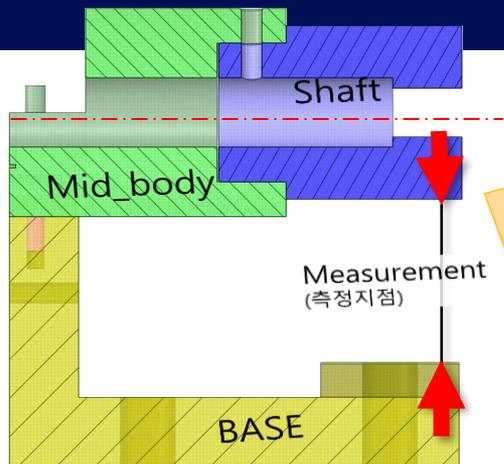


3 assy, stack-up model Model

3차원 공차분석 예제 모델 / CETOL

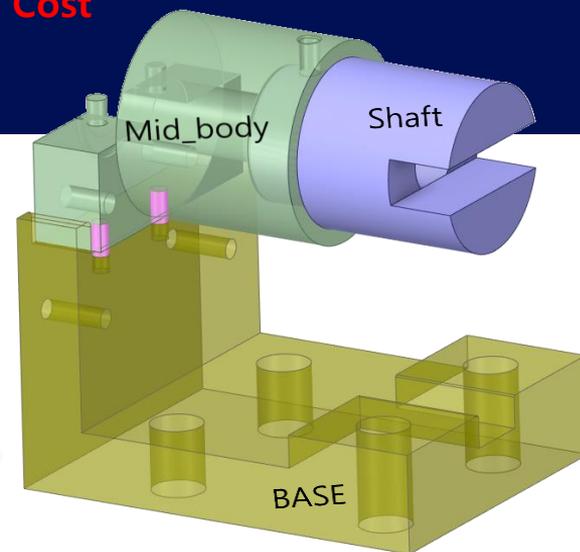
#3 체험존(exZone)

Balance between Design Performance & Cost



목표범위 (Requirements)

- 47 ± 0.20
- 목표 양품율: 96% 이상



Contents

1. Roller gap Model 설명
2. Stack-up Tolerance 따라하기(실습)
 - 문제정의(측정지점)
 - 조립관계 구성
 - 각 파트별 치수관계 구성
3. Roller gap Model
 - (필요시) CETOL 6 σ 정답모델 불러오기

#3 이번 과정에서는...

#Note ...

- Measurements, Assembly, Dimension 기능 사용법에 약간의 숙지가 되어야 본 자료를 활용한 모델 구성에 어려움이 없습니다.
- 설명의 도움이 필요하다면 이러닝(영상)을 같이 참고하면 쉽게 모델 구성이 가능합니다.

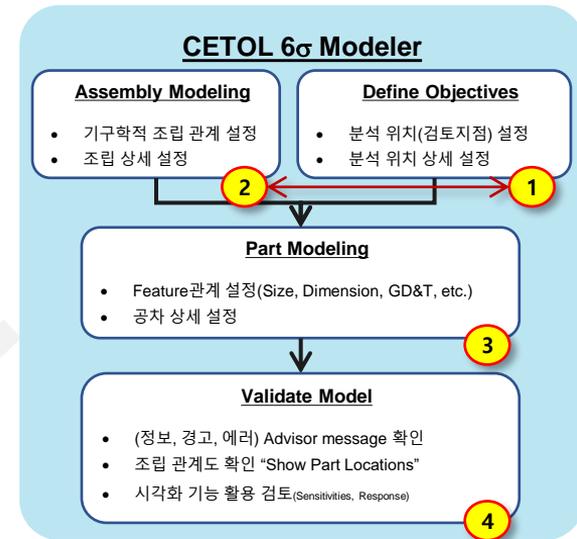
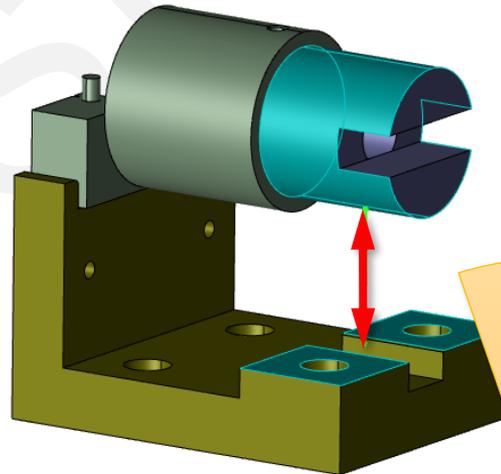
• 따라하기 예제를 통해

- CAD 시스템 이해
- 도면의 이해(설계 의도)

산출된 결과와 기여도를 확인하여

품질에 영향을 미치는 주요 인자들을 살펴 봅니다.

- 일반적으로 정립된 도면은 가공, 조립, 관리(품질)를 고려하여 설계의도가 반영되어 있습니다.
- 도면을 검토 및 분석하여 누구나 동일한 해석(해독)이 되어야 합니다.



Tolerance Analysis Procedure

목표범위 (Requirements)

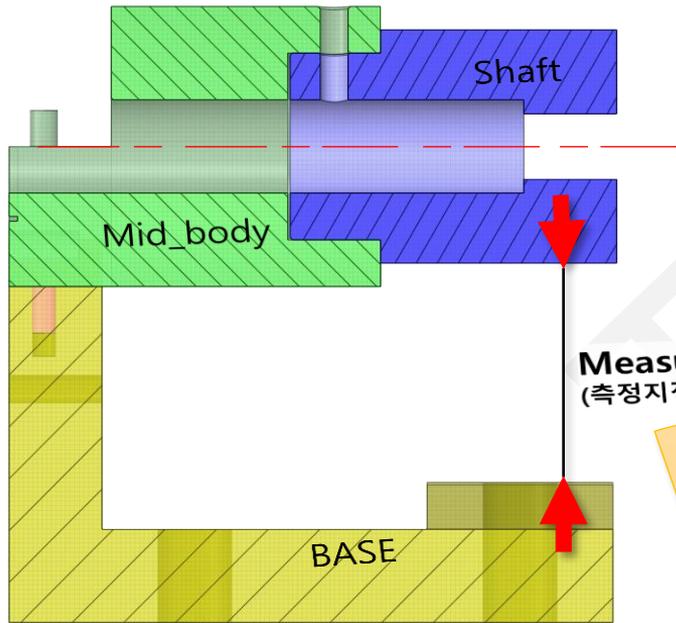
- 47 ± 0.20
- **양품율: 96% 이상**

Roller gap Model 설명

- 품질관리(문제정의)
- BASE Part(치수정보)
- Mod_body Part(치수정보)
- Shaft Part(치수정보)

품질관리(문제정의)

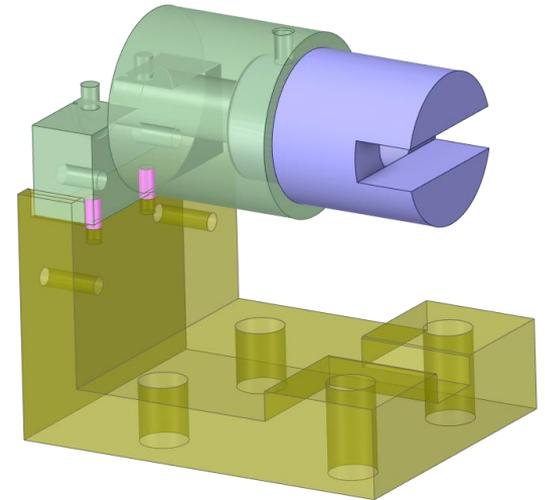
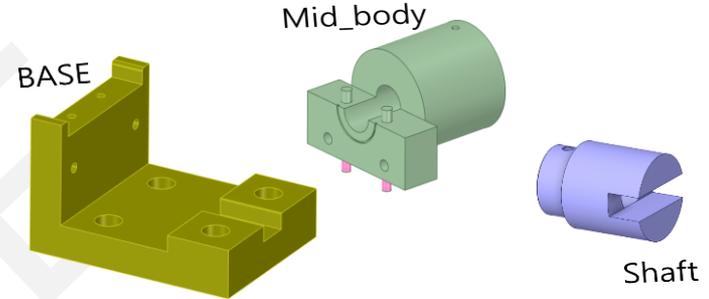
- 부품 조립 후 일정범위(목표범위, 품질관리범위)를 부합하는지 확인 합니다.



Measurement
(측정지점)

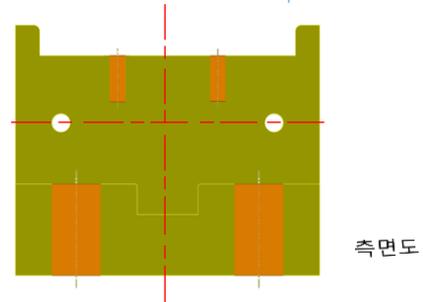
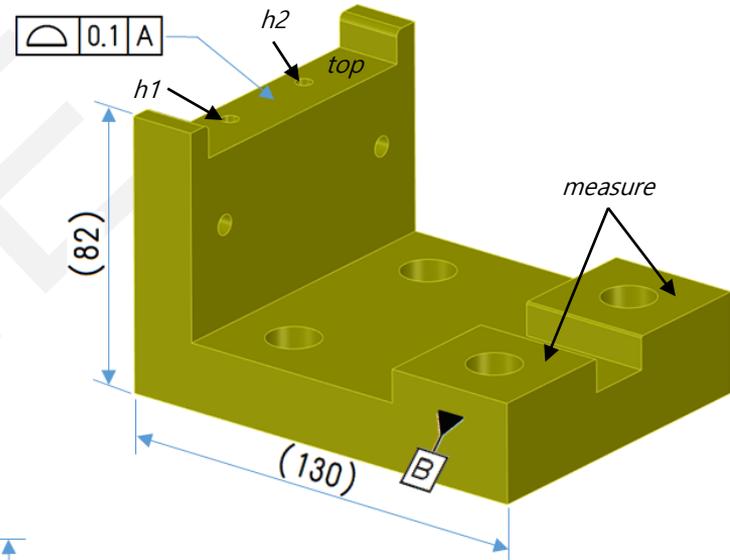
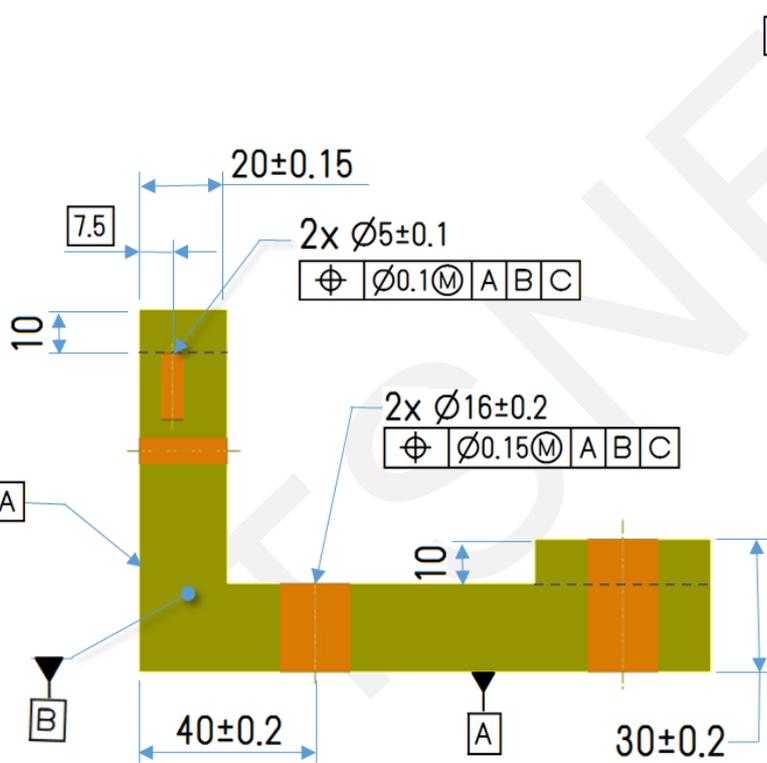
목표범위 (Requirements)

