Workshop: Parameters and Associativity

Release 2021 R2

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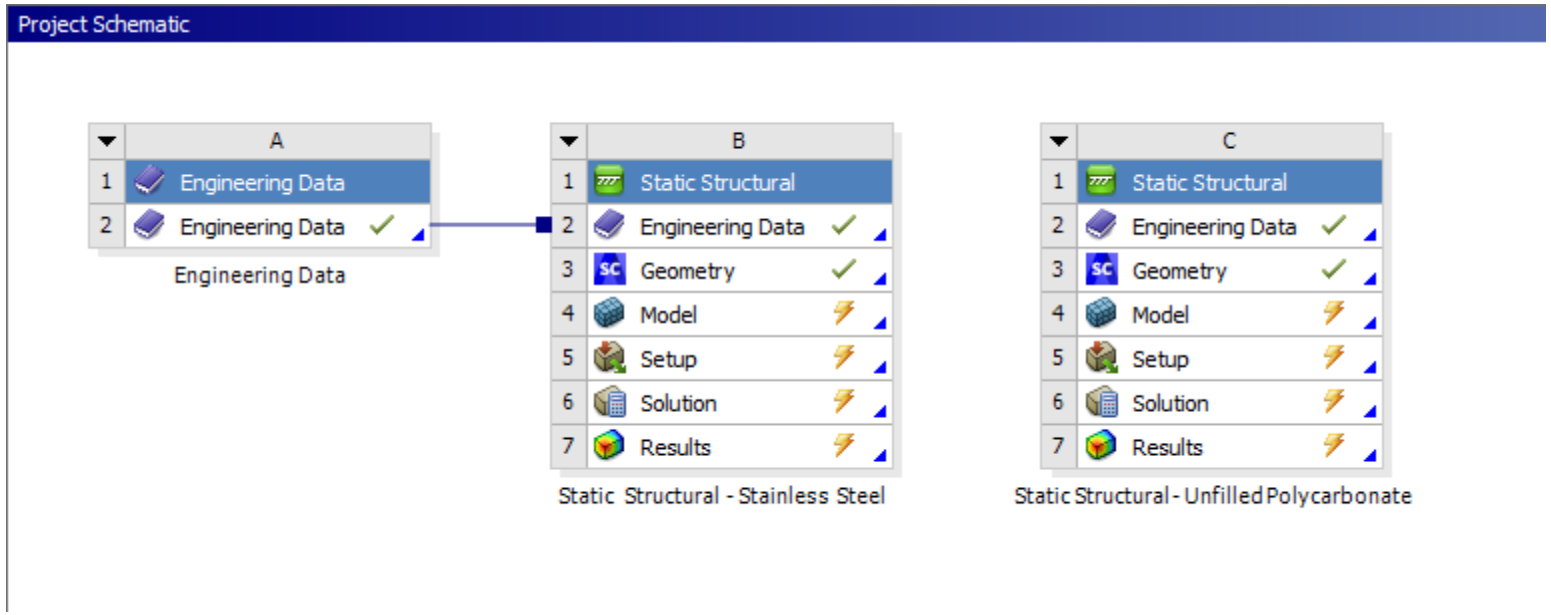
Workshop: Parameters and Associativity

Use this guide to work on the Journal Bearing model.



