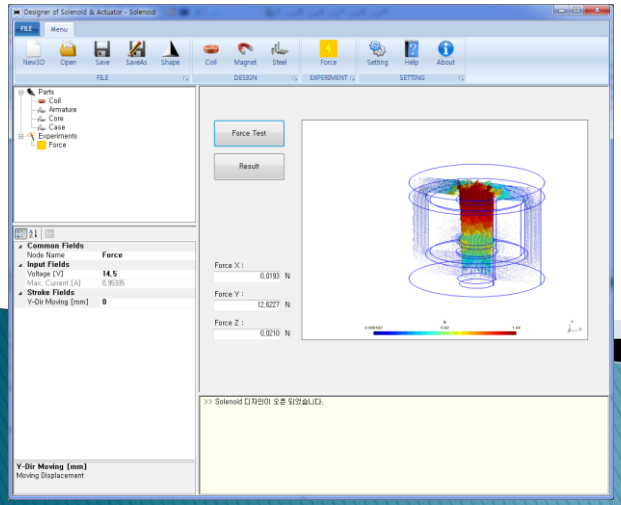
DoSA-Open_3D 사용 메뉴얼

Example of Solenoid

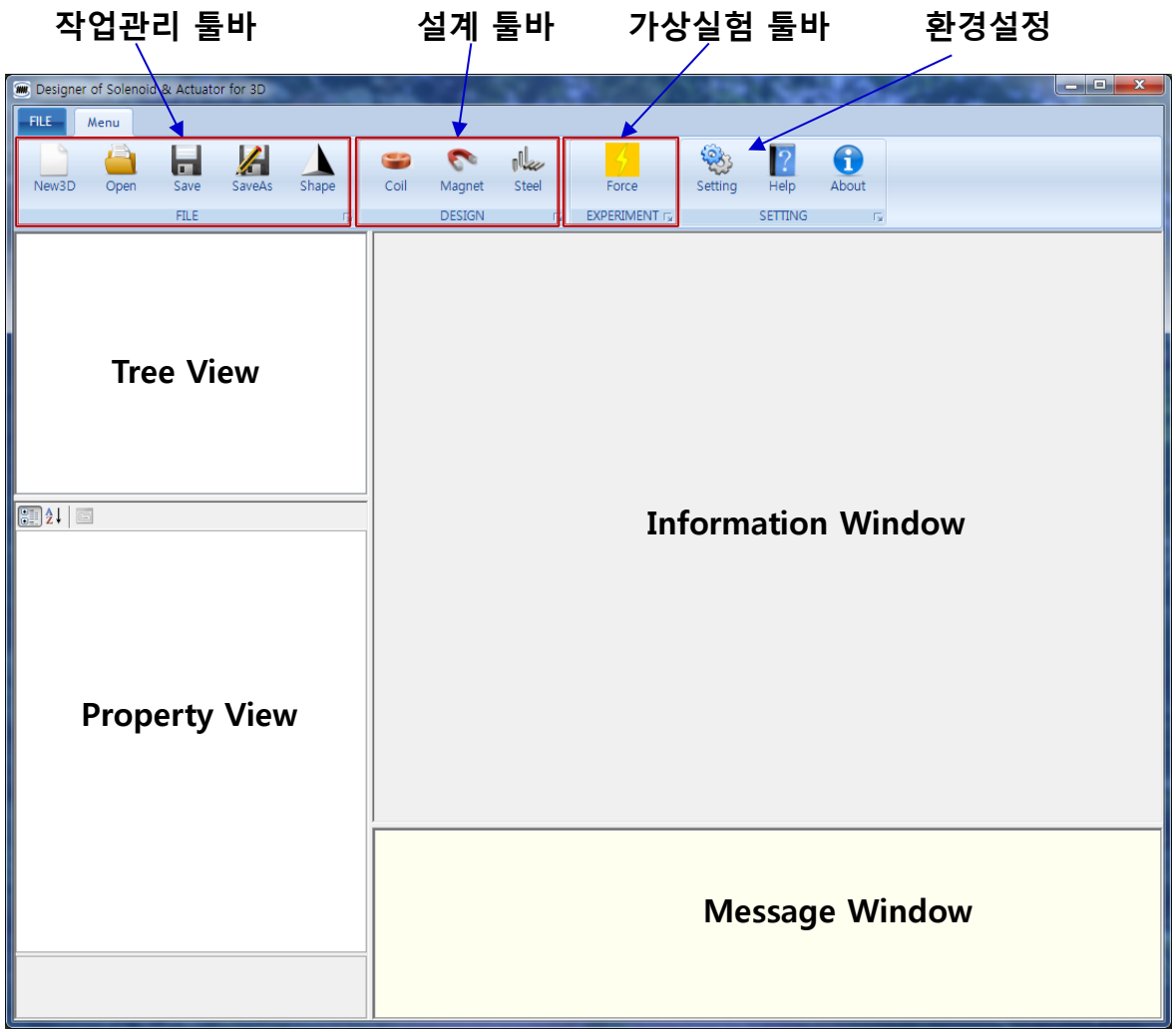


2019-12-25

권기태 (zgitae@gmail.com)