- 47 ± 0.20
- 양품율: 96% 이상



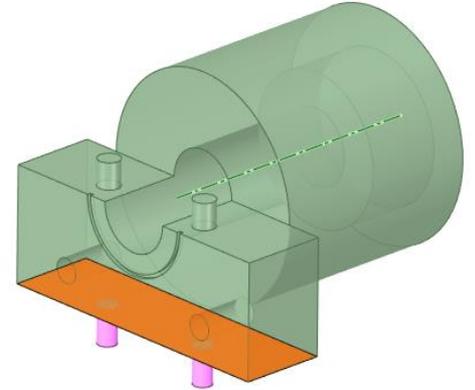
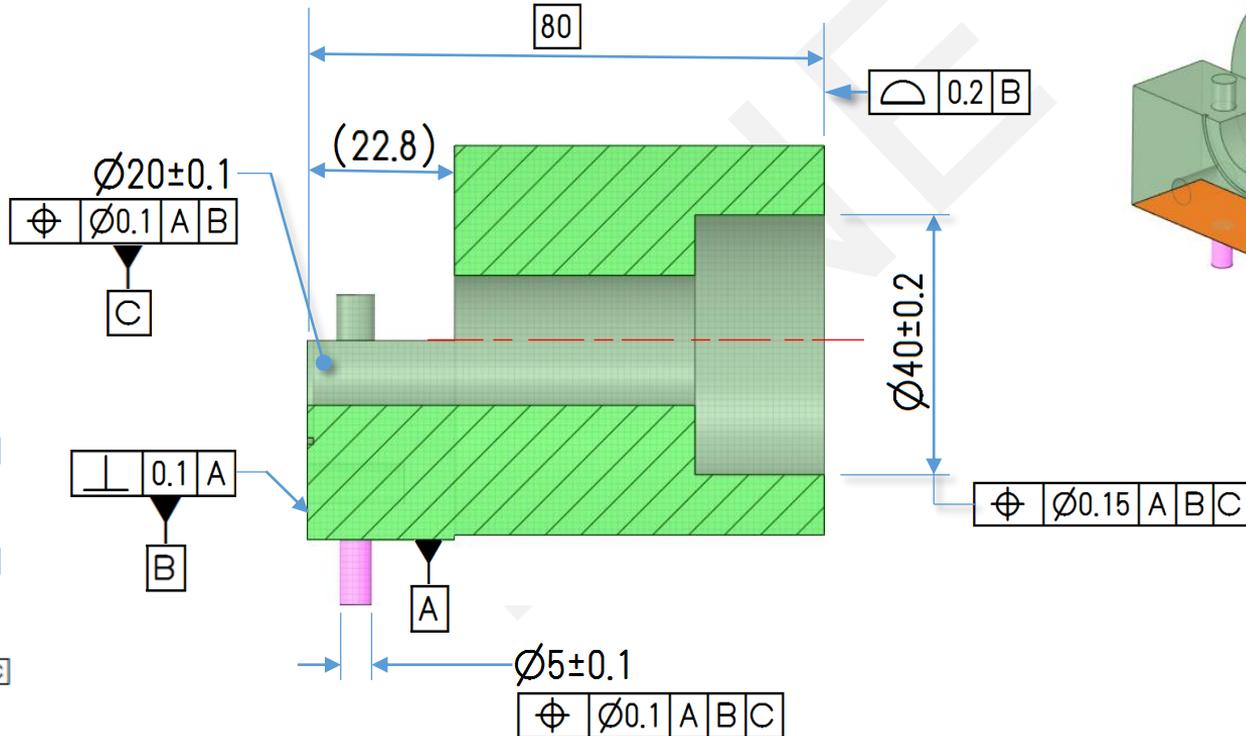
BASE 치수 정보

- Base
 - A
 - B
 - C
 - 90,0
 - 0,1 A
 - A B C
 - measure
 - 30,00±0,20
 - top
 - 0,1 A
 - h1
 - 5,00±0,10
 - 0,1 A B C
 - h2
 - 5,00±0,10
 - 0,1 A B C



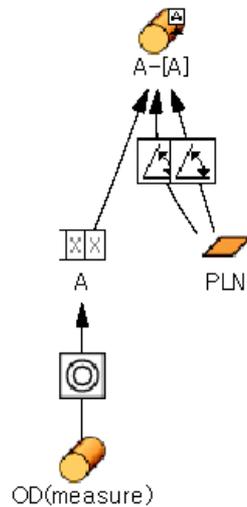
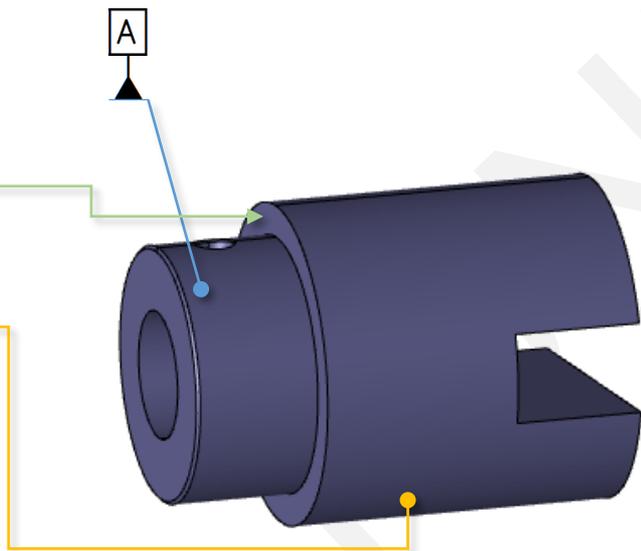
Mod_body 치수 정보

- Mid_body
 - A
 - A
 - B
 - 0.1 A
 - A B
 - C
 - 20,00±0,10
 - 0.1 A B
 - A B C
 - Pin_h1
 - 5,00±0,10
 - 0.1 A B C
 - Pin_h2
 - 5,00±0,10
 - 0.1 A B C
 - ID
 - 40,00±0,20
 - 0.15 A B C



Shaft 치수 정보

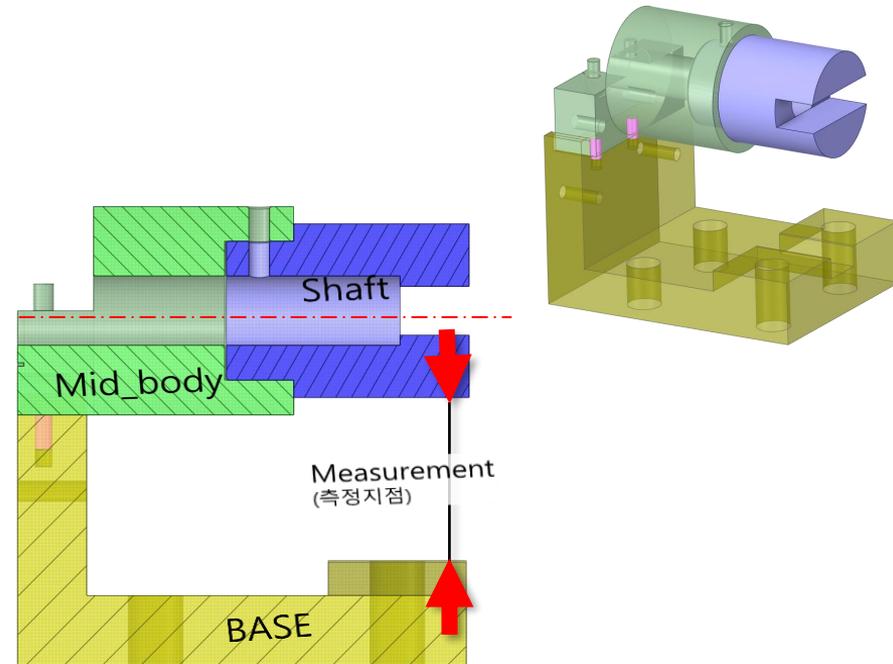
- Shaft
 - A
 - $\varnothing 40,00 \pm 0,05$
 - A
 - PLN
 - 90,0
 - 90,0
 - OD(measure)
 - $\varnothing 50,00 \pm 0,05$
 - $\varnothing 0,1$ A



Roller gap Model 따라하기(실습)