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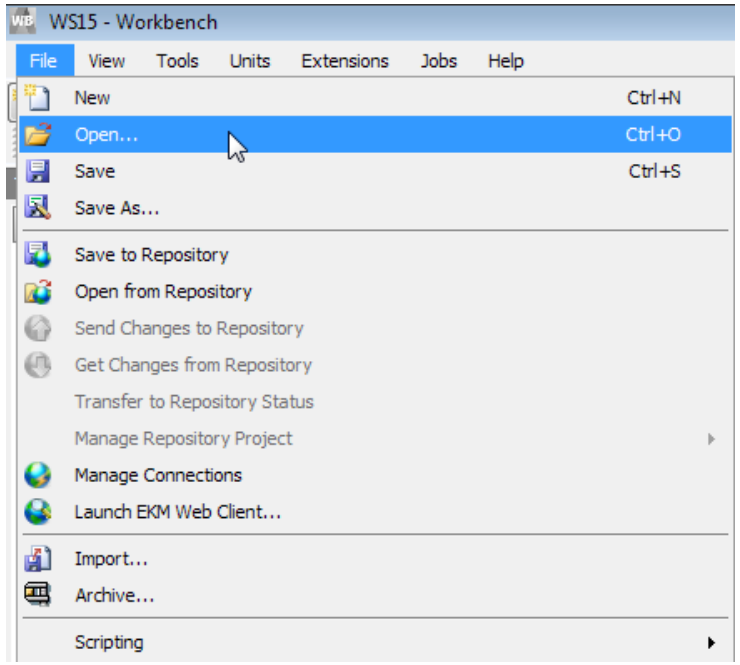
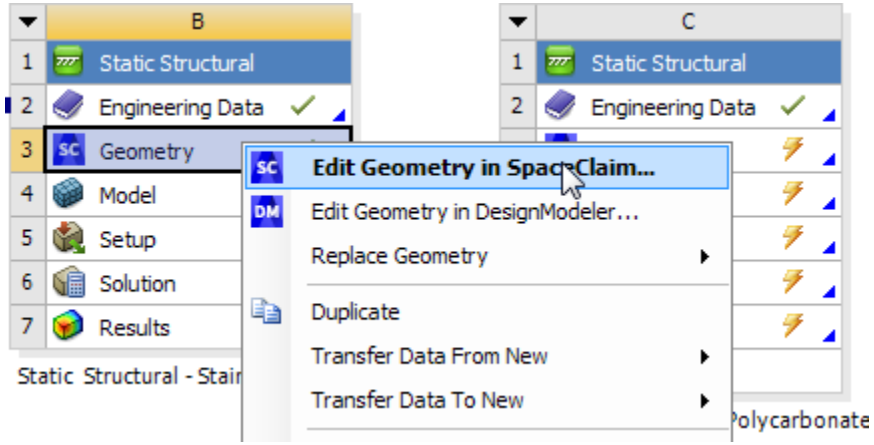
- Open **Archive:** “Shaft_Bearings_WS15_Start.wbpz”
- Edit the Geometry in Cell B3 in SpaceClaim





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We've concluded that Unfilled Polycarbonate cannot replace Stainless Steel for the Housings since the shaft misalignment increases too much to satisfy the design conditions.

The conveyor design you've analyzed is not the only one in the factory. There are many others at different stages of the production. You are now asked to check if the use of Unfilled Polycarbonate can be considered for some of the other conveyor designs.

The designs of the other conveyors are provided, as well as the computed misalignment values for the use of Stainless Steel for each case.

We'll assume the displacement vectors to be in the same direction for both ends of the shaft for this investigation.

To reduce solution time, we'll use a coarser mesh in this Workshop. The analysis model is still nonlinear, however, so it will likely take a minimum of 40 minutes to solve all four Design Points.

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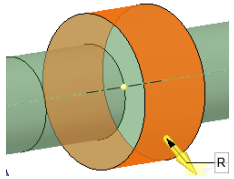
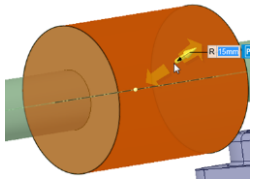
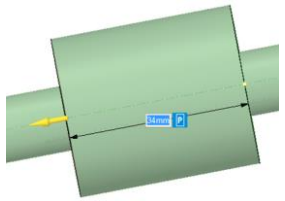
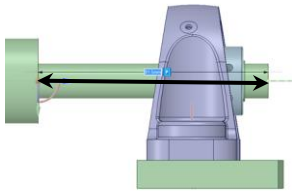
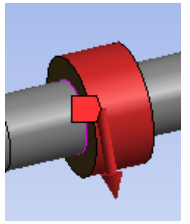
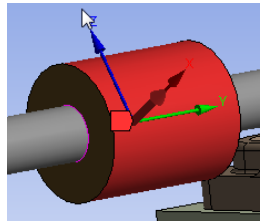
Other conveyor designs:

	Pulley A Diameter (smaller pulley), mm	Pulley B Diameter (bigger pulley), mm	Length of Pulley B, mm	Distance from Pulley B to end of Shaft, mm	Force due to belt for motor transmission (along global Z), N	Force due to conveyor belt (orientation remains 30°), N
Current Design	20	30	49.82	81.15	-2000	2500
Conveyor A	18	24	34	81.15	-1725	1120
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Conveyor C	14	30	49	81.15	-1000	1500

