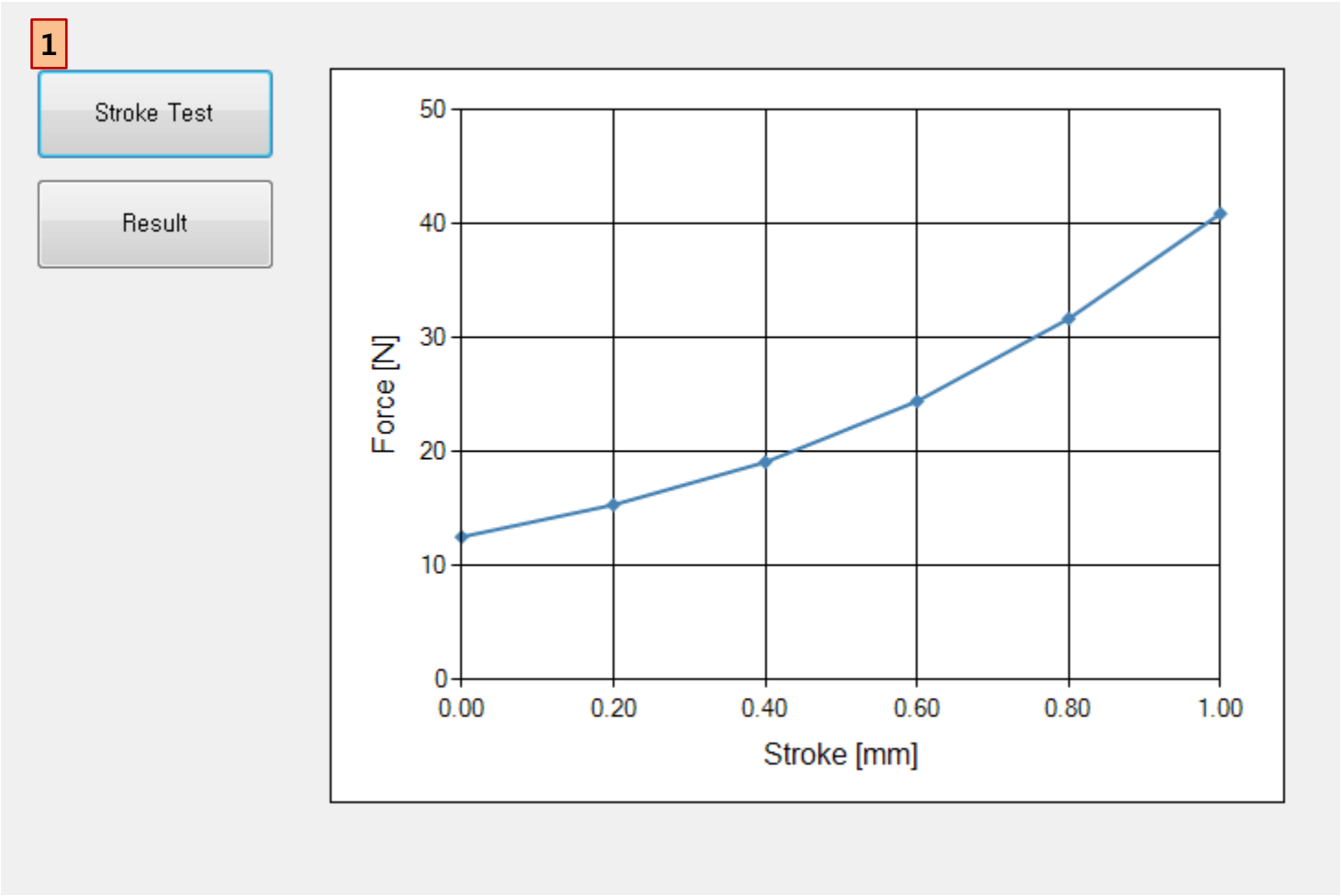


4

Common Fields	
Node Name	**stroke**
Input Fields	
Voltage [V]	**14.5**
Max. Current [A]	0.95335
Stroke Fields	
Initial Stroke [mm]	**0**
Final Stroke [mm]	**1**
Step Count	**5**

