



# Autodesk Inventor\* Design Accelerator: Tolerance Calculator

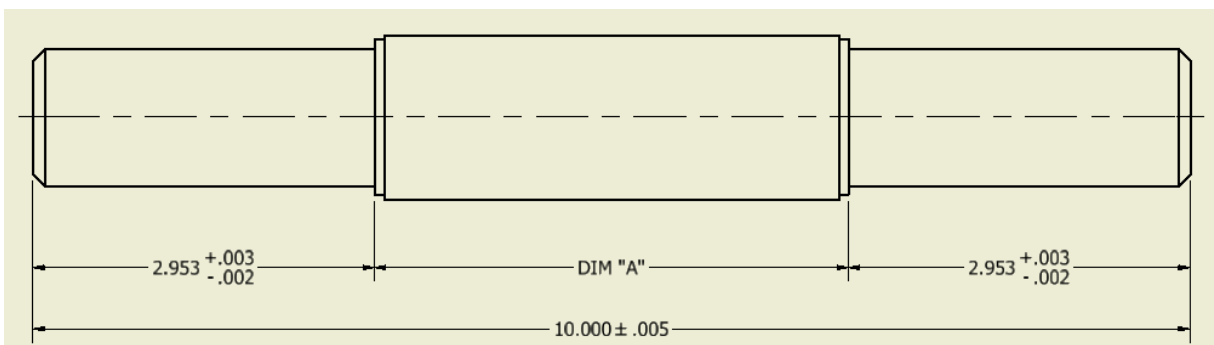
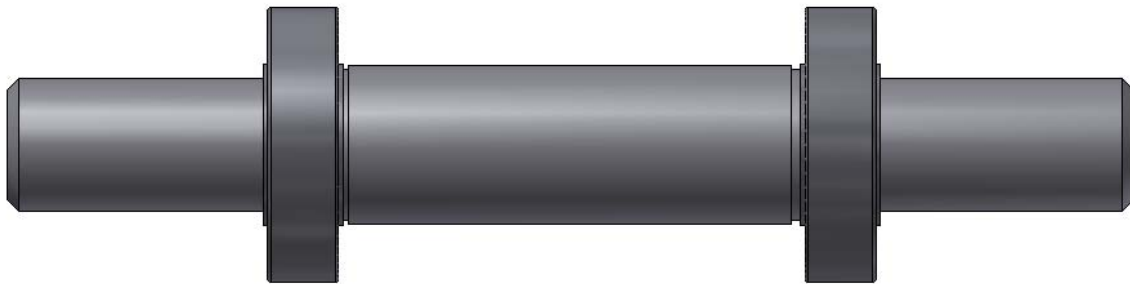
Robert Reid

The "Tolerance Calculator" helps the end user to perform calculations of closed linear dimension chains within the Part environment, or the Assembly environment. The calculator can work in the following two basic modes:

- Calculation of the resulting dimension including tolerances (check calculation):  
Performs a check verifying correctness of design dimensions
- Calculation of tolerances of the closing chain element (design calculation)

In the following example, we will look at a simple shaft made up of 3 sections.

The 2 end journals are machined for positioning of bearings to be press-fitted up against the journals:



\*This paper will work for either Autodesk Inventor® 2012 or 2013.

