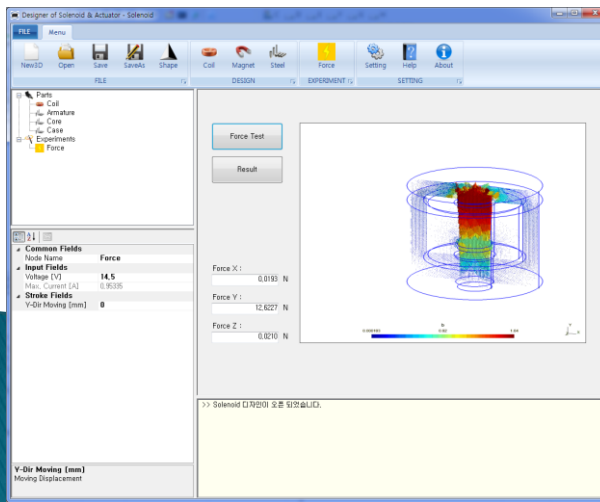


# DoSA-Open\_3D 사용 메뉴얼

Example of Solenoid

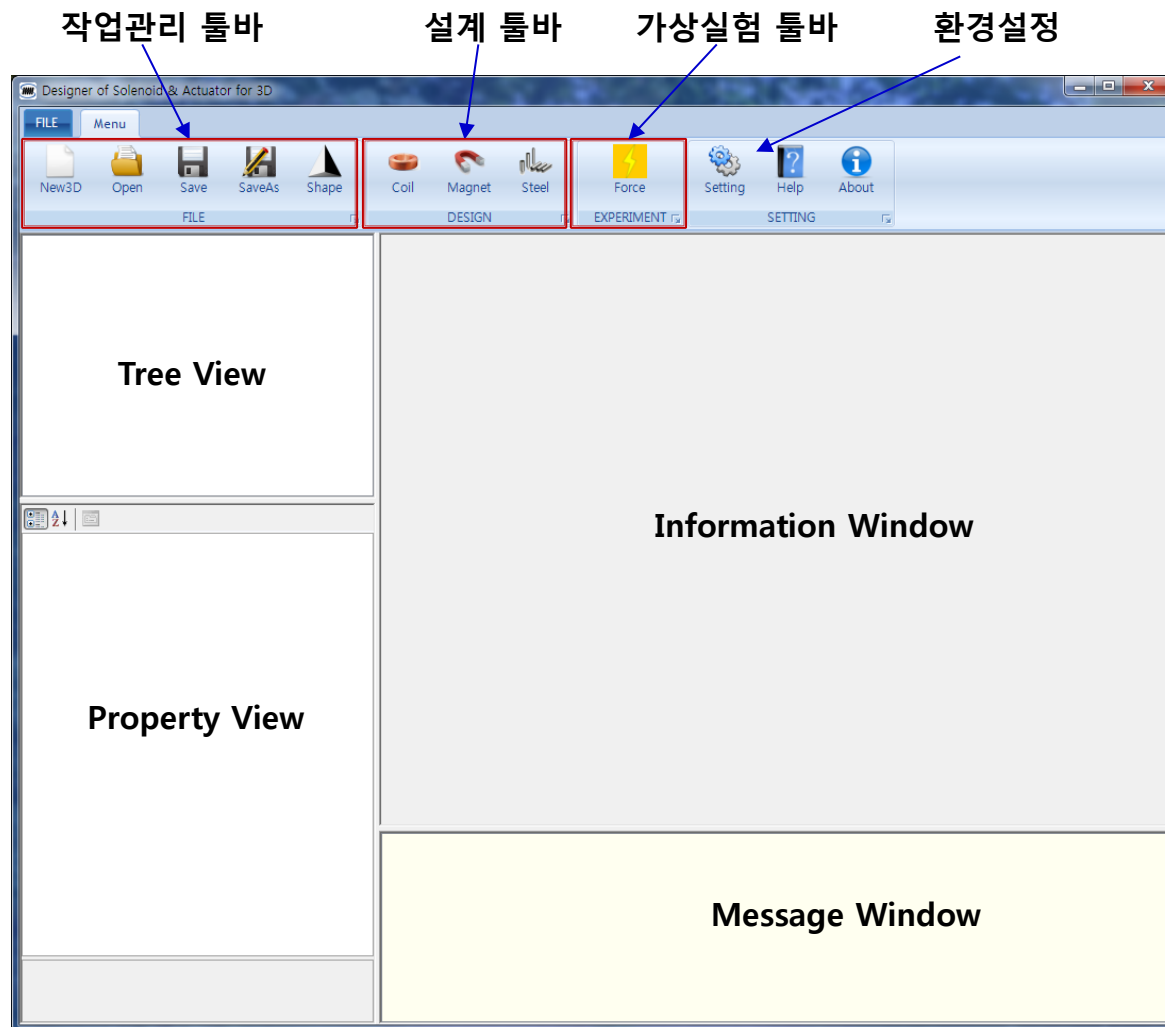


2019-11-26

권기태 (zgitae@gmail.com)