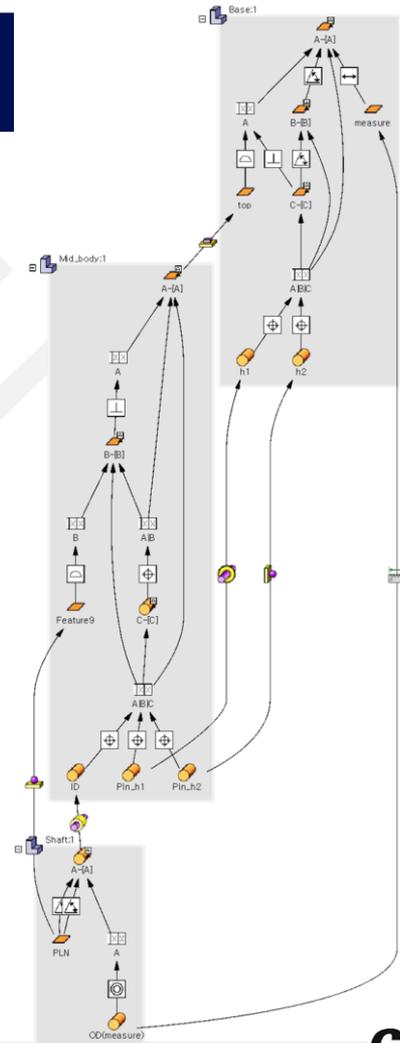
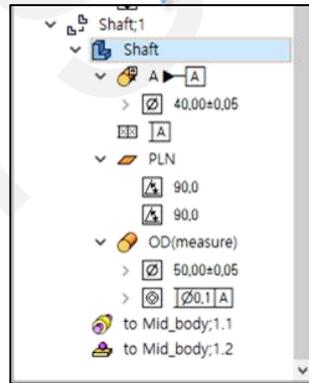
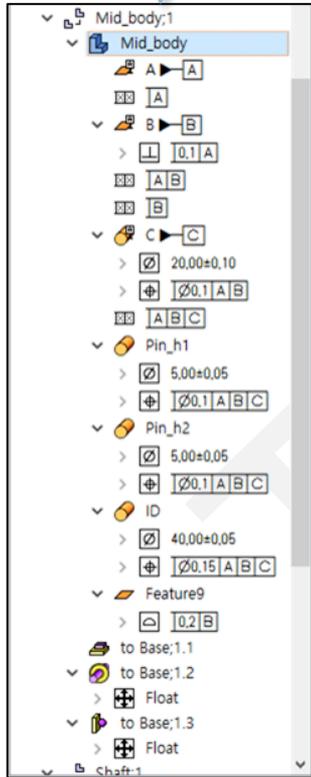
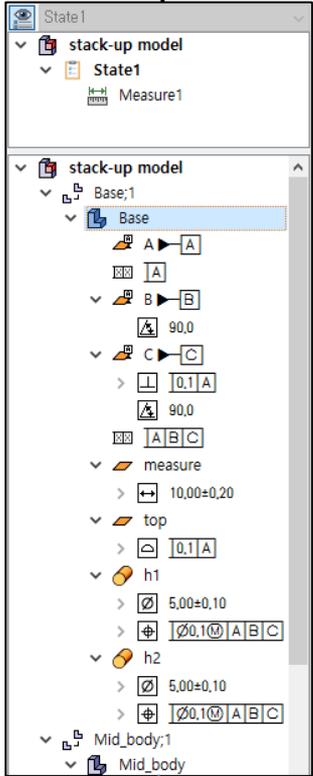
- CETOL 6σ에서 따라하기

1. 측정지점(Measurements)
2. 조립관계(Joint Modeling)
3. 치수관계(Part Modeling)

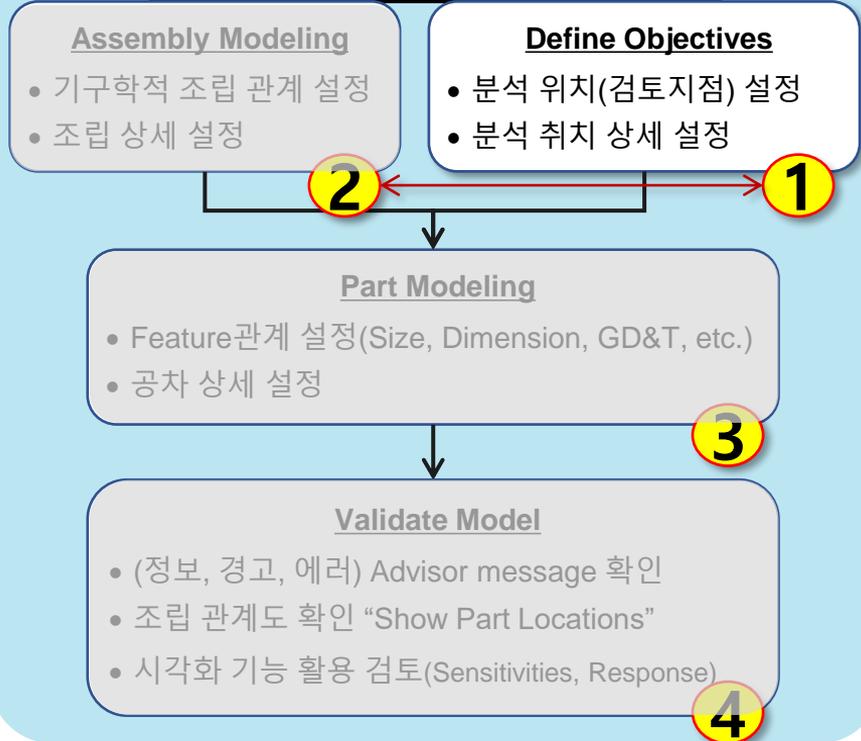


Roller gap Model 따라하기(실습)

- Completed CETOL Models



CETOL 6 σ Modeler



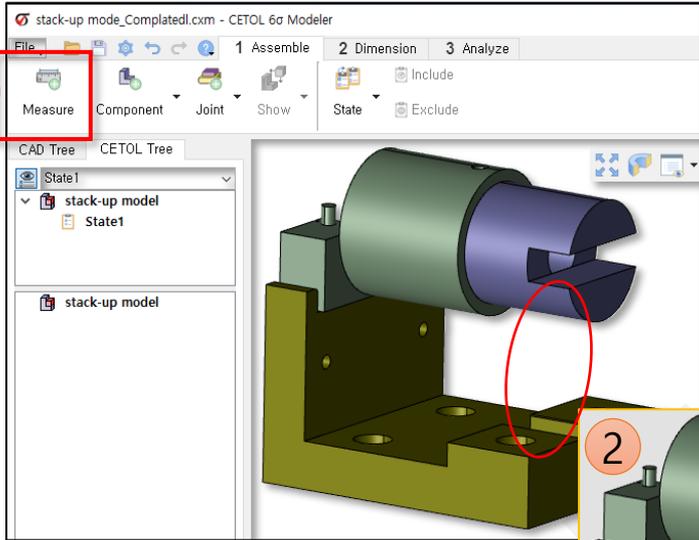
첫번째로

검토지점(Measurement)을 설정 합니다.

(속련도가 일정 이상 올라가면 1번, 2번의 작업은 유연하게 대처 할 수 있습니다.)

Stack-up Tolerance 따라하기(실습)

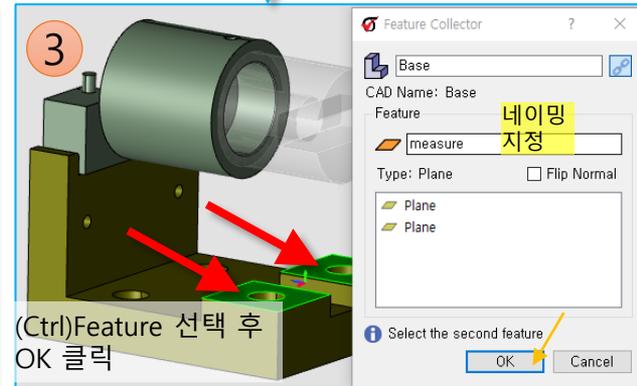
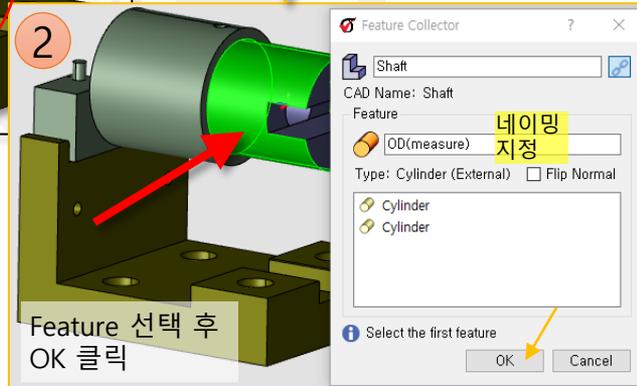
• 측정지점(Measurements) 설정하기



1. "Measure"를 클릭 합니다.

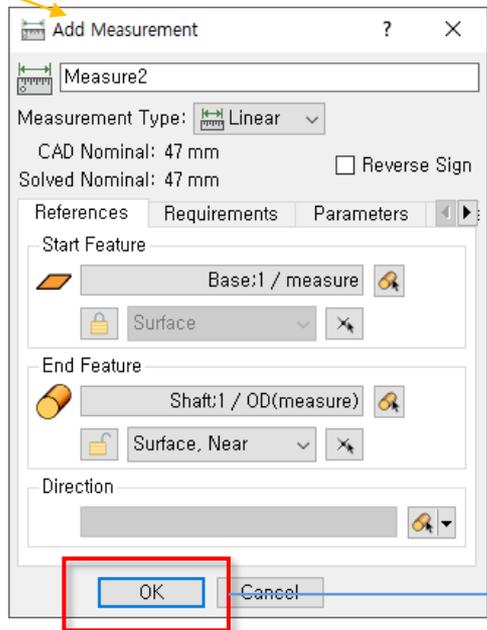
2. 첫번째 팝업(Feature Collector)창에서 feature를 선택 후 OK 버튼 클릭합니다.

3. 두번째 팝업(Feature Collector)창에서 feature를 선택 후 OK 버튼 클릭합니다.

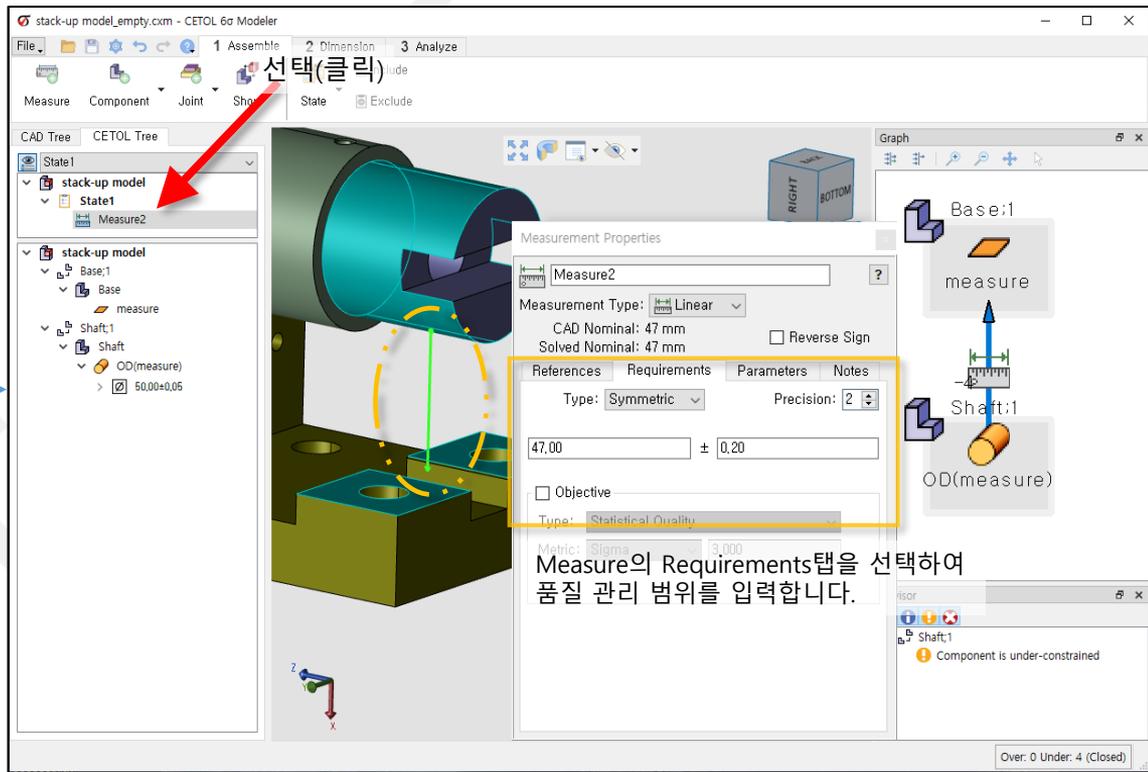


Stack-up Tolerance 따라하기(실습)