DoSA 구성

프로그램 구성


작업관리 툴바
설계 툴바
가상실험 툴바
환경설정
Designer of Solenoid & Actuator for 3D
FILE
Menu
New3D
Open
Save
SaveAs
Shape
FILE
Coil
Magnet
Steel
DESIGN
Force
EXPERIMENT
Setting
Help
About
SETTING
Tree View
Property View
Information Window
Message Window

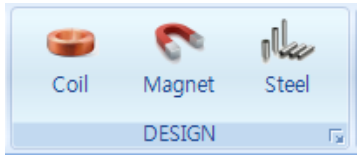
Toolbar

1. 작업관리

- ✓ New : 신규작업 생성
- ✓ Open : 이전작업 열기
- ✓ Save : 작업 저장
- ✓ SaveAs : 다른 이름으로 저장
- ✓ Shape : 3D 형상 확인

2. 설계

- ✓ Coil : 권선 추가 및 사양 설계
- ✓ Magnet : 영구자석 추가 및 사양 설정
- ✓ Steel : 연자성체 추가 및 사양 설정



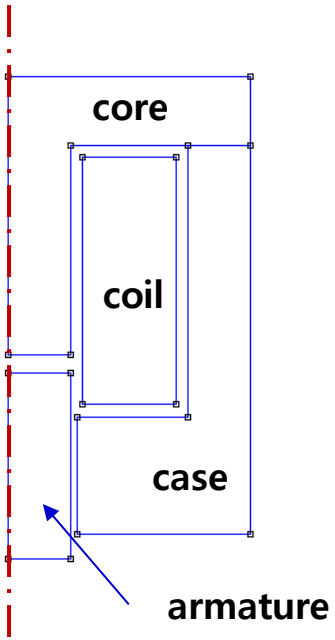
3. 가상실험

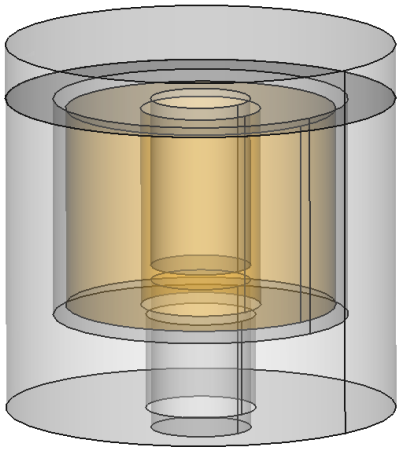
- ✓ Force : 구동부 자기력 예측

해석 모델

해석모델 설명

1. 형상 모델





2. 제품 사양

가. 코일권선

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

나. 전원

- Voltage : 14.5V

(작업 예제파일 : DoSA 설치 디렉토리 > Samples > Solenoid)

Design 생성

1. Toolbar > New 버튼 클릭 

2. Design Name : 작업 명칭 입력 (Solenoid)

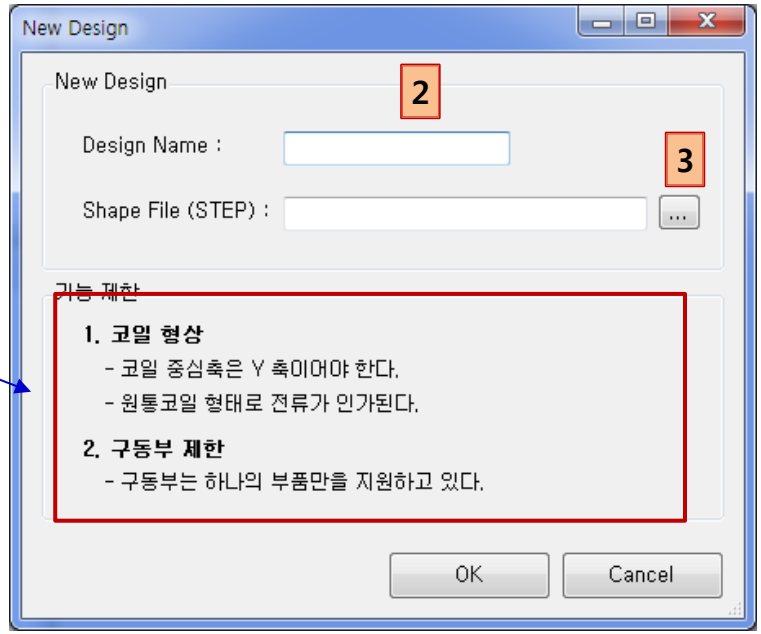
3. Shape File (STEP) : Solenoid.step 선택하기 (작업 예제파일 : DoSA 설치 디렉토리 > Samples > Solenoid)

[형상모델 주의 사항]