# DoSA 구성

# 프로그램 구성



# Toolbar

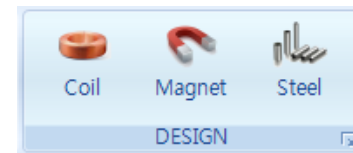
## 1. 작업관리

- ✓ 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

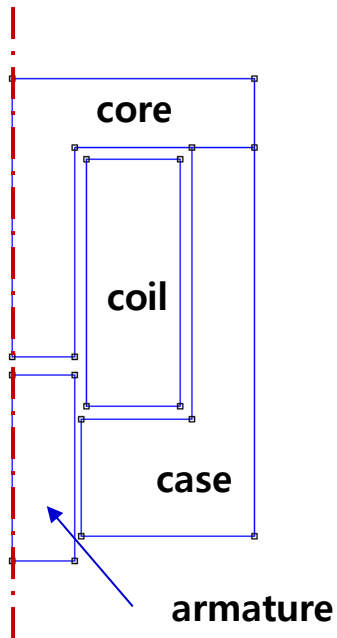
- ✓ Force : 구동부 자기력 예측



# 해석 모델

# 해석모델 설명

## 1. 형상 모델



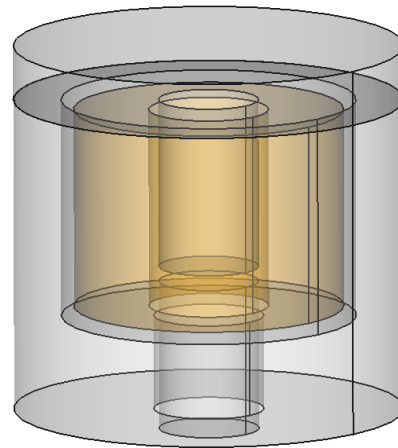
## 2. 제품 사양

### 가. 코일권선

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

### 나. 전원

- Voltage : 14.5V



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