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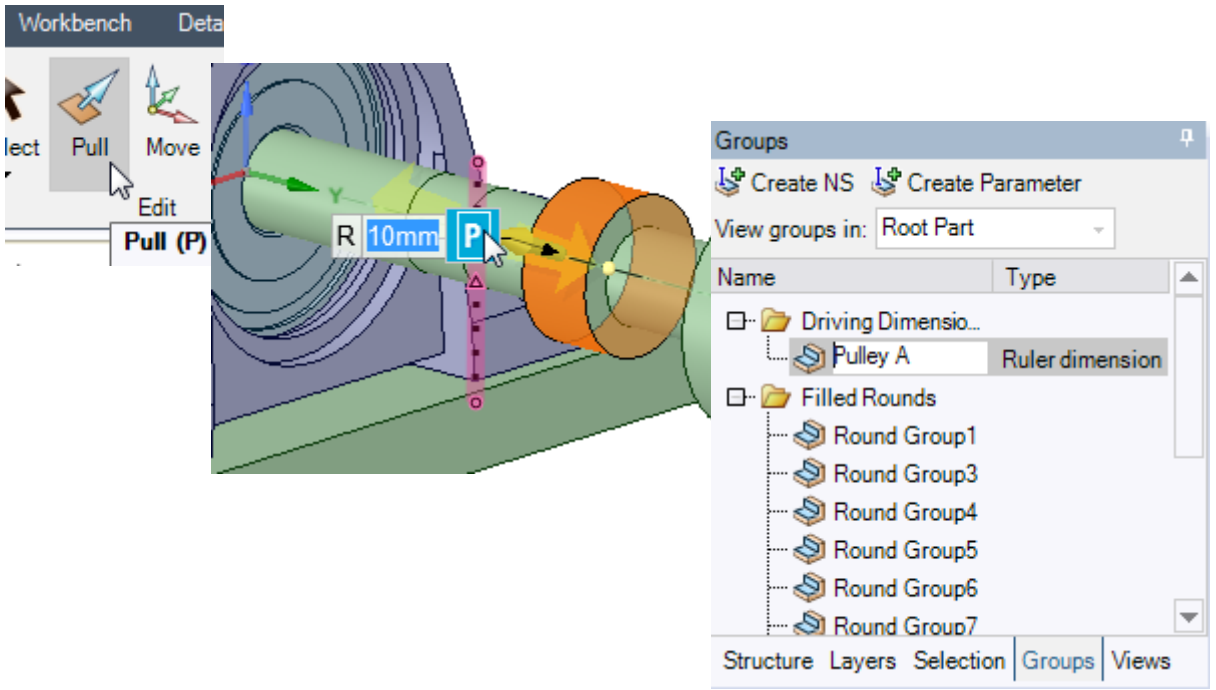
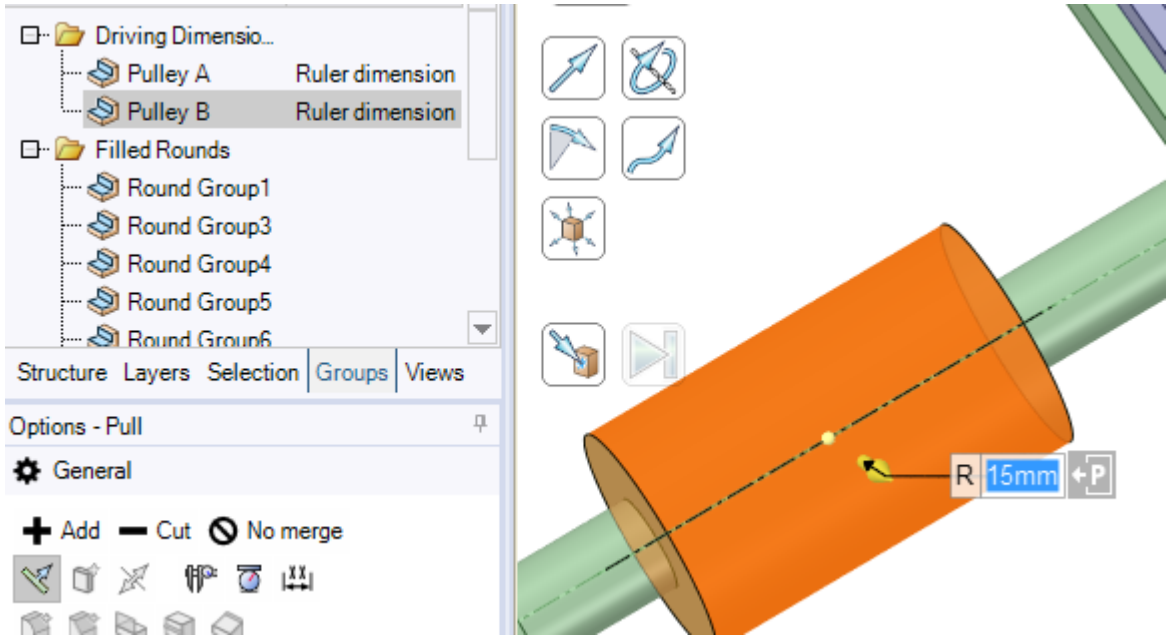
Parameterize a radius in SpaceClaim: Use the Pull tool, click on the face for which you want to parameterize the radius and click on the ‘P’ button. Select the smallest pulley first.