- 측정지점(Measurements) 설정(확인)하기



Add Measurement 팝업창에서 OK버튼을 클릭 합니다.
→ Cancel 누를 시에 Measure설정은 취소 됩니다.
→ Requirements 탭에서 허용공차 범위 설정하고
OK 버튼 눌러도 됩니다. (선행작업)



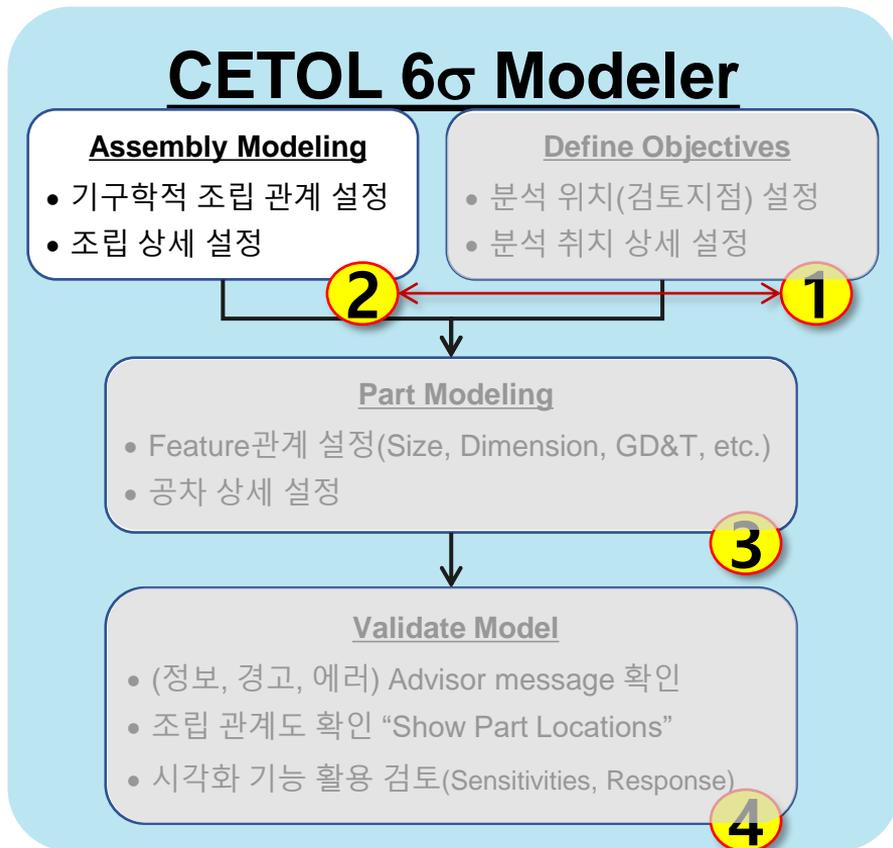
Measure 설정 완료된 모습

Tolerance Analysis Procedure

두번째로

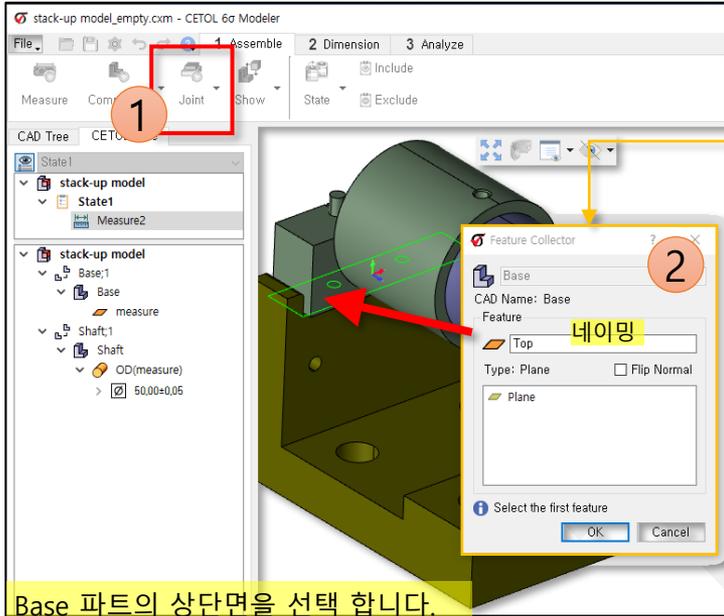
부품간 조립관계(Joint)를
설정 합니다.

- 조립순서(우선순위) 고려
- 자유도 구속



Stack-up Tolerance 따라하기(실습)

- 부품간 조립관계(Joint) 설정하기.

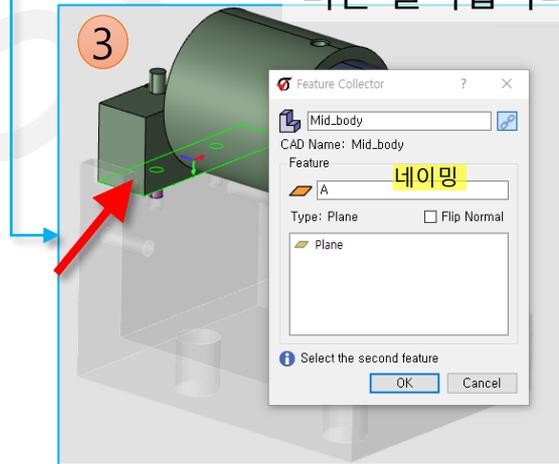


Base 파트의 상단면을 선택 합니다.
(Mid_body와 접촉 되는 면)

1. "Joint"를 클릭 합니다.

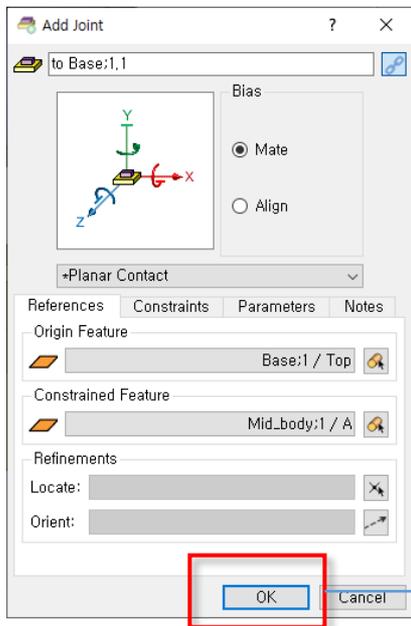
2. 첫번째 팝업(Feature Collector)창에서 Base Part의 상단 feature 선택 후 OK 버튼 클릭합니다.

3. 두번째 팝업(Feature Collector)창에서 1번 block의 하부 feature를 선택 후 OK 버튼 클릭합니다.

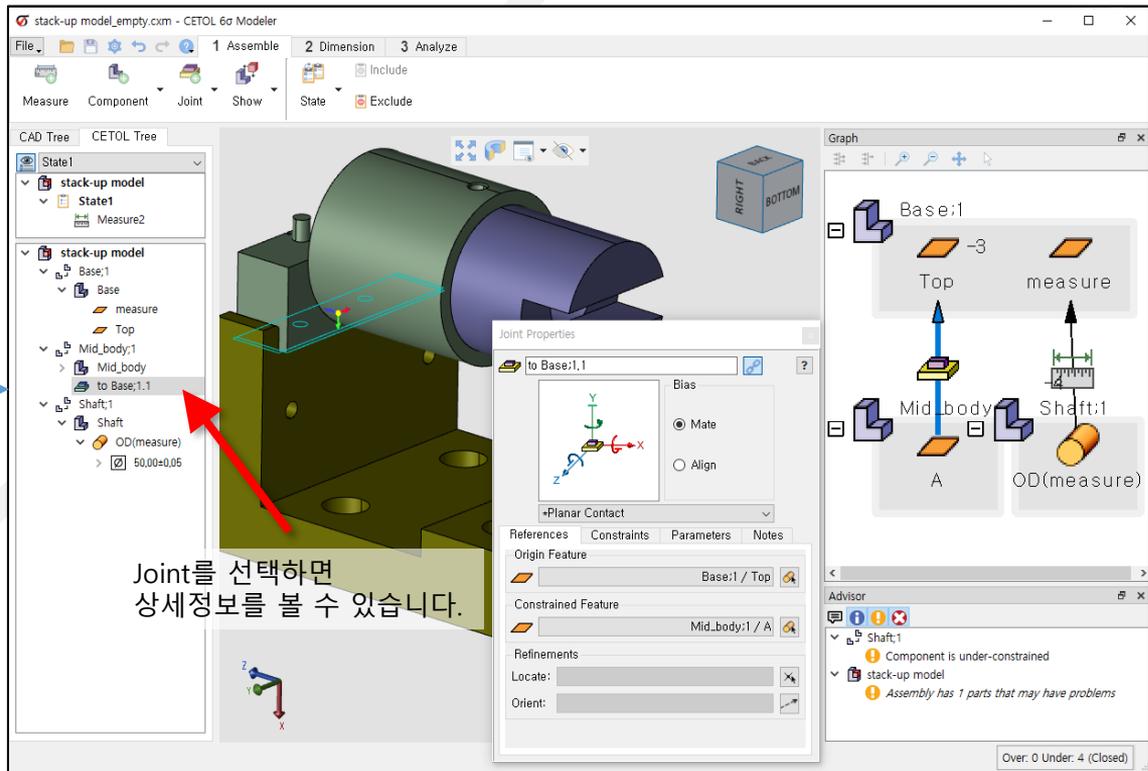


Stack-up Tolerance 따라하기(실습)

- 부품간 조립관계(Joint) 설정하기.



Add Joint 팝업창에서 OK버튼을 클릭 합니다.
→ Cancel 누를 시에 Joint설정은 취소 됩니다.