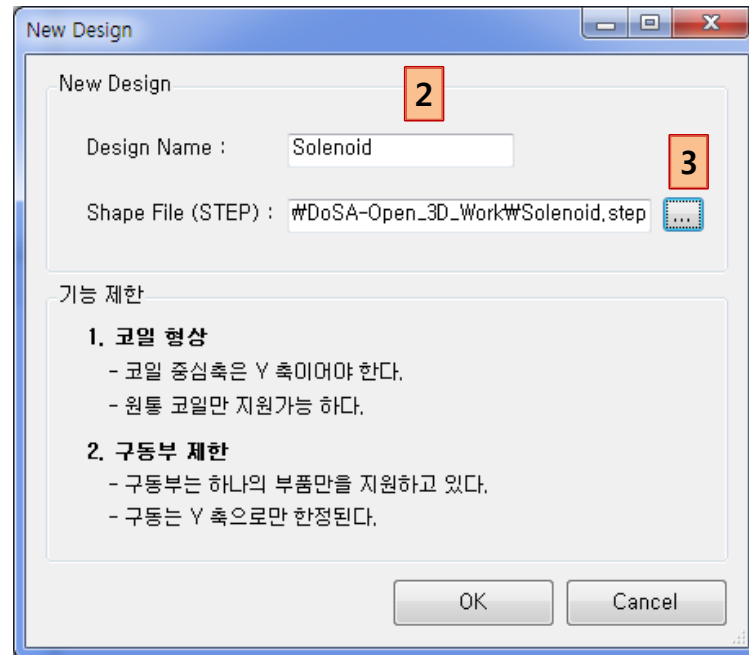
# Design 생성

1. Toolbar > New 버튼 클릭



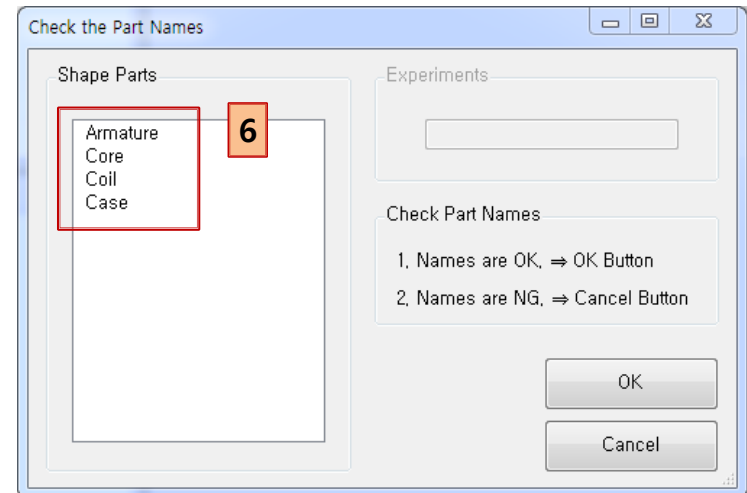
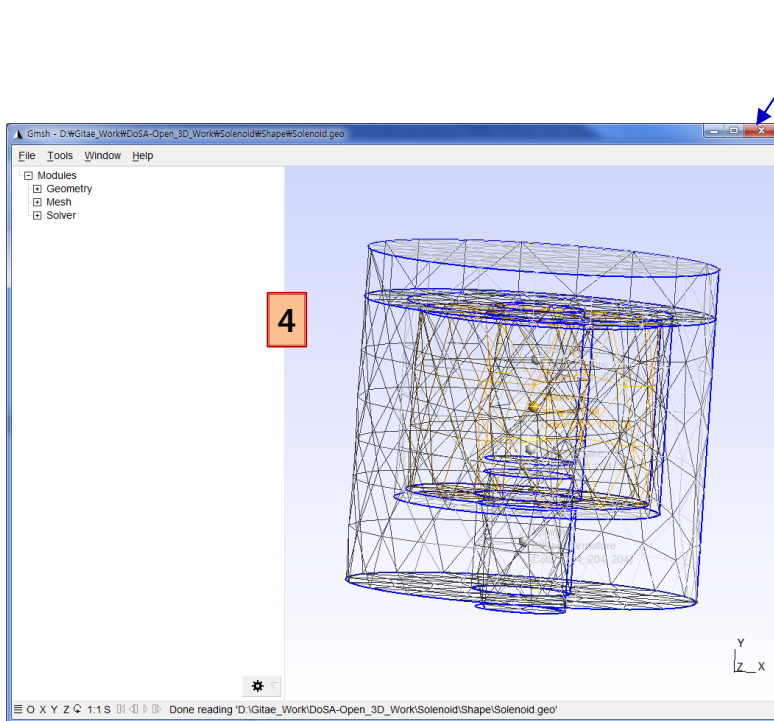
2. Design Name : 작업 명칭 입력 ( Solenoid )

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



# Design 생성

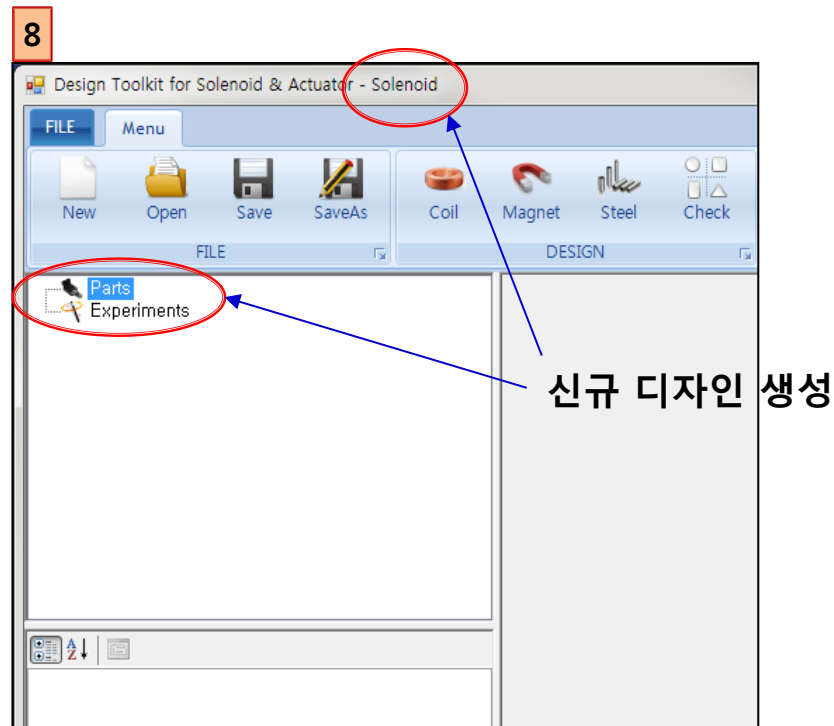
4. Gmsh 에서 Solenoid 3차원 형상을 확인한다.
5. Gmsh 를 종료한다.
6. Part Name 을 확인 한다.
7. 형상과 Part Name 에 문제가 없다면 OK 를 클릭한다.