See the driving dimension in the **Groups** tab and rename it as you like.

Repeat for the larger pulley.





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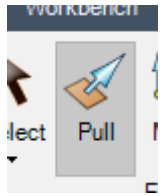
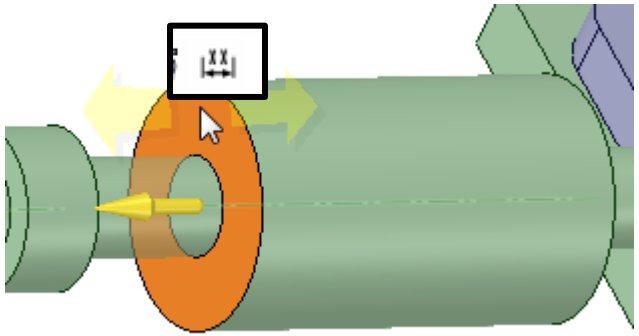
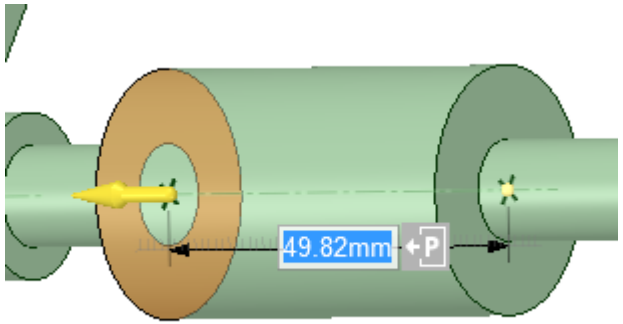
Parameterize the pulley <u>length</u> in SpaceClaim: Use the **Pull** tool, select the face you want to move (the extension will be done on this side of the pulley). Use the **Ruler** button and select the opposite face as the reference. Click on the **'P'** button to define the driving dimension. Rename the Group as you like.







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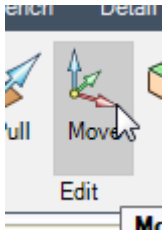
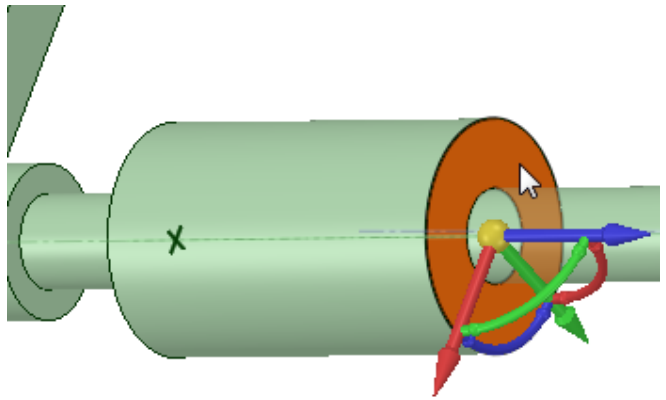
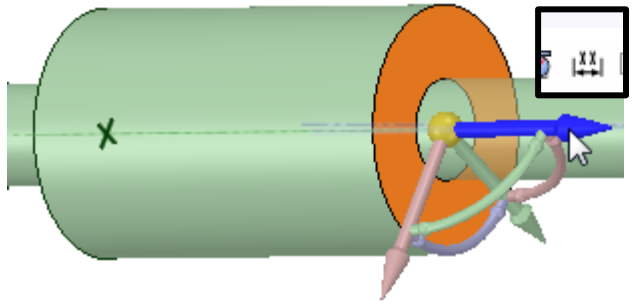
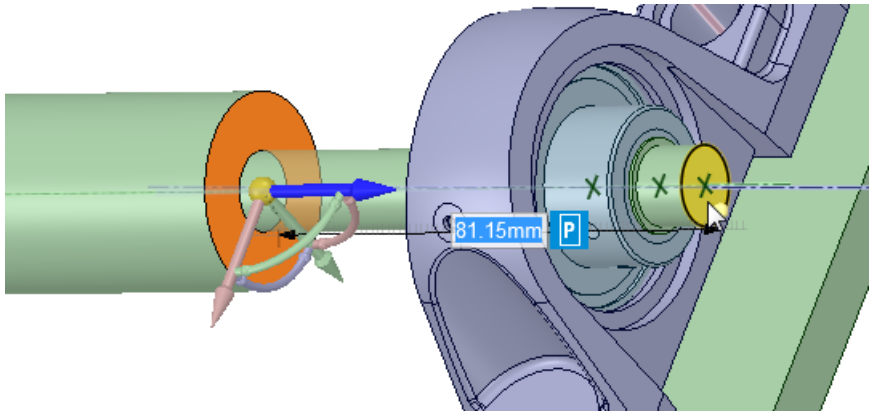
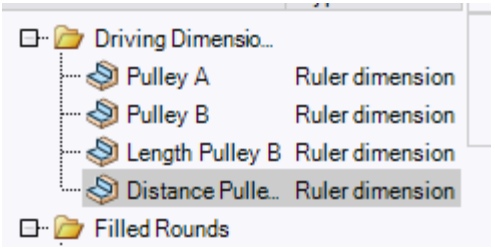
Parameterize a distance in SpaceClaim: Use the Move tool. Select the face to move, select the move direction, select the ruler tool and put the reference at the desired location, the end of the shaft. Click on the **'P'** button to define the driving dimension and rename the Group as you like.