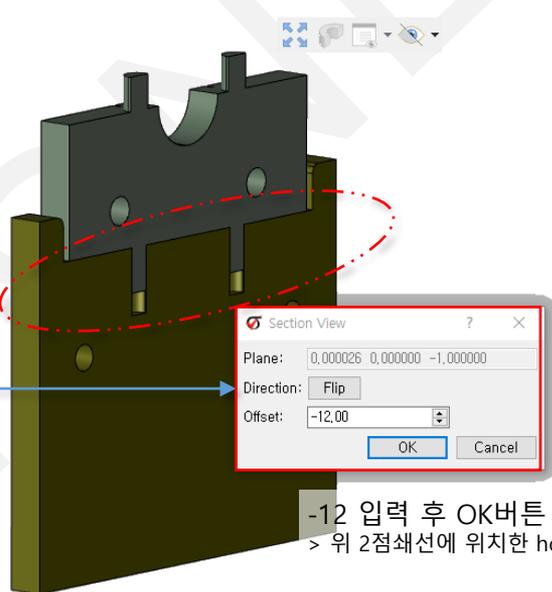
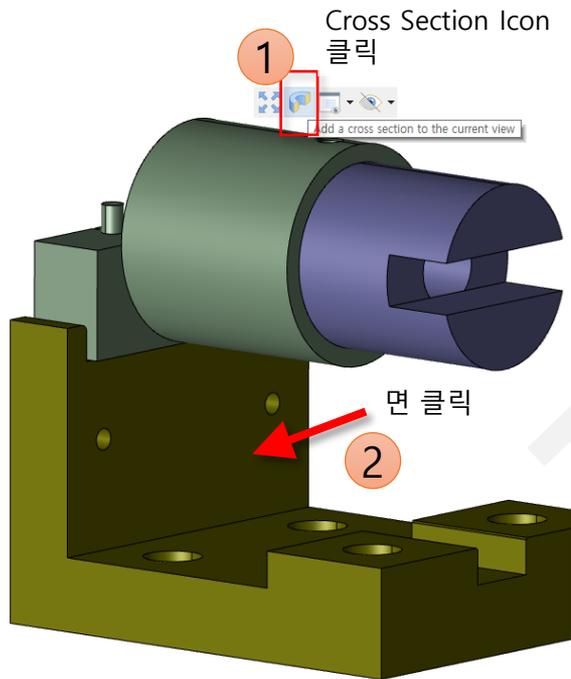


Joint를 선택하면
상세정보를 볼 수 있습니다.

Joint 설정 완료된 모습

Stack-up Tolerance 따라하기(실습)

- 부품간 조립관계(Joint) 설정하기.
 - 수월한 작업을 위해 Section view 진행



Stack-up Tolerance 따라하기(실습)

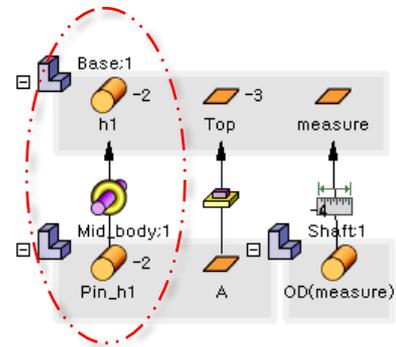
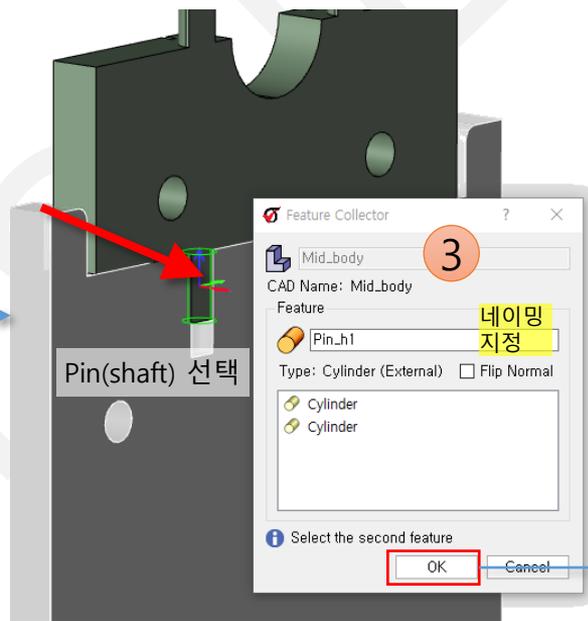
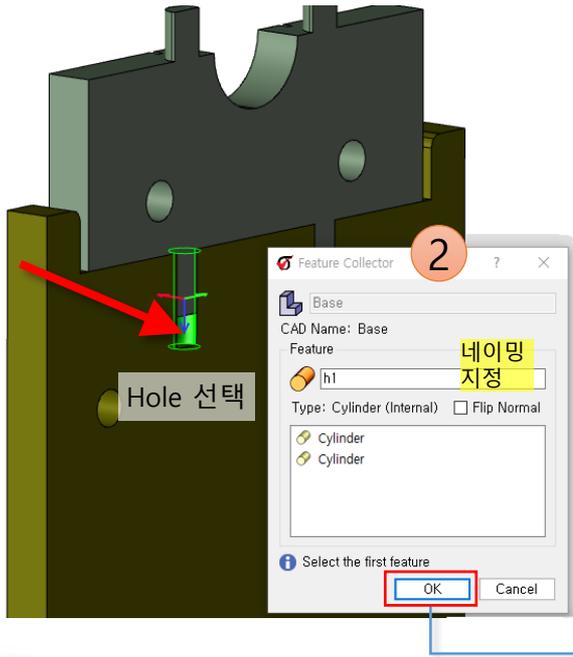
- 부품간 조립관계(Joint) 설정하기.



1

Joint 클릭

Joint

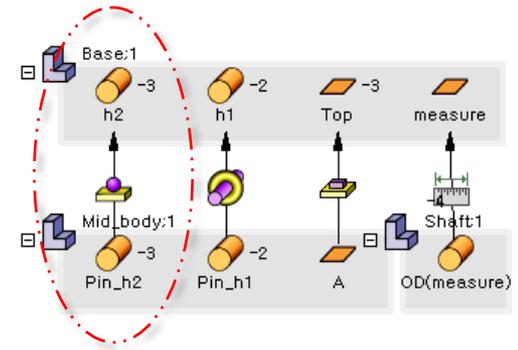
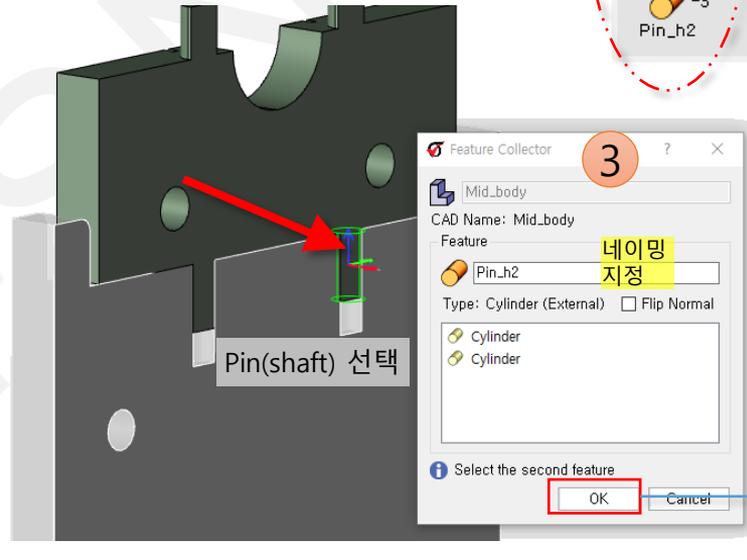
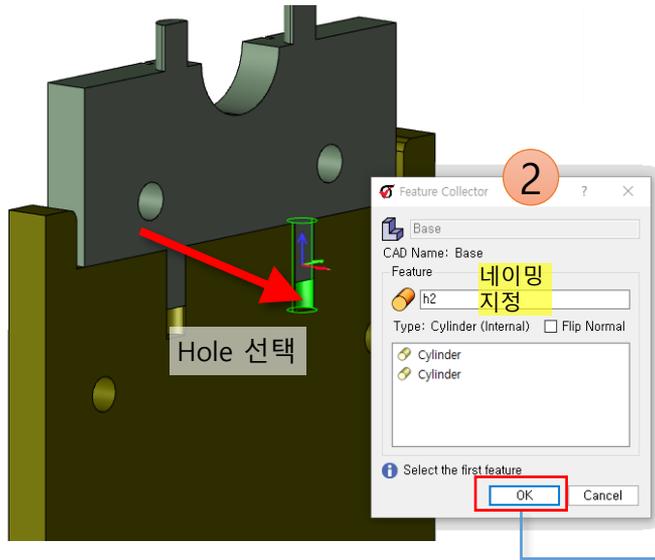


OK버튼 클릭 후
Add Joint 팝업창에서 OK 클릭

Stack-up Tolerance 따라하기(실습)

- 부품간 조립관계(Joint) 설정하기.

 1 Joint 클릭
Joint



OK버튼 클릭 후
Add Joint 팝업창에서
OK 클릭



작업 완료 후
선택 해제

Stack-up Tolerance 따라하기(실습)

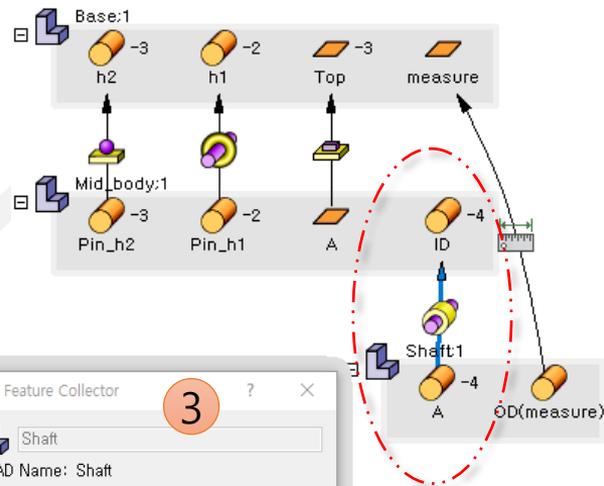
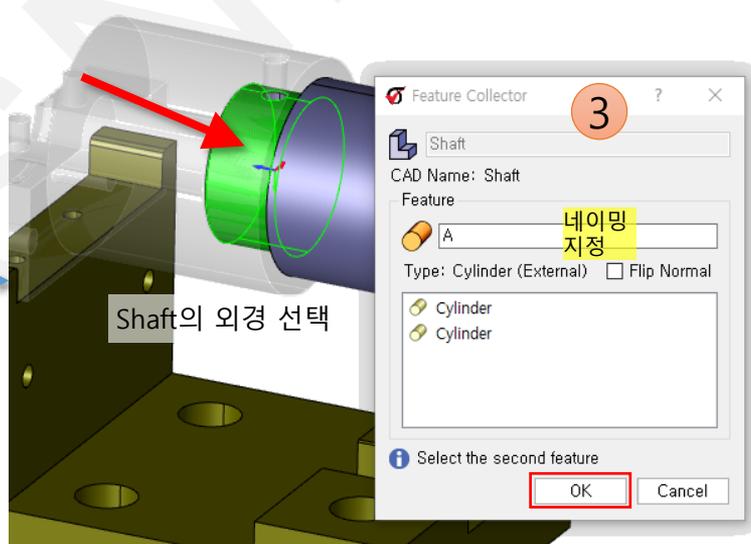
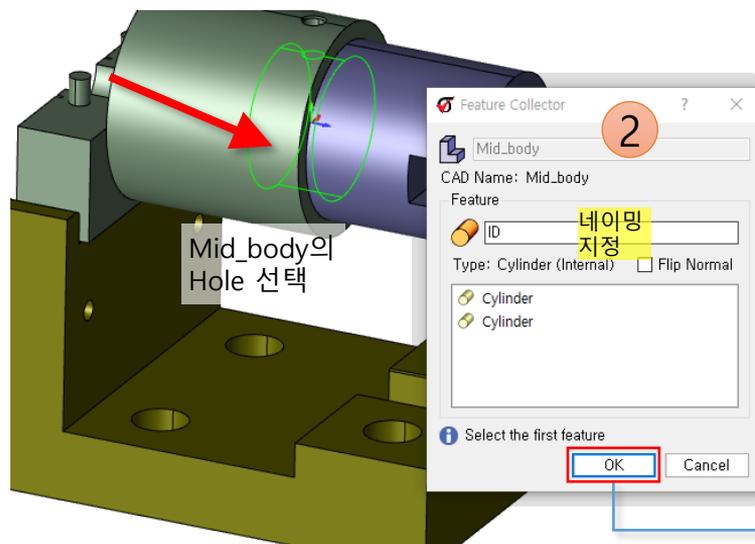
- 부품간 조립관계(Joint) 설정하기.