# Design 생성

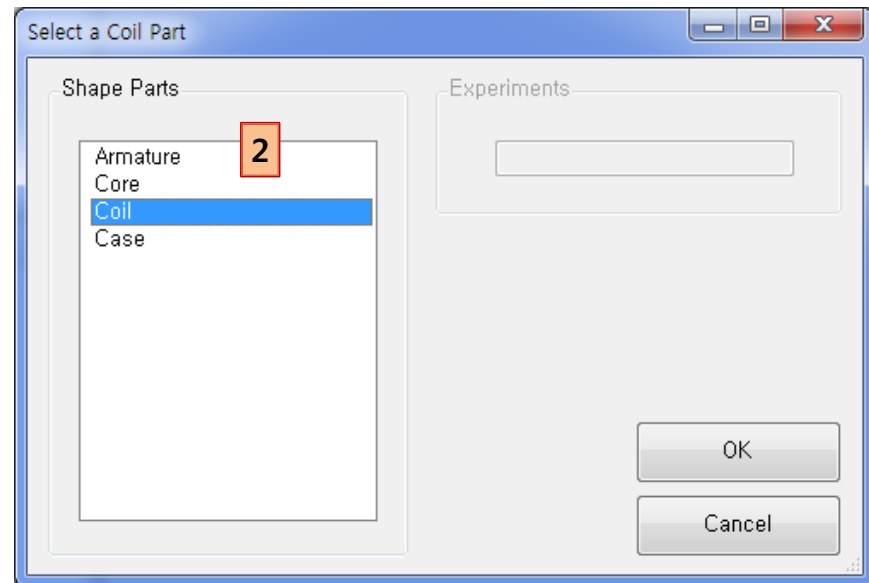
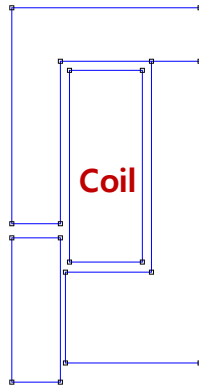
8. Design 생성을 확인한다.



# 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

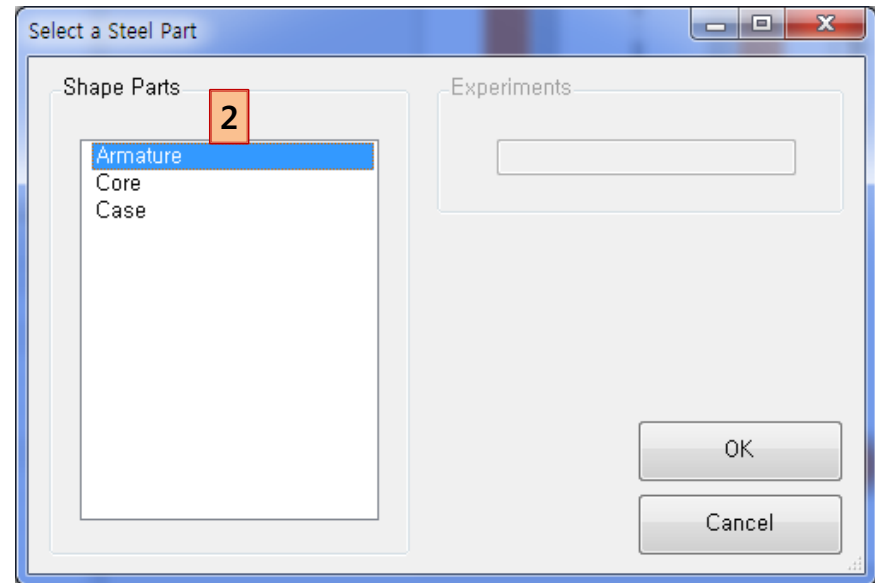
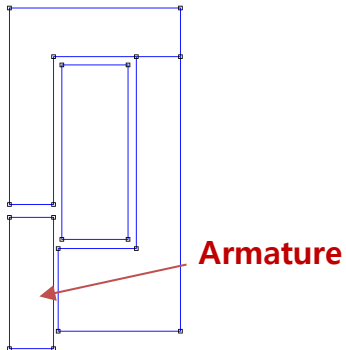