DoSA-Open_3D 는 아직 아래의 기능제한을 가지고 있음

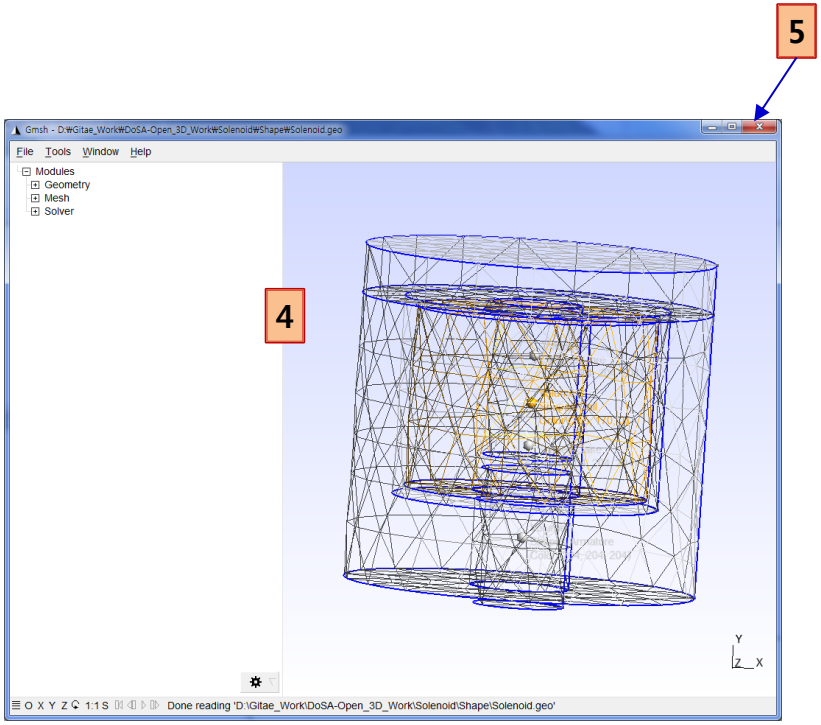
가. 코일 형상 제한
- 코일 중심 축이 Y 방향이어야 한다.
- 원통코일 형태로 전류가 인가된다.
  (사각 코일인 경우는 약간의 차이가 발생할 수 있음)

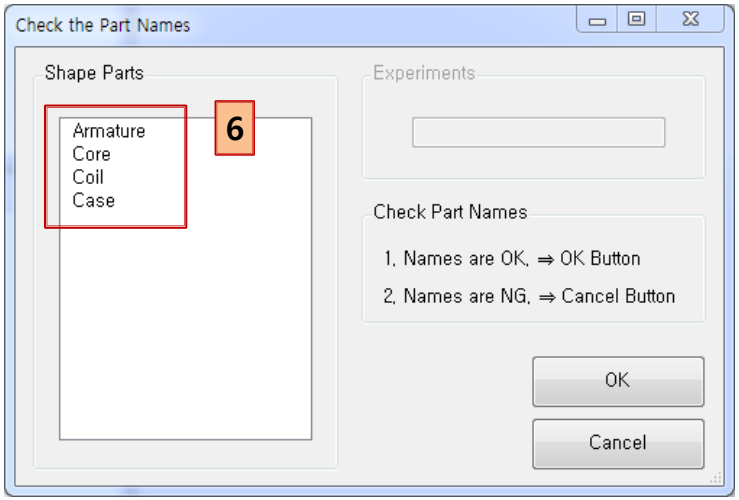
나. 구동부 형상 제한
- 구동부는 아직 하나의 부품만을 지원하고 있다.



Design 생성

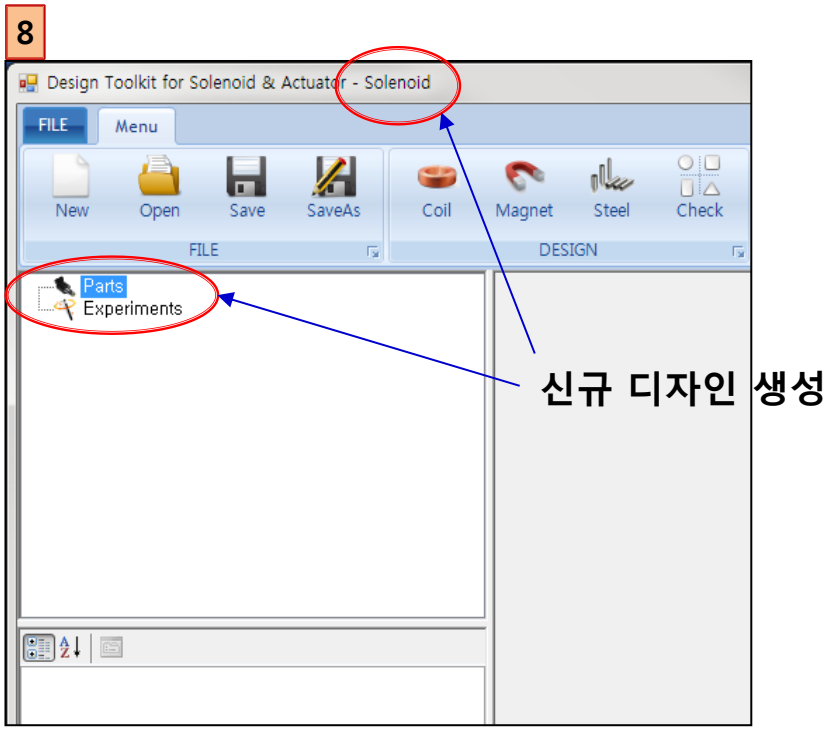
4. Gmsh 에서 Solenoid 3차원 형상을 확인한다.
5. Gmsh 를 종료한다.
6. Part Name 을 확인 한다.
7. 형상과 Part Name 에 문제가 없다면 OK 를 클릭한다.