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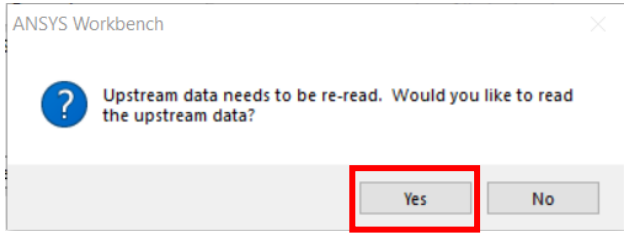
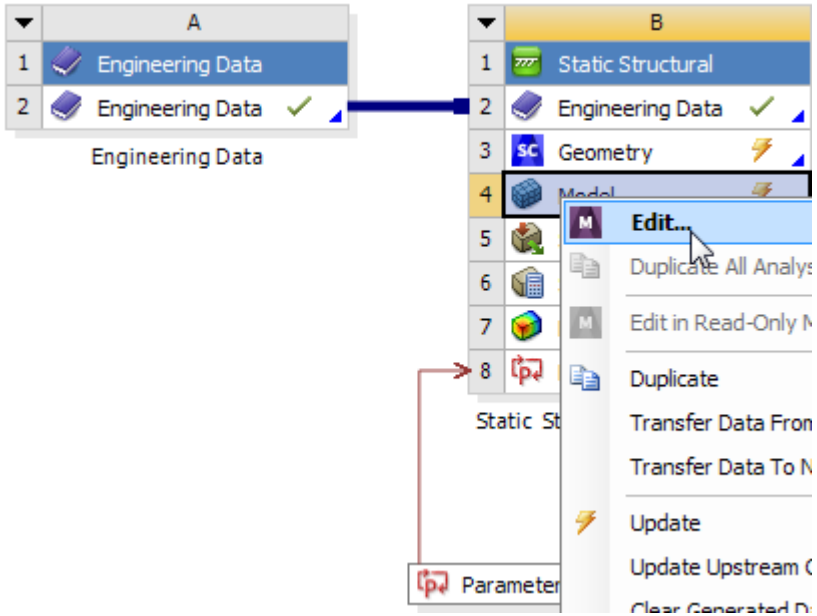
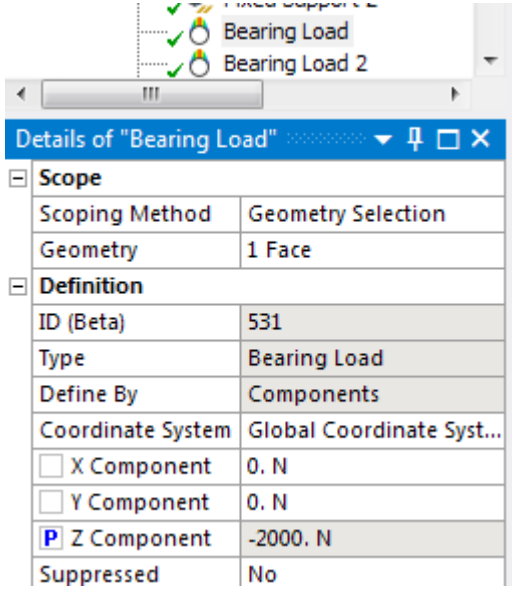
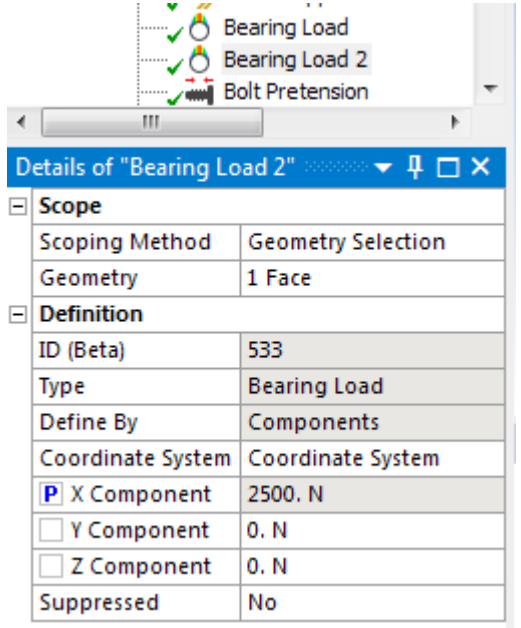
Open Mechanical from cell B4 on the Project page and accept the prompt to re-read upstream data.