1

Common Fields	
Node Name	Coil
Specification Fields	
Part Material	Copper
Current Direction	IN
Moving Parts	FIXED
Calculated Fields	
Coil Turns	1040
Coil Resistance [ $\Omega$ ]	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 [ $^{\circ}\text{C}$ ]	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

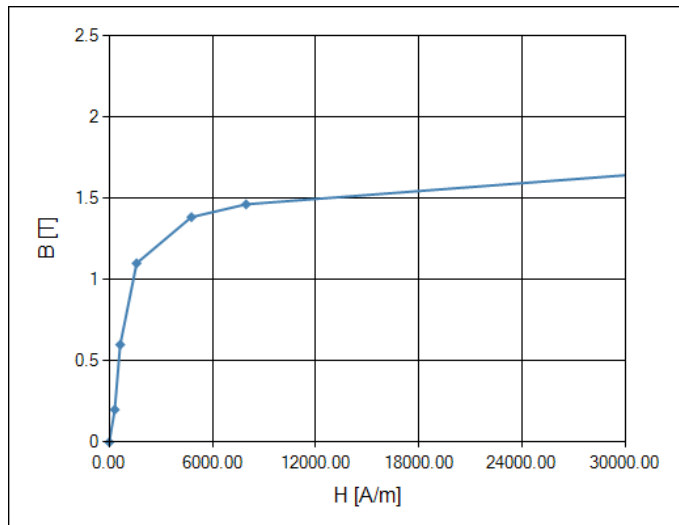


# Armature 설정

## 1. Armature 속성 설정

- ✓ Part Material : SUS\_430 선택
- ✓ Moving Parts : Moving (동작 부품)

[ BH 곡선 ]

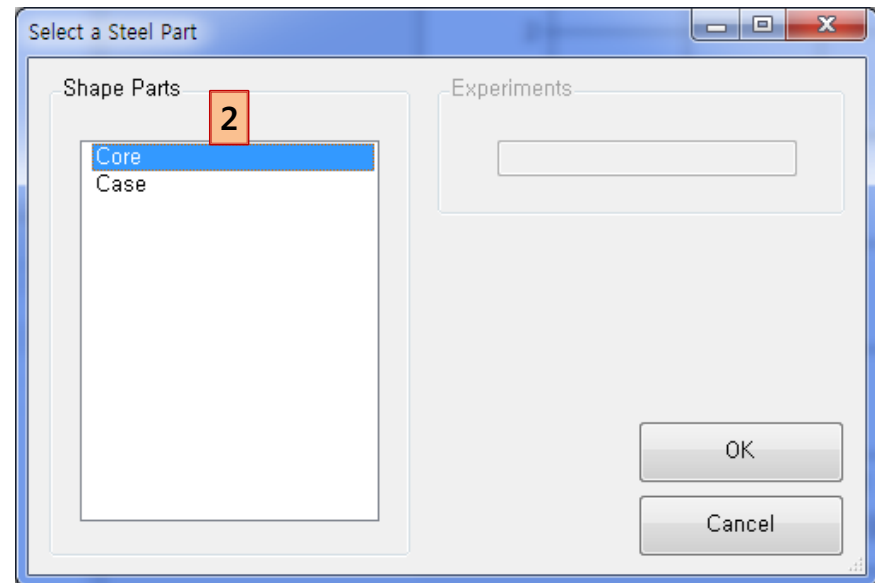
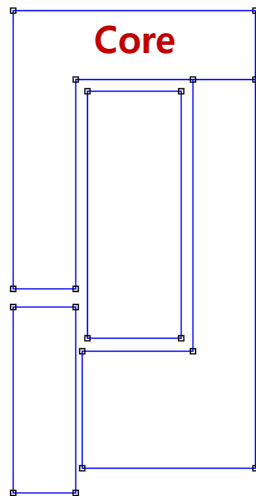