Design 생성

8. Design 생성을 확인한다.



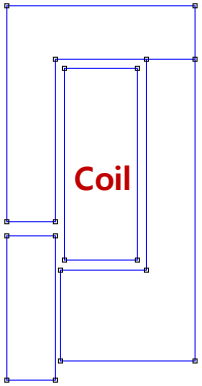
Parts Design

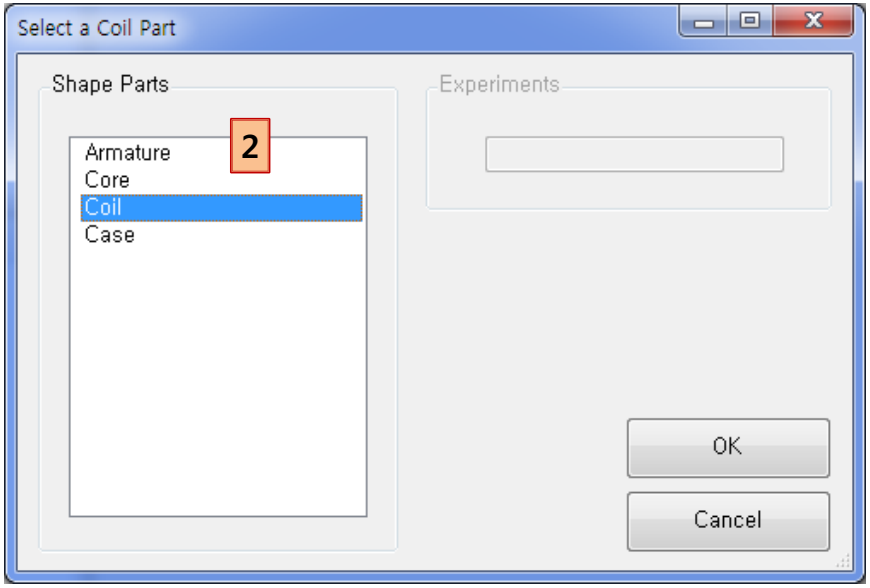
Coil 추가

1. Toolbar > Coil 버튼 클릭

2. List Box 에서 "Coil" 선택

3. OK 버튼 클릭





Coil 설계

1. Coil 기구사양 입력
   - ✓ Part Material : Copper
   - ✓ Current Direction : IN (안쪽 방향)
   - ✓ Moving Parts : FIXED (고정 부품)
   - ✓ Coil Wire Grade : Enameled_IEC_Grade_2
   - ✓ Inner Diameter : 9.6 mm
   - ✓ Outer Diameter : 21.6 mm
   - ✓ Coil Height : 16 mm
   - ✓ Copper Diameter : 0.27 mm
   - ✓ Horizontal Coefficient : 0.9 (Enameled Type)
   - ✓ Vertical Coefficient : 0.98 (Enameled Type)
   - ✓ Resistance Coefficient : 1 (Enameled Type)

2. Coil 사양 계산
   - ✓ Design Coil 버튼 클릭

2

1

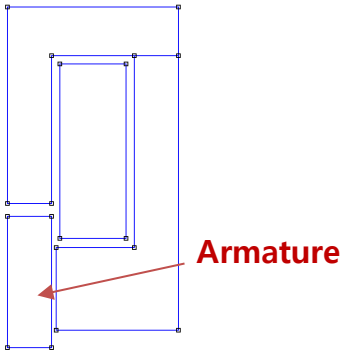
Common Fields	
Node Name	**Coil**
Specification Fields	
Part Material	**Copper**
Curent Direction	**IN**
Moving Parts	**FIXED**
Calculated Fields	
Coil Turns	**1040**
Coil Resistance [Ω]	**15.20945**
Coil Layers	20
Turns of One Layer	52
Design Fields (optional)	
Coil Wire Grade	**Enameled_IEC_Grade_2**
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**