In Mechanical, **Parameterize** the magnitudes of both **Bearing Loads**.







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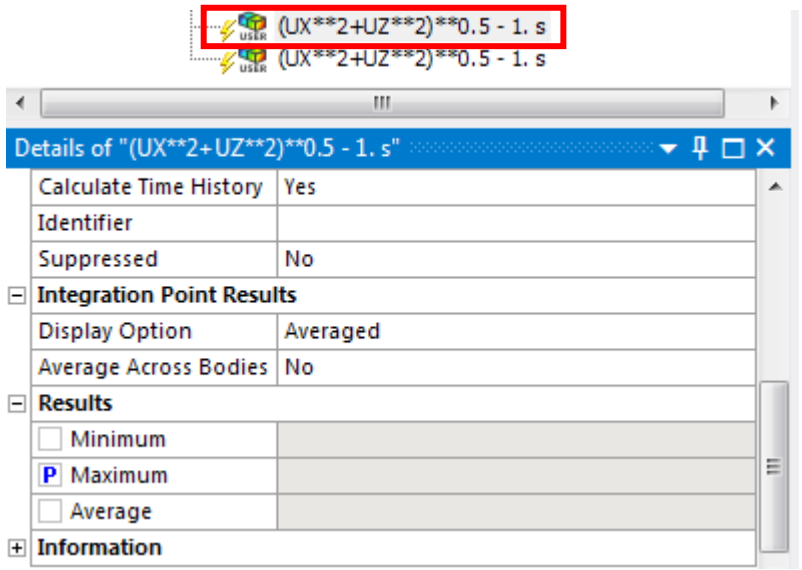
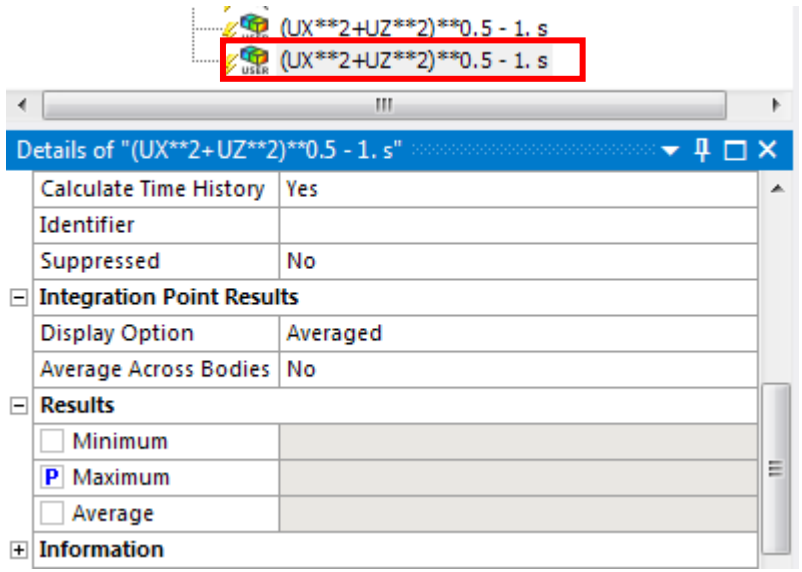
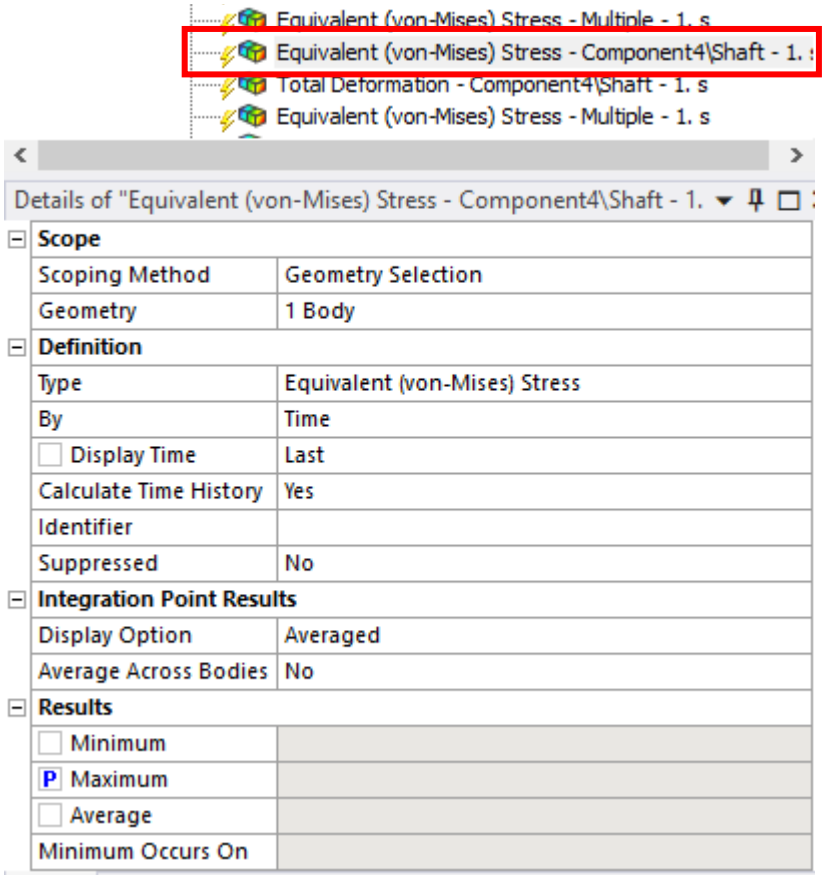
Parameterize the maxima of the user defined results as output parameters.

Parameterize the maximum equivalent stress in the Shaft component as an output parameter.







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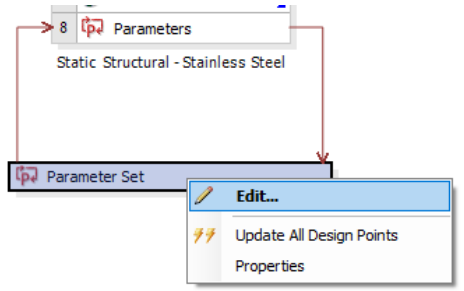

Edit the Parameter Set

Add a new output parameter compute to the misalignment:

- Click on the **New expression** cell for output parameters
  - Type **P7–P8** (or whatever respective IDs are shown in Column A for the User Defined Results)
  - **Rename** the parameter to ‘Misalignment’

Outline of All Parameters

	A	B	C	D
1	ID	Parameter Name	Value	Unit
2	Input Parameters			
3	Static Structural - Stainless Steel (B1)			
4	P1	Pulley A	10	mm
5	P2	Pulley B	15	mm
6	P3	Length Pulley B	49.82	mm
7	P4	Distance Pulley B	81.15	mm
8	P5	Bearing Load Z Component	-2000	N
9	P6	Bearing Load 2 X Component	2500	N
*	New input parameter	New name	New expression	
11	Output Parameters			
12	Static Structural - Stainless Steel (B1)			
13	P7	(UX**2+UZ**2)**0.5 - 1. s Maximum		
14	P8	(UX**2+UZ**2)**0.5 - 1. s Maximum		
15	P9	Equivalent (von-Mises) Stress - Component4 \Shaft - 1. s Maximum		MPa
*	New output parameter		New expression	
17	Charts			