1

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

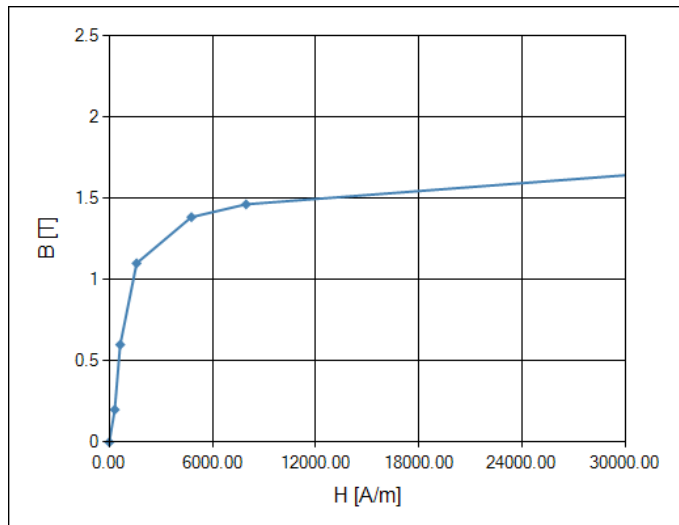


# Core 설정

## 1. Core 속성 설정

- ✓ Part Material : SUS\_430 선택
- ✓ Moving Parts : FIXED (고정 부품)

[ BH 곡선 ]



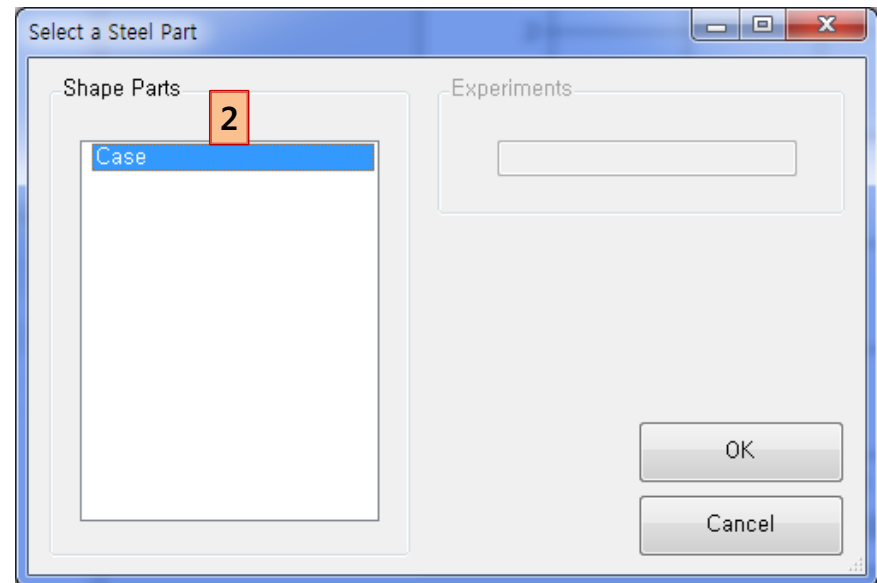
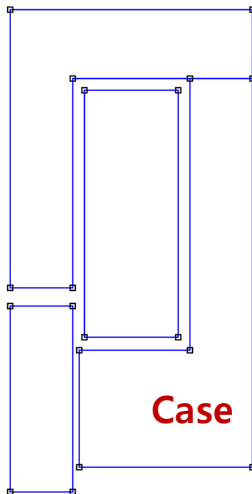
1