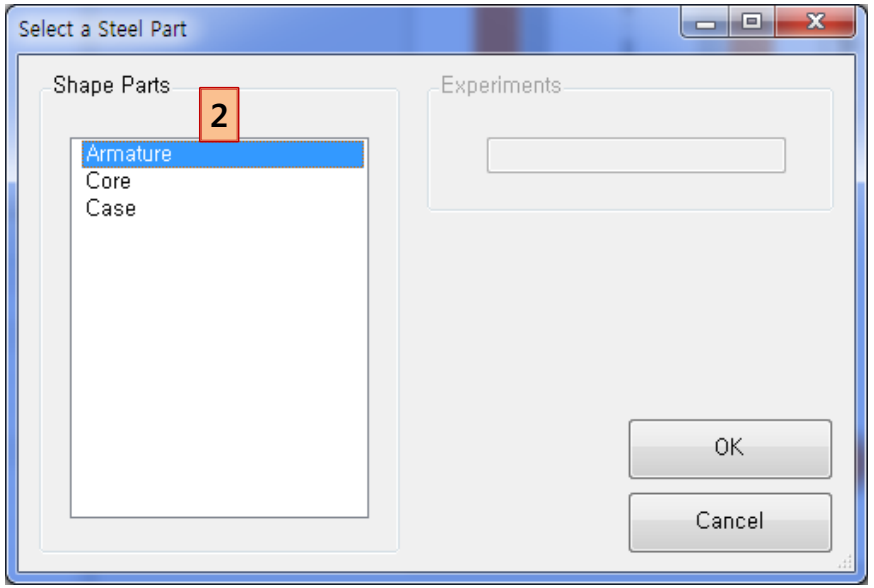
Armature 추가

1. Toolbar > Steel 버튼 클릭

2. List Box 에서 "Armature" 선택

3. OK 버튼 클릭

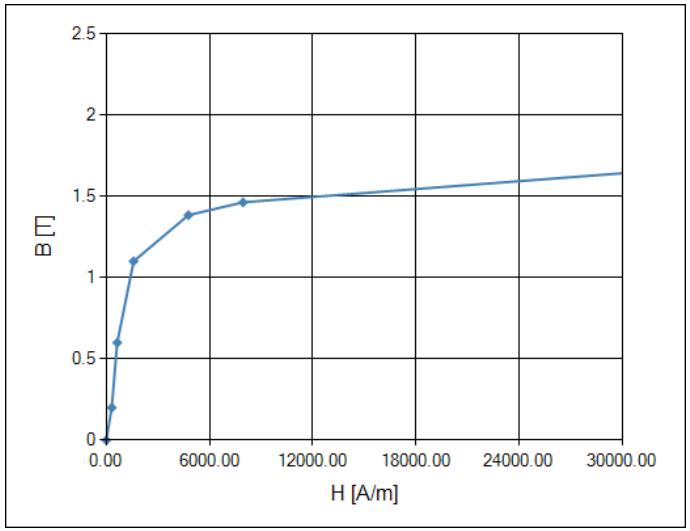




Armature 설정

1. Armature 속성 설정
   - ✓ Part Material : SUS_430 선택
   - ✓ Moving Parts : Moving (동작 부품)

[BH 곡선]



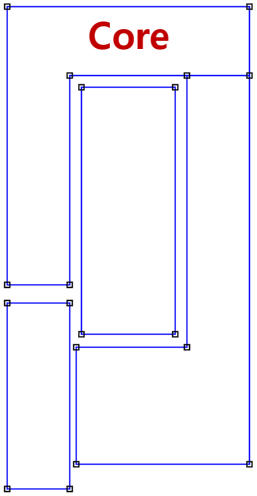
1

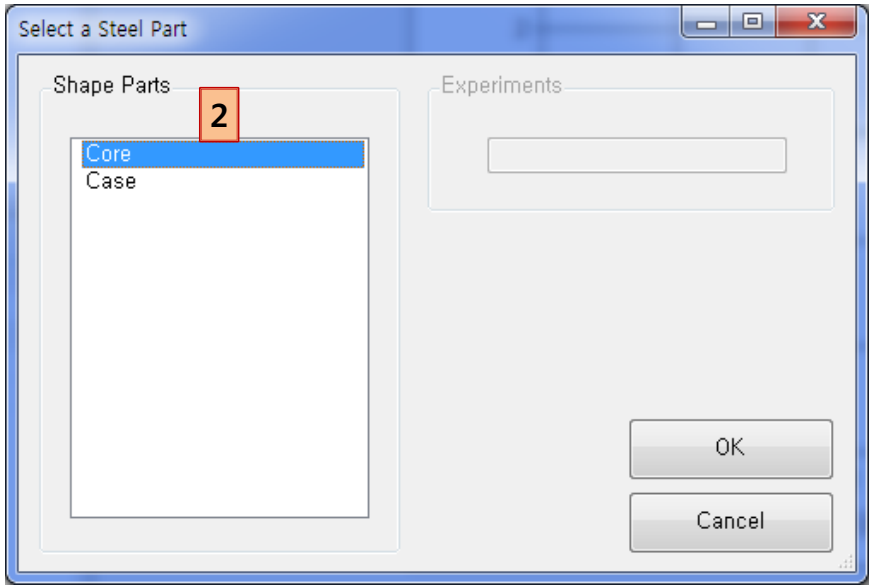
Common Fields	
Node Name	Armature
Specification Fields	
Part Material	SUS_430
Moving Parts	MOVING