Outline of All Parameters

	A	B	C	D
1	ID	Parameter Name	Value	Unit
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*	New input parameter	New name	New expression	
11	Output Parameters			
12	Static Structural - Stainless Steel (B1)			
13	P7	(UX**2+UZ**2)**0.5 - 1. s Maximum		
14	P8	(UX**2+UZ**2)**0.5 - 1. s Maximum		
15	P9	Equivalent (von-Mises) Stress - Component4 \Shaft - 1. s Maximum		MPa
16	P10	Misalignment		
*	New output parameter		New expression	
18	Charts			

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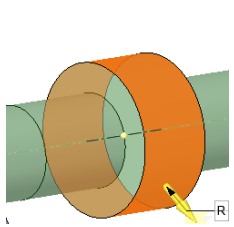
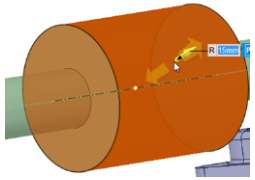
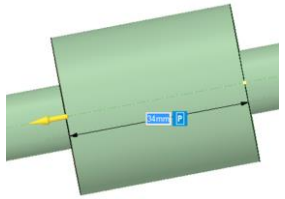
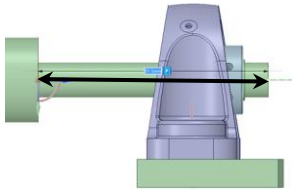
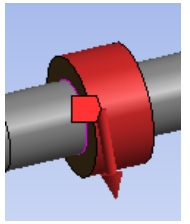
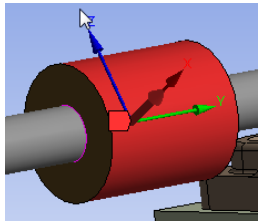
Create a Table of Design Points using the data below.

Note: **Diameters** are given in the table below but the SpaceClaim parameters are **Radii.**

	Pulley A Diameter (smaller pulley), mm	Pulley B Diameter (bigger pulley), mm	Length of Pulley B, mm	Distance from Pulley B to end of Shaft, mm	Force due to belt for motor transmission (along global Z), N	Force due to conveyor belt (orientation remains 30°), N
Current Design	20	30	49.82	81.15	-2000	2500
Conveyor A	18	24	34	81.15	-1725	1120
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Conveyor C	14	30	49	81.15	-1000	1500

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The Table of Design points should look like this:

Table of Design Points

	A	B	C	D	E	F	G	
1	Name	P1 - Pulley A	P2 - Pulley B	P3 - Length Pulley B	P4 - Distance Pulley B	P5 - Bearing Load Z Component	P6 - Bearing Load 2 X Component	P7 - (UX**2+U
2	Units	mm	mm	mm	mm	N	N	
3	DP 0 (Current)	10	15	49.82	81.15	-2000	2500	
4	DP 1	9	12	34	81.15	-1725	1120	
5	DP 2	8	14	34	81.15	-1510	2120	
6	DP 3	7	15	49	81.15	-1000	1500	
*								

Update All Design Points

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When complete, this design point solution will yield results for Stainless Steel:

	STAINLESS STEEL	
	Misalignment (mm)	Maximum Equivalent Stress in Shaft (MPa)
Current Design	0.012	236.1
Conveyor A	−0.001	166.4
Conveyor B	0.016	208.5
Conveyor C	0.009	137.5

What's the best way to transfer the **SpaceClaim Parameters** to the **Polycarbonate** design in **Analysis System C** of the Project? Repeat the analysis on the Polycarbonate design to determine if there any conveyors for which Unfilled Polycarbonate material can replace Stainless Steel in the housings.

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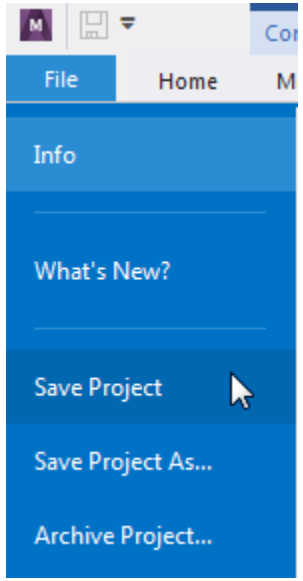
Save Project for use later if desired.



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