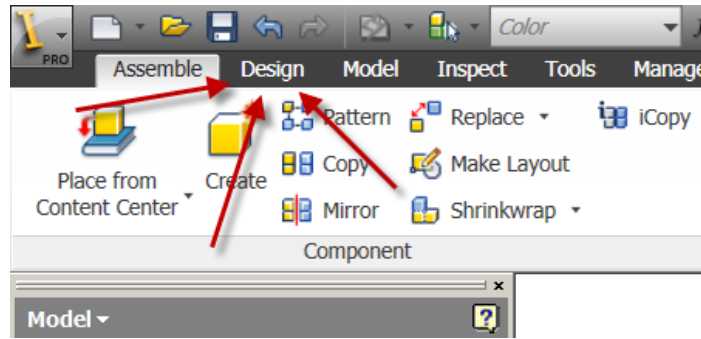


# Design Accelerator: Tolerance Calculator

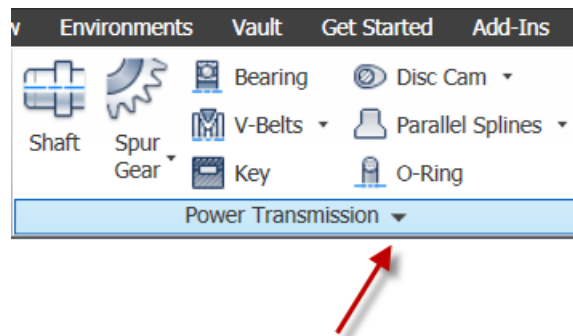
Using the “Tolerance Calculator” Tool, we want to find the Dimension and Tolerances of DIM “A” to ensure our bearing housings are located correctly.

To access the “Tolerance Calculator”:

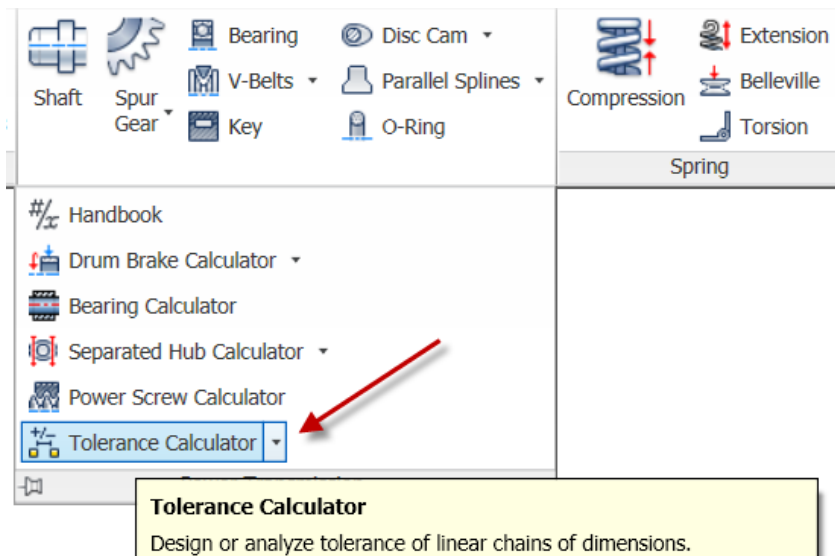
In the Assembly environment, click the Design Tab:



Click the black down arrow on the Power Transmission Panel:

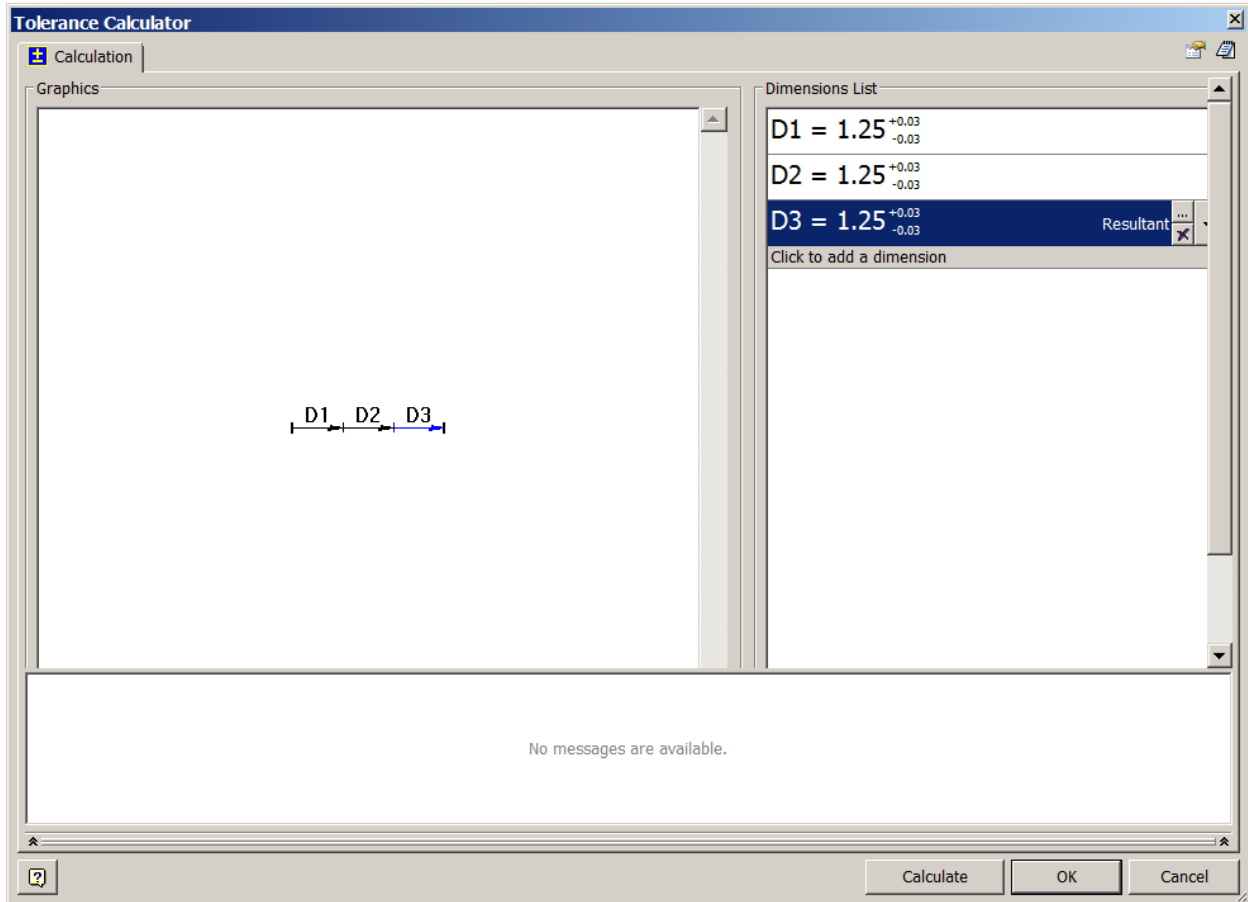


Click on “Tolerance Calculator”:





# Design Accelerator: Tolerance Calculator



The above screen-shot represents the “default” each time the dialogue is opened.

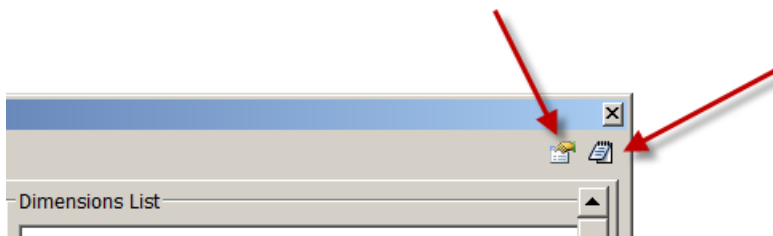
The **Graphics area** represents the number of shaft segments to analyze.

The **Dimensions List** will represent the tolerances for each shaft segment

The Upper Right Hand Corner has 2 icons:

## File Naming

## Results



**File Naming** is to give you a choice in what you want to name the analysis

**Results** will be an HTM file we will look at later.

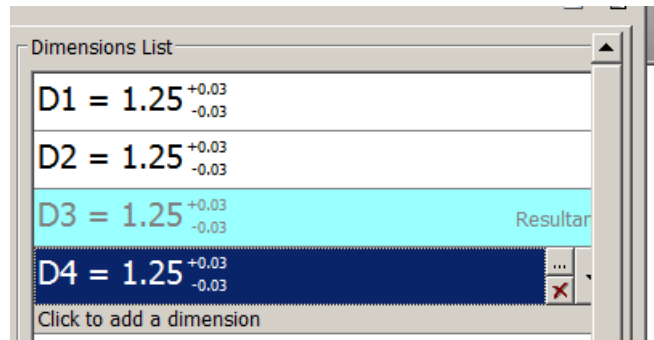


# Design Accelerator: Tolerance Calculator

In my shaft example, I have 3 sections. These will be represented by D1, D2, and D3.


Notice how the Direction arrows are all showing the same direction to the right. At this point I want to add 1 more section which represents the overall shaft length.