Core 추가

1. Toolbar > Steel 버튼 클릭

2. List Box 에서 "Core" 선택
3. OK 버튼 클릭





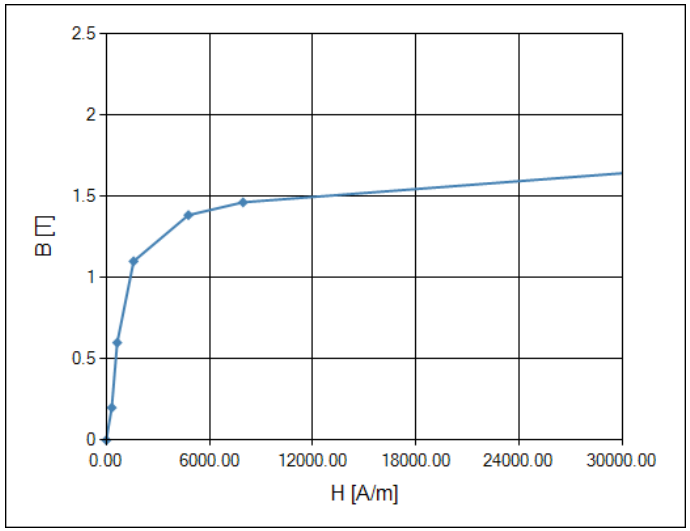
Core 설정

1. Core 속성 설정

   ✓ Part Material : SUS_430 선택

   ✓ Moving Parts : FIXED (고정 부품)

[BH 곡선]



1

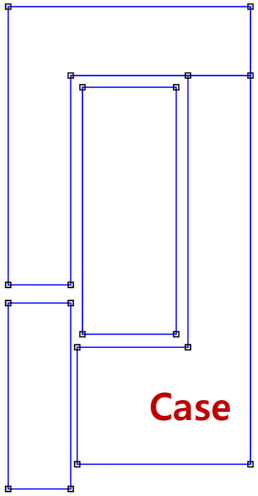
Common Fields	
Node Name	**Core**
Specification Fields	
Part Material	**SUS_430**
Moving Parts	**FIXED**

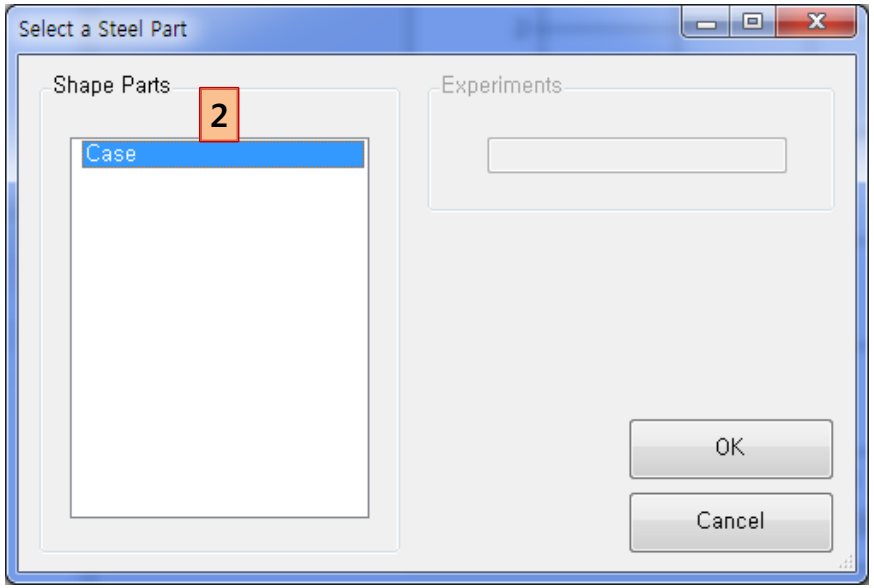
Case 생성

1. Toolbar > Steel 버튼 클릭

2. List Box 에서 "Case" 선택

3. OK 버튼 클릭





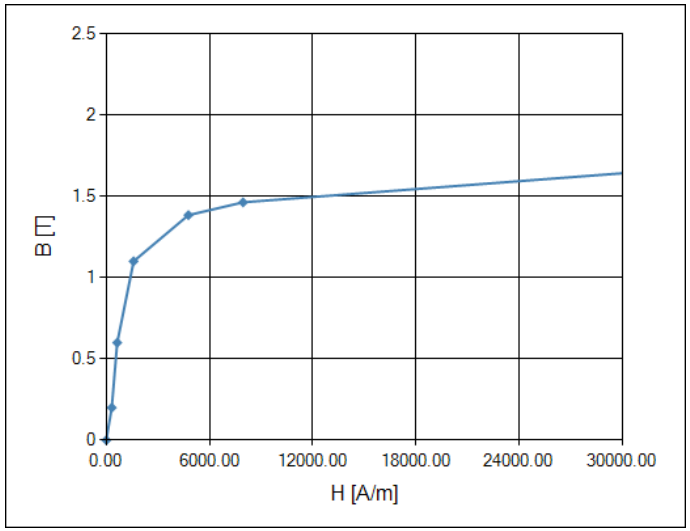
Case 설정

1. Case 속성 설정

   ✓ Part Material : SUS_430 선택

   ✓ Moving Parts : FIXED (고정 부품)