1

Joint 클릭

Joint

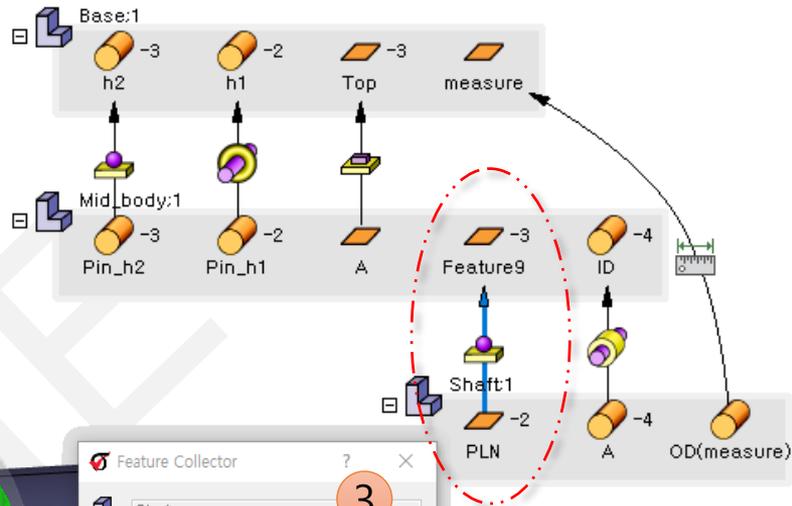
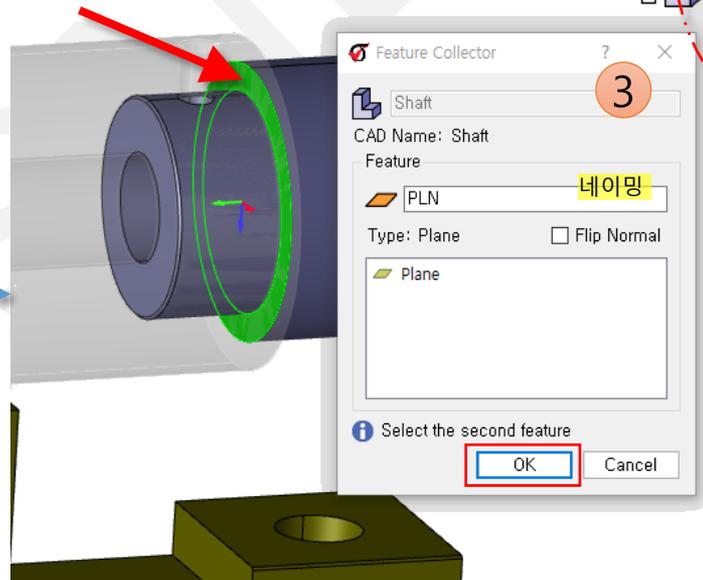
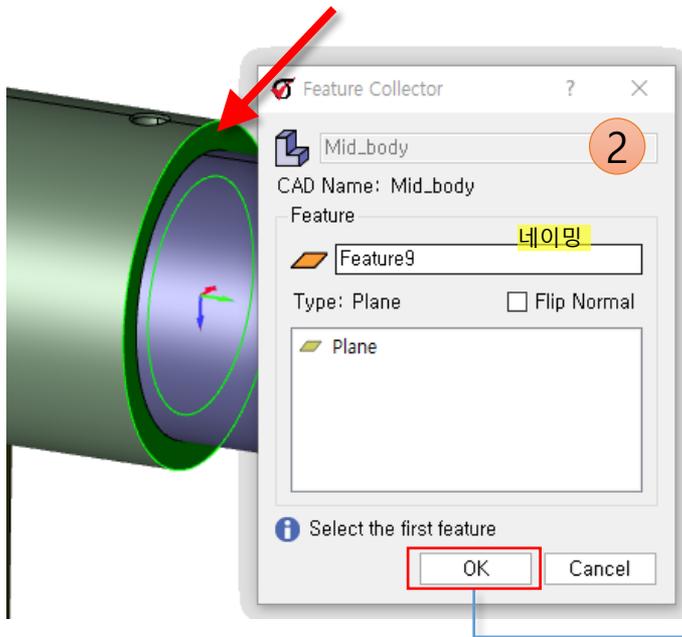


Stack-up Tolerance 따라하기(실습)

- 부품간 조립관계(Joint) 설정하기.

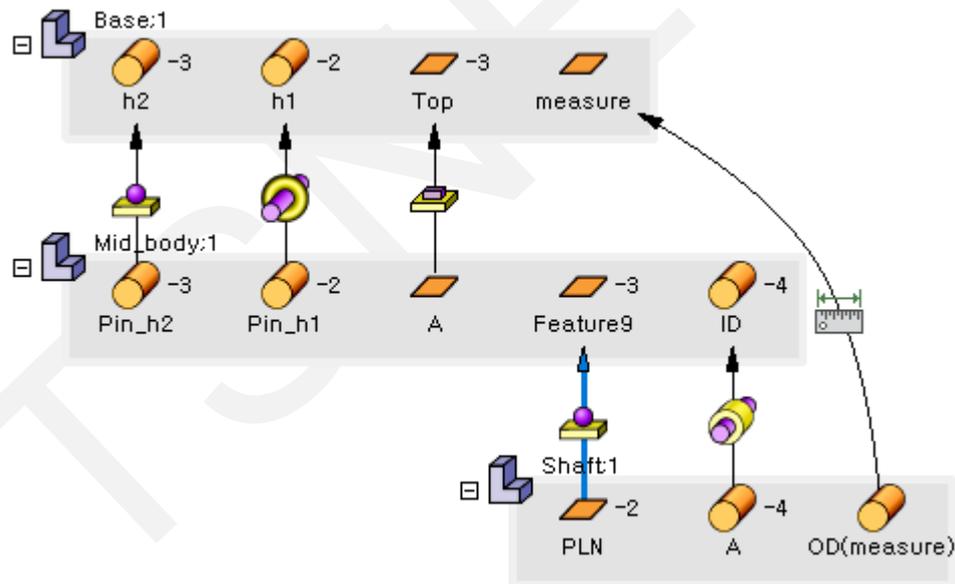
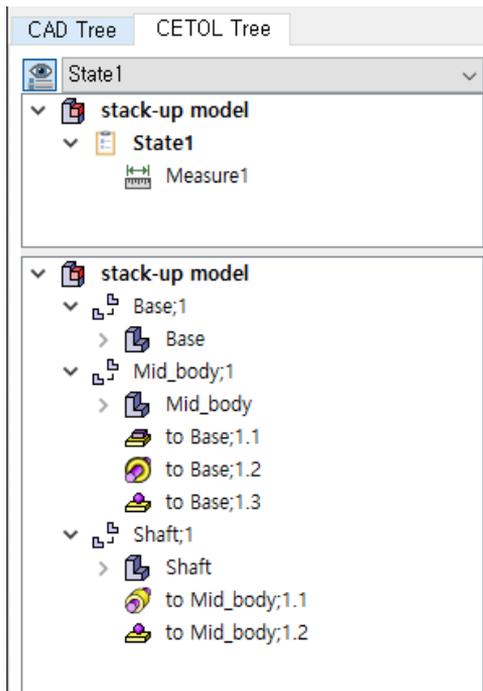
1 Joint 클릭

Joint



Stack-up Tolerance 따라하기(실습)

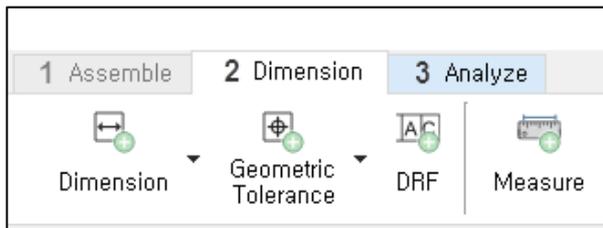
- 부품간 조립관계(Joint) 설정하기.
→ Measure 및 조립관계 완료된 모습



Stack-up Tolerance 따라하기(실습)

- 부품간 조립관계(Joint) 설정하기.

Tolerance Analysis Procedure



- Part 및 Feature 순서 고려하여, 각 Feature의 사이즈공차 및 위치치수(GD&T)정보를 입력 합니다.
- Exam1, 2번 모델을 선행하였다면, 다음의 슬라이드의 화면을 참조하여 작업을 진행하며
- 기본 사용법 숙지가 미흡하다면, 따라하기 영상을 참조하여 작업을 진행 합니다.