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

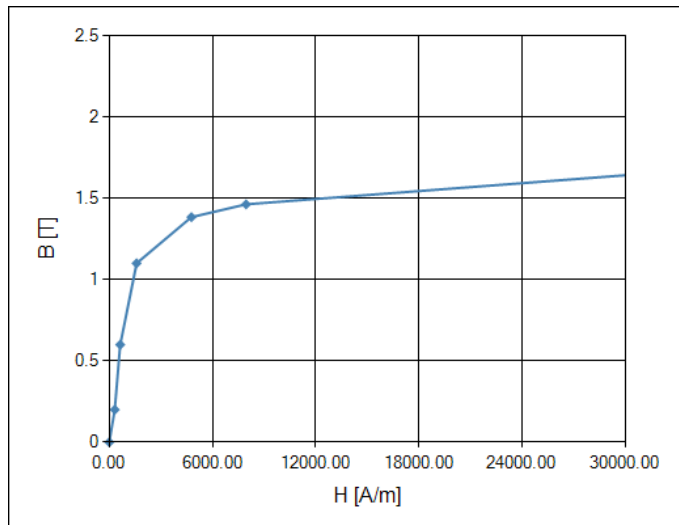


# Case 설정

## 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

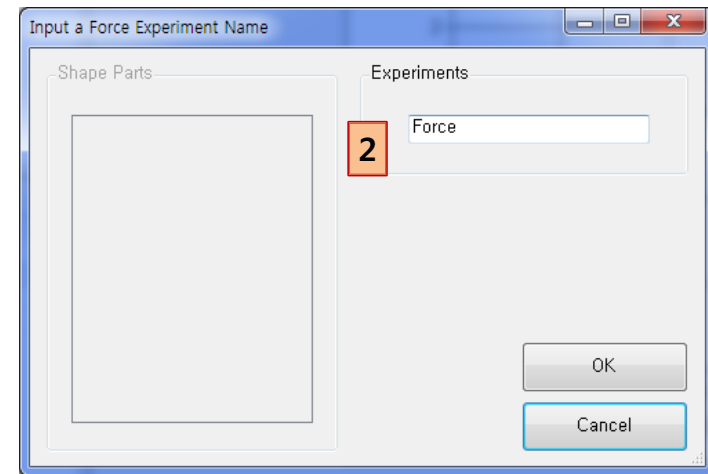
✓ Voltage : 14.5 V

5. 해석조건 설정

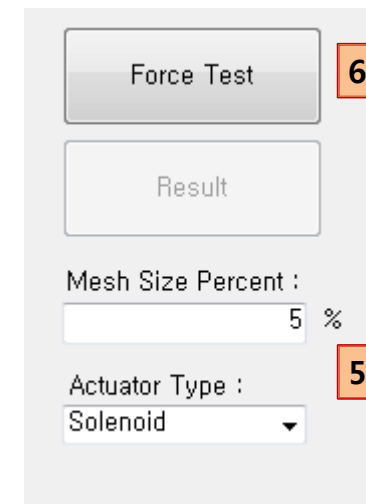
✓ Mesh Size Percent : 5 %

✓ Actuator Type : Solenoid