[BH 곡선]



1

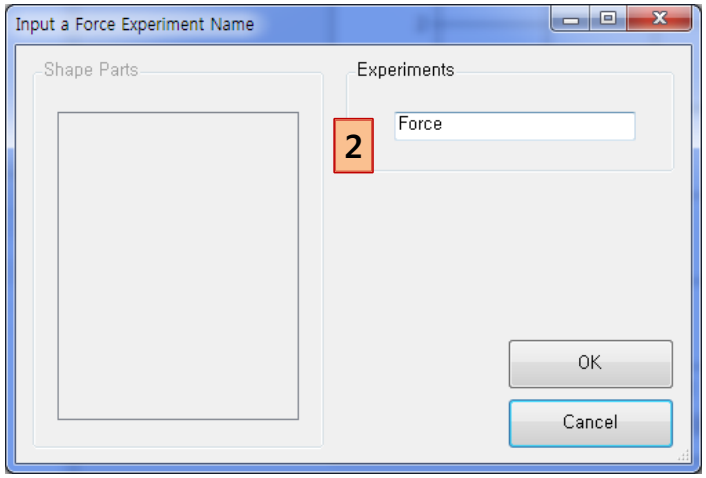
Common Fields	
Node Name	Case
Specification Fields	
Part Material	SUS_430
Moving Parts	FIXED

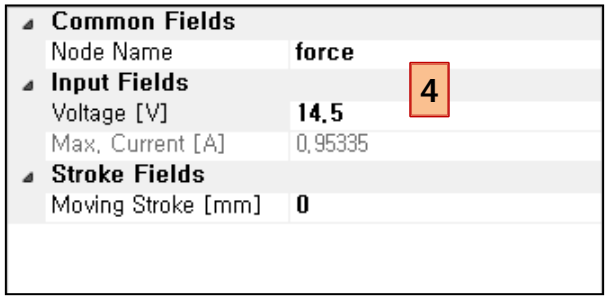
Virtual Experiments

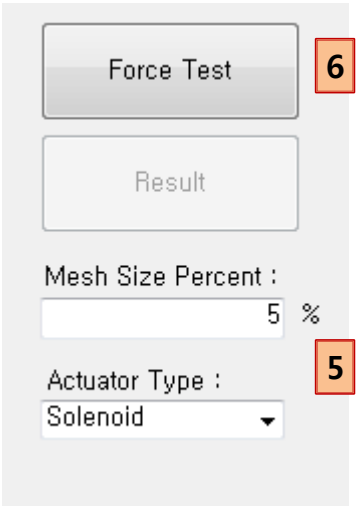
자기력 가상실험

1. Toolbar > Force 버튼 클릭 

2. Experiment Name 입력 : “force”
3. OK 버튼 클릭
4. 자기력 가상실험 설정
   - ✓ Voltage : 14.5 V
5. 해석조건 설정
   - ✓ Mesh Size Percent : 5 %
   - ✓ Actuator Type : Solenoid
6. Force Test 버튼 클릭