CETOL 6 σ Modeler

Assembly Modeling

- 기구학적 조립 관계 설정
- 조립 상세 설정

Define Objectives

- 분석 위치(검토지점) 설정
- 분석 취치 상세 설정

2

1

Part Modeling

- Feature관계 설정(Size, Dimension, GD&T, etc.)
- 공차 상세 설정

3

Validate Model

- (정보, 경고, 에러) Advisor message 확인
- 조립 관계도 확인 "Show Part Locations"
- 시각화 기능 활용 검토(Sensitivities, Response)

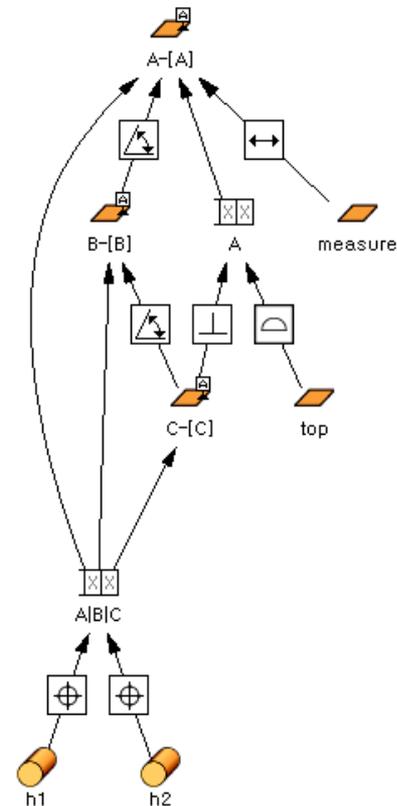
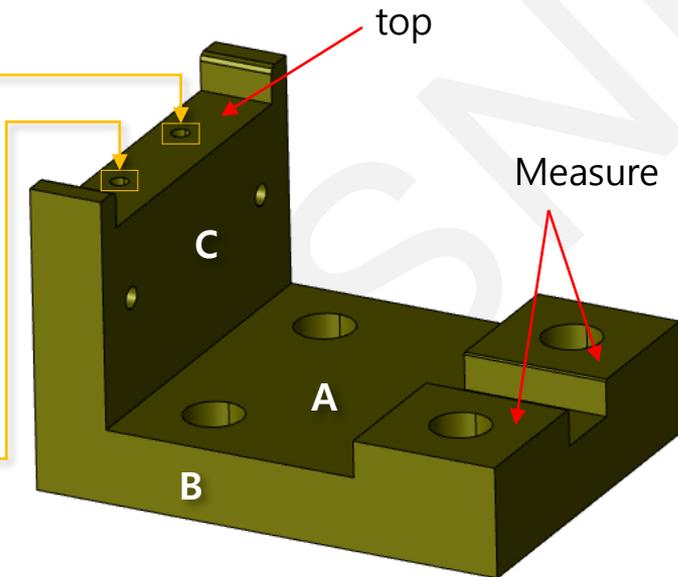
4

Stack-up Tolerance 따라하기(실습)

- 부품간 조립관계(Joint) 설정하기.

Base

- A [A]
- [A]
- B [B]
- 90,0
- C [C]
- [0,1] A
- 90,0
- [A] [B] [C]
- measure
- 10,00±0,20
- top
- [0,1] A
- h1
- 5,00±0,10
- ⊕ [0,1] A B C
- h2
- 5,00±0,10
- ⊕ [0,1] A B C



Stack-up Tolerance 따라하기(실습)

- 부품간 조립관계(Joint) 설정하기.

Mid_body

A [A]

[A]

B [B]

L [0,1] A

[A] B

[B]

C [C]

$\varnothing 20,00 \pm 0,10$

$\varnothing 0,1 [A] B$

[A] B C

Pin_h1

$\varnothing 5,00 \pm 0,05$

$\varnothing 0,1 [A] B C$

Pin_h2

$\varnothing 5,00 \pm 0,05$

$\varnothing 0,1 [A] B C$

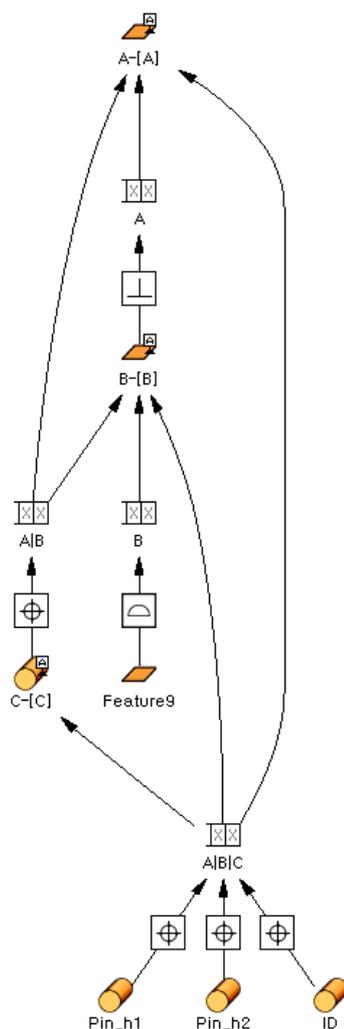
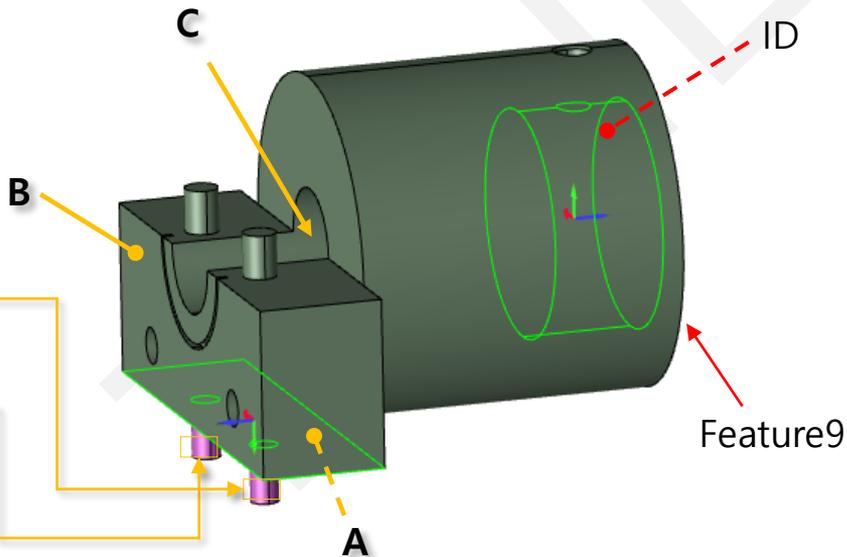
ID

$\varnothing 40,00 \pm 0,05$

$\varnothing 0,15 [A] B C$

Feature9

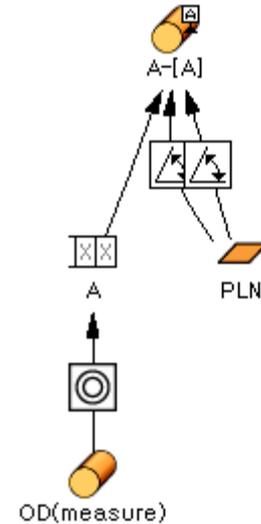
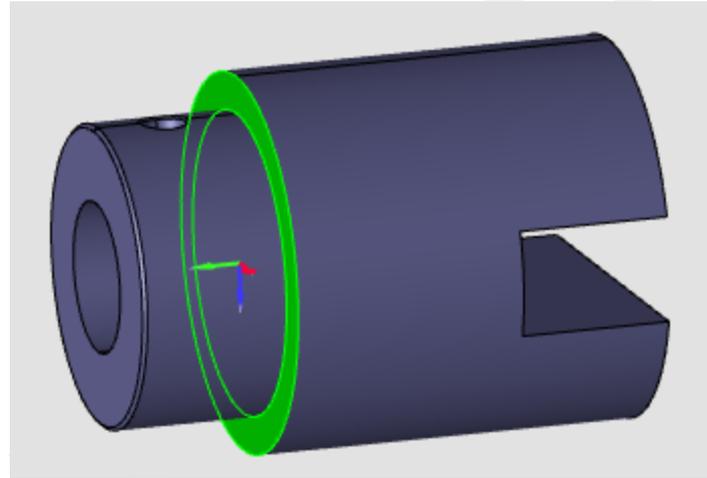
[0,2] B



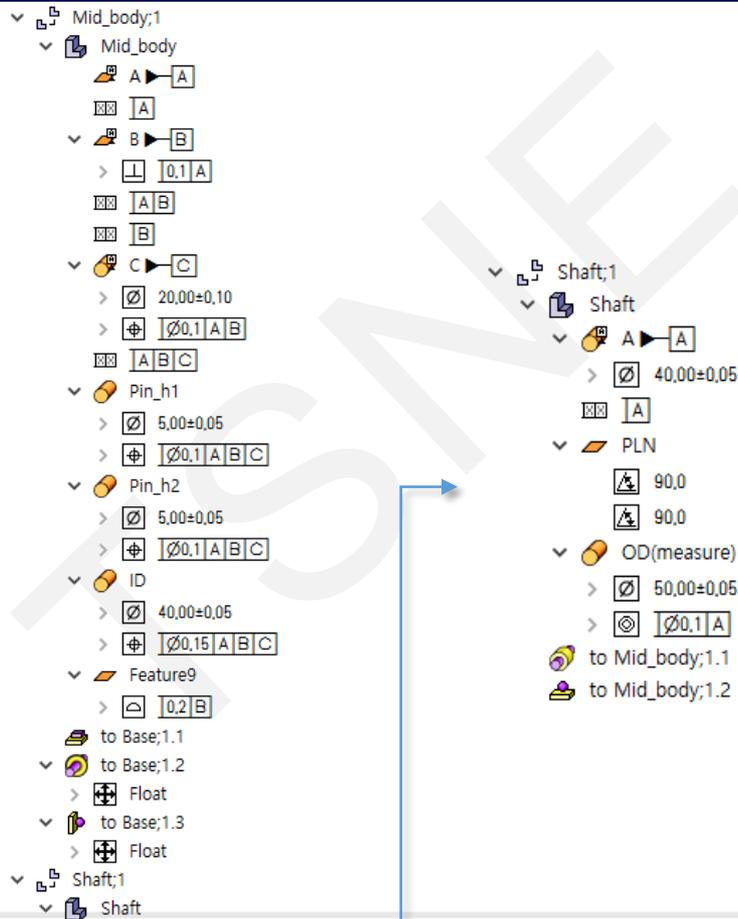
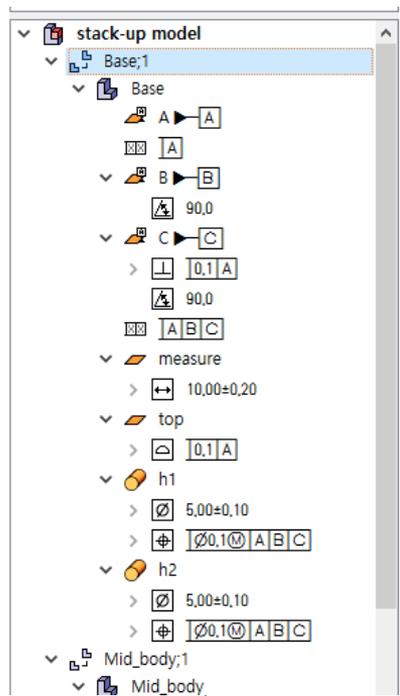
Stack-up Tolerance 따라하기(실습)

- 부품간 조립관계(Joint) 설정하기.

- Shaft
 - A \rightarrow A
 - \varnothing 40,00 \pm 0,05
 - PLN
 - 90,0
 - 90,0
 - OD(measure)
 - \varnothing 50,00 \pm 0,05
 - \varnothing 0,1 A

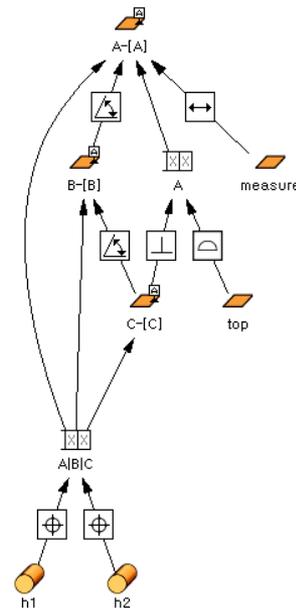
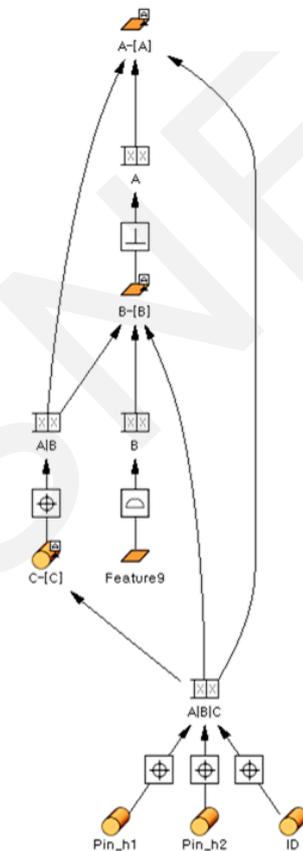
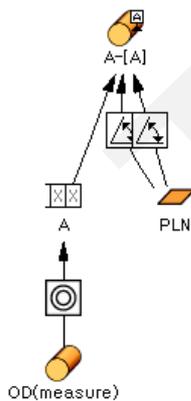
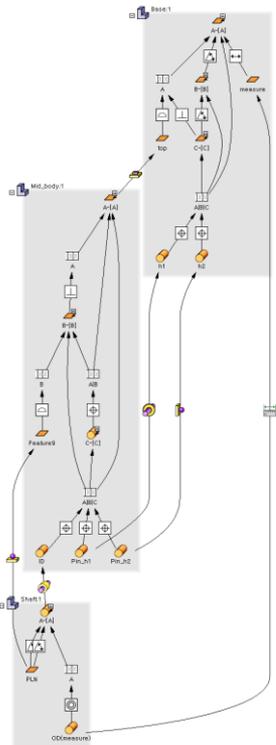


Stack-up Tolerance 따라하기(실습)



Stack-up Tolerance 따라하기(실습)

- 부품간 조립관계(Joint) 설정하기.

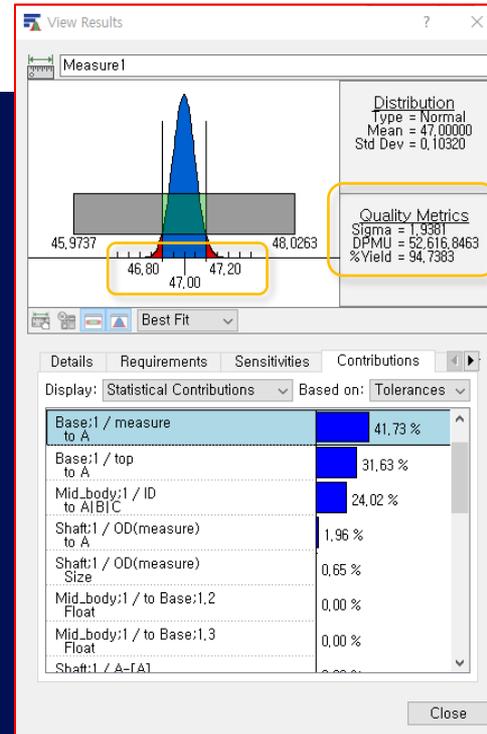


Stack-up Tolerance 따라하기(실습)

• 결과 검토 및 개선 하기

목표범위 (Requirements)

- 47 ± 0.20
- 양품율: 96% 이상



Tolerance Analysis Procedure

CETOL 6 σ Modeler

Assembly Modeling

- 기구학적 조립 관계 설정
- 조립 상세 설정

Define Objectives

- 분석 위치(검토지점) 설정
- 분석 취치 상세 설정

2

1

Part Modeling

- Feature관계 설정(Size, Dimension, GD&T, etc.)
- 공차 상세 설정

3

Validate Model

- (정보, 경고, 에러) Advisor message 확인
- 조립 관계도 확인 "Show Part Locations"
- 시각화 기능 활용 검토(Sensitivities, Response)

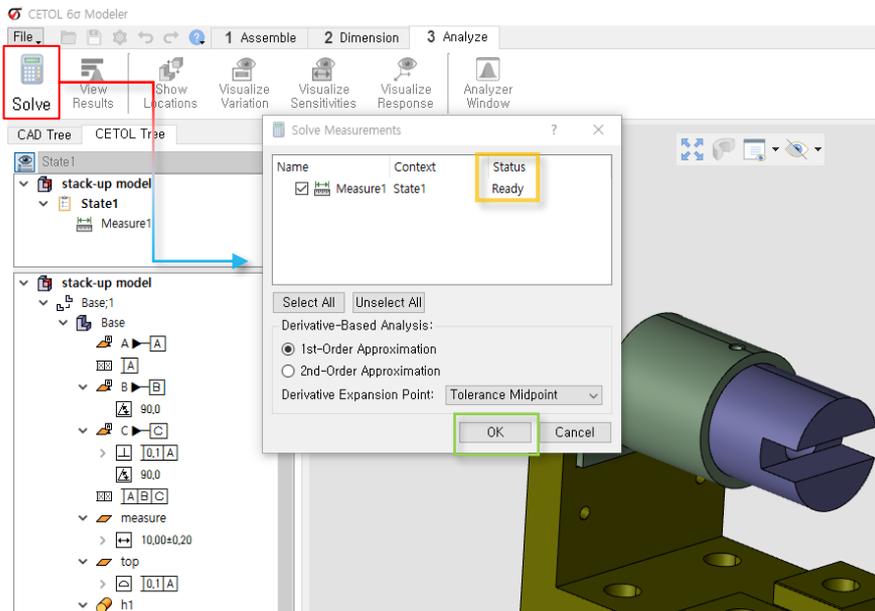
4

네번째는

구성한 모델을 검토하고,
결과확인하고 도면 개선작업을
진행 합니다.

Stack-up Tolerance 따라하기(실습)

• 결과보기



- 3 Analyze 탭에서 Solve버튼을 클릭 합니다.  

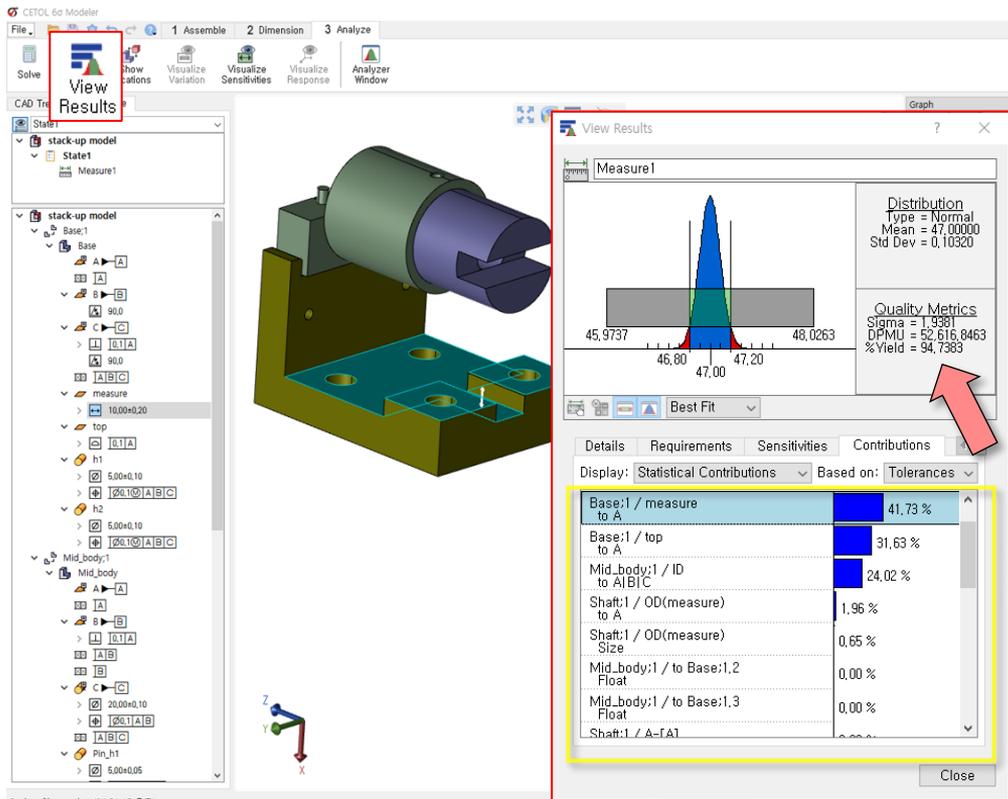
- 모델구성에 문제가 없다면 Status에 "Ready"라는 문자가 표현 합니다.

- 문제가 없다면 팝업창에서 OK 버튼을 클릭 합니다.

- 계산(Solve) 시간은 1초 내외 입니다.

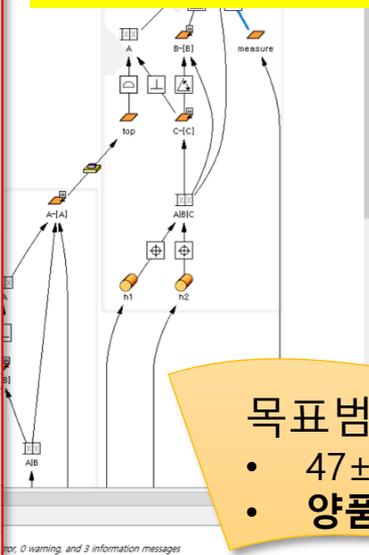
Stack-up Tolerance 따라하기(실습)

결과보기(개선 검토)



측정지점의 품질관리 범위기준으로 양품율을 약 94.7%의 결과로 산출 되었습니다.

목표수준인 96% ↑ 으로 맞추기 위해서 기여도 항목을 조정해 보세요.



목표범위 (Requirements)

- 47 ± 0.20
- 양품율: 96% 이상

Technical Support of 3D Tolerance Analysis



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