Displacement-Magnetic Force Experiment Results

1. Information View / Click Stroke Test Button

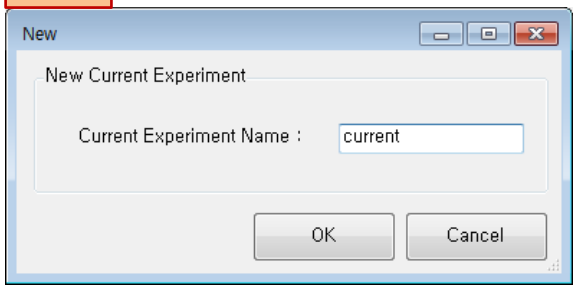


Current-Magnetic Force Experiment

1. Toolbar > Click Current Button 

2. Current Experiment Name : "current"
3. Click OK Button
4. Magnetic Force-Current Experiment Settings
   - ✓ Initial Current : 0.0 A
   - ✓ Final Current : 1.5 A
   - ✓ Step Count : 5

2~3

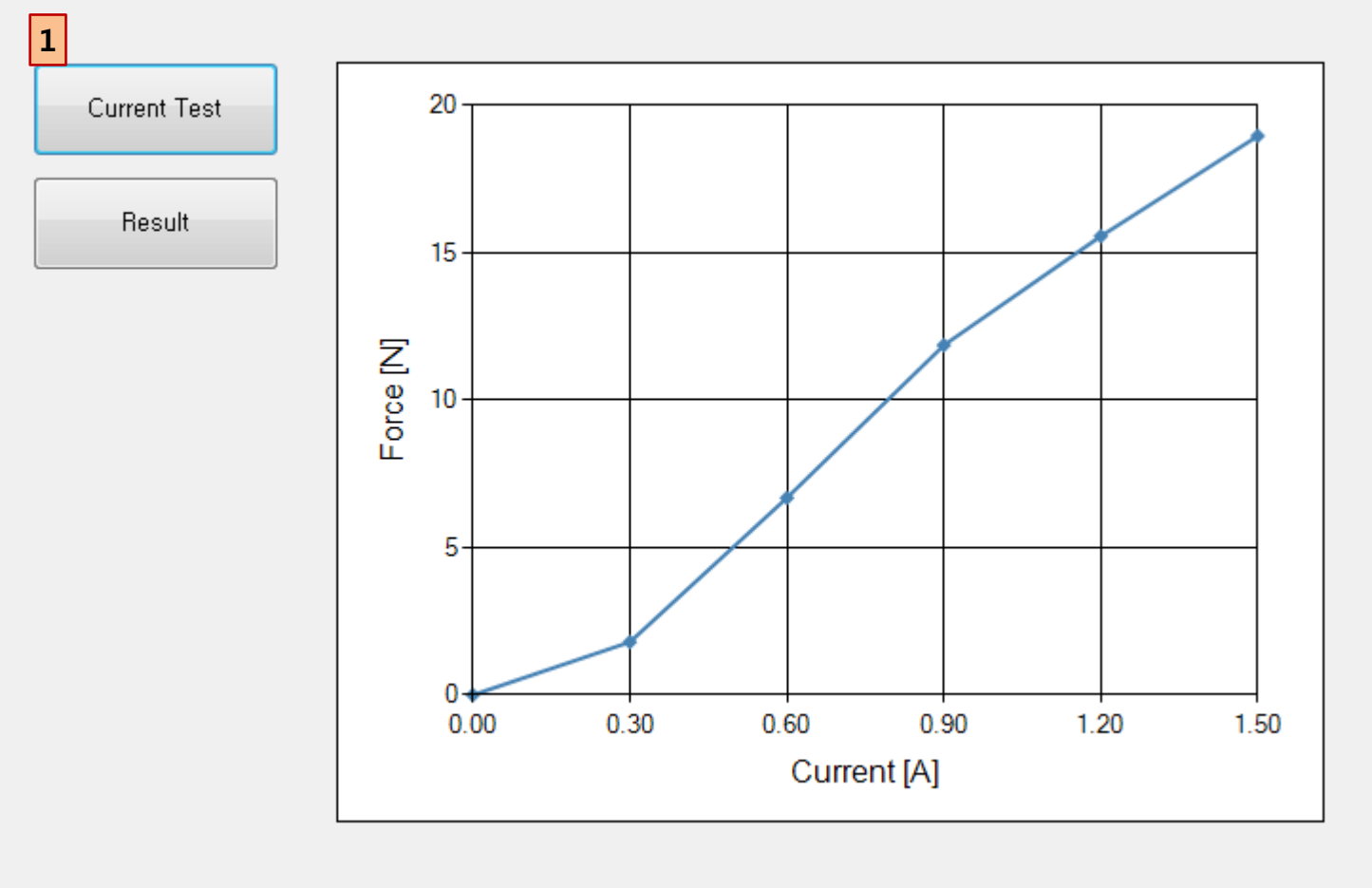


4

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**

Current-Magnetic Force Experiment Results

1. Information View / Click Current Test Button



– Thank You –