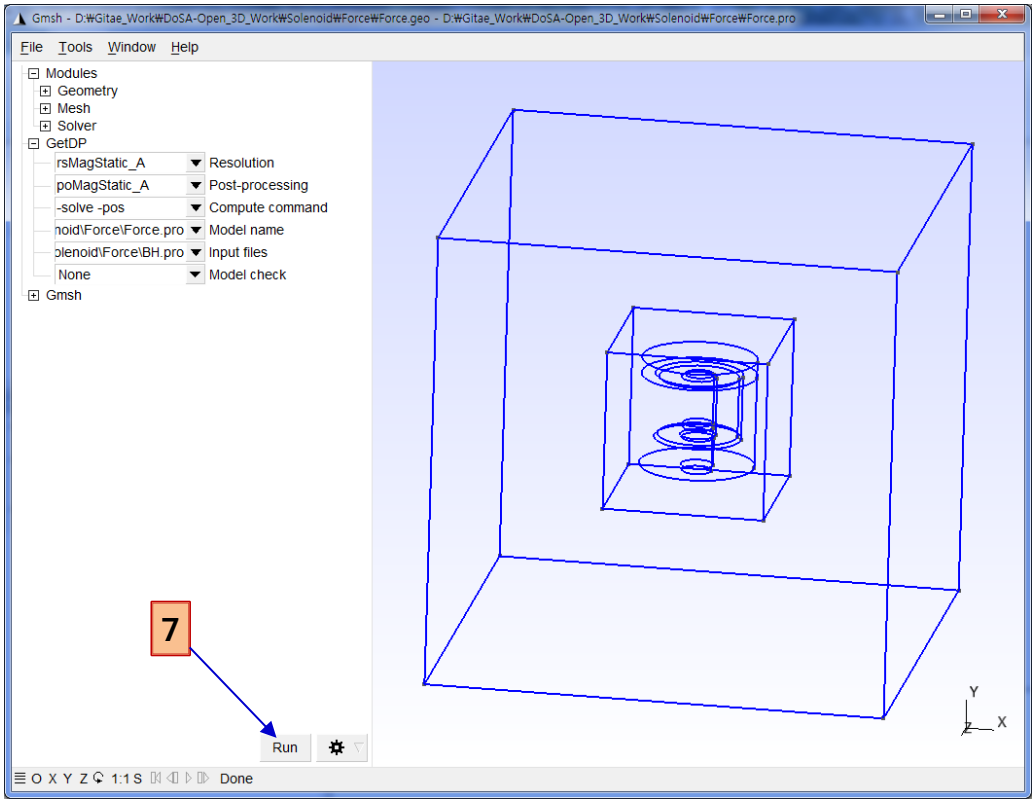






자기력 가상실험 실행

7. 형상을 확인 하고 Run 버튼 클릭

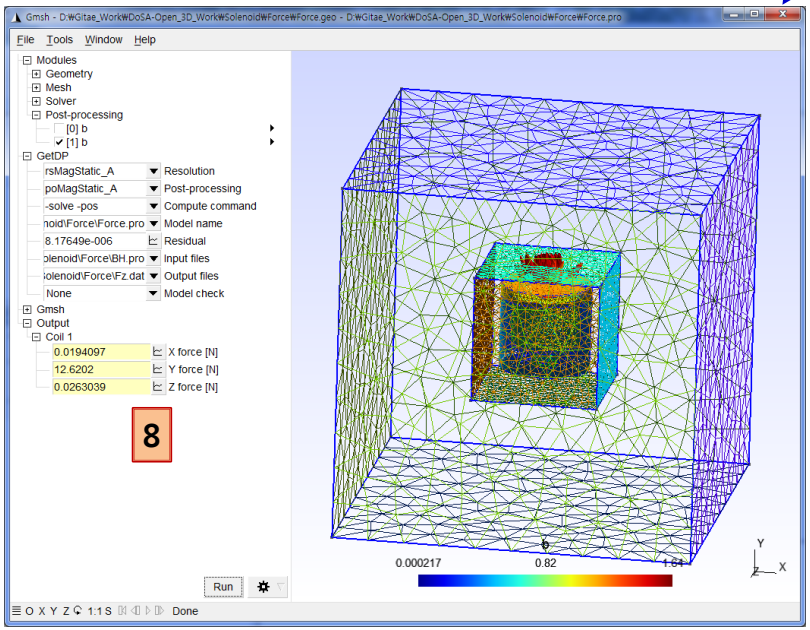


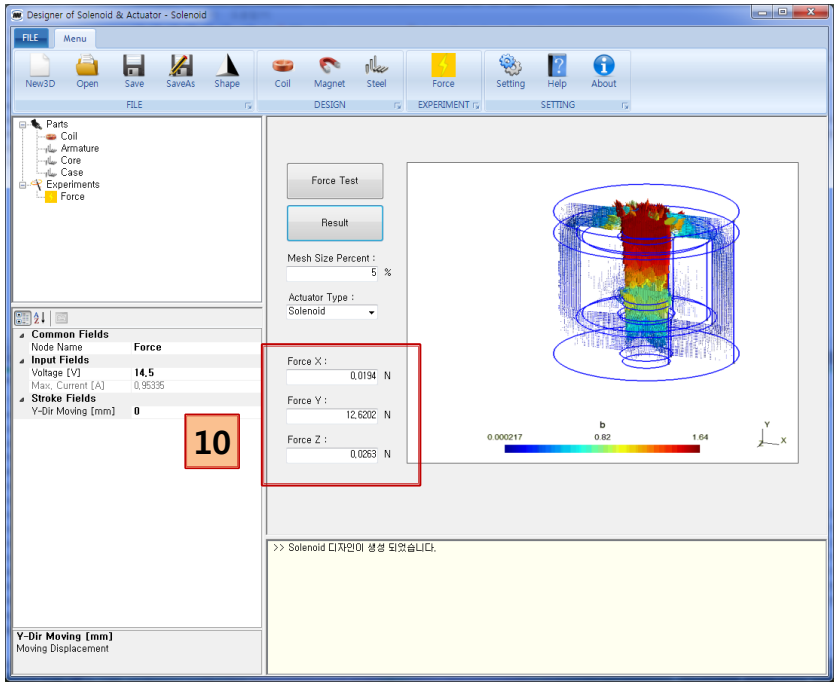
자기력 가상실험 결과

8. 해석 결과를 확인함 (Mesh Percent 5% 인 경우는 해석시간 약 8분, Memory 약 1.4GB 가 소요됨)

9. Gmsh 를 종료함

10. 자기력 확인





Thank You