6. Force Test 버튼 클릭

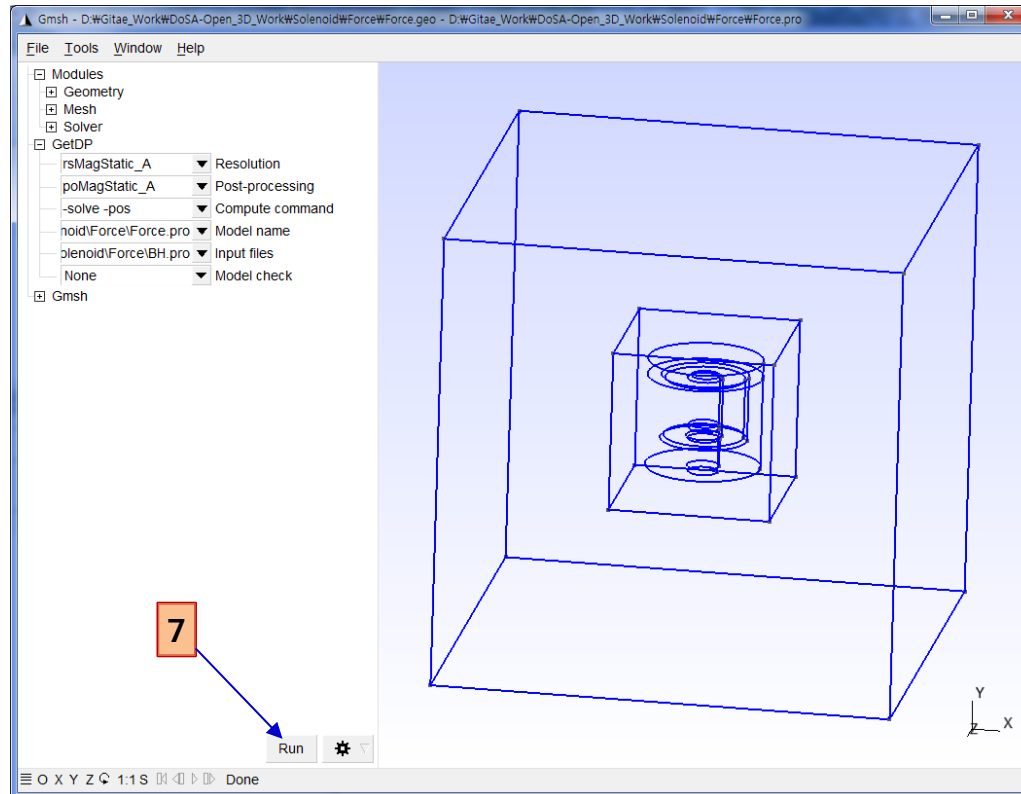


Common Fields	
Node Name	force
Input Fields	
Voltage [V]	14.5
Max. Current [A]	0.95335
Stroke Fields	
Moving Stroke [mm]	0



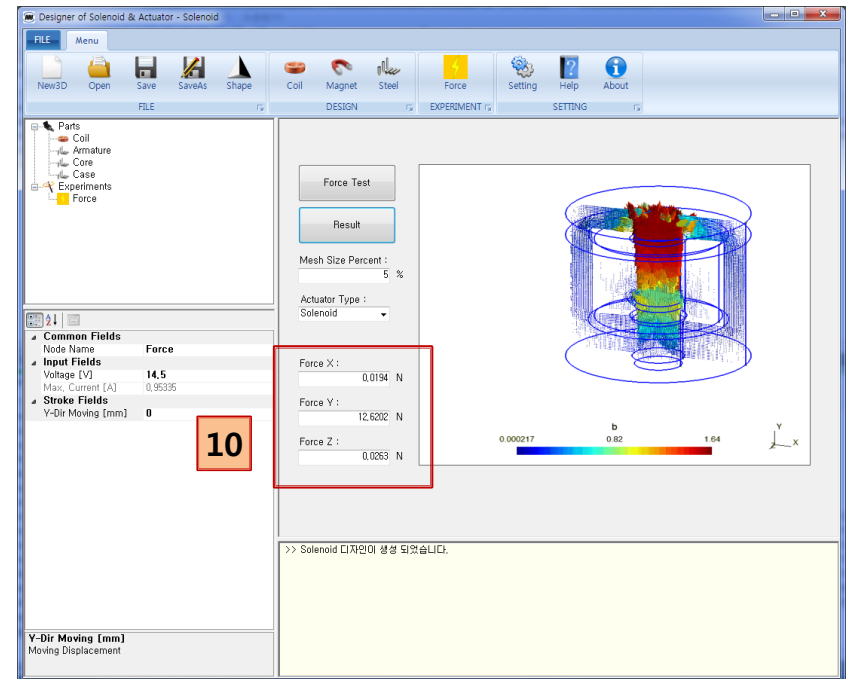
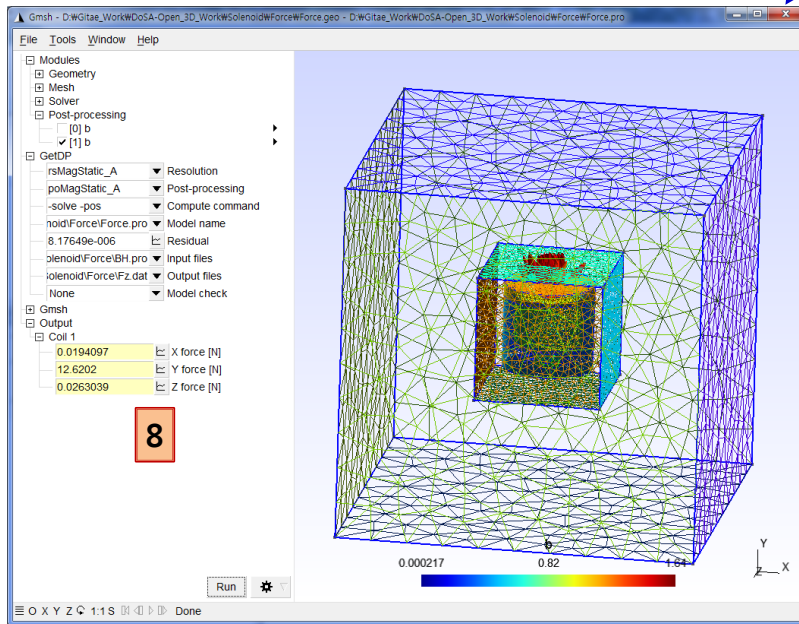
# 자기력 가상실험 실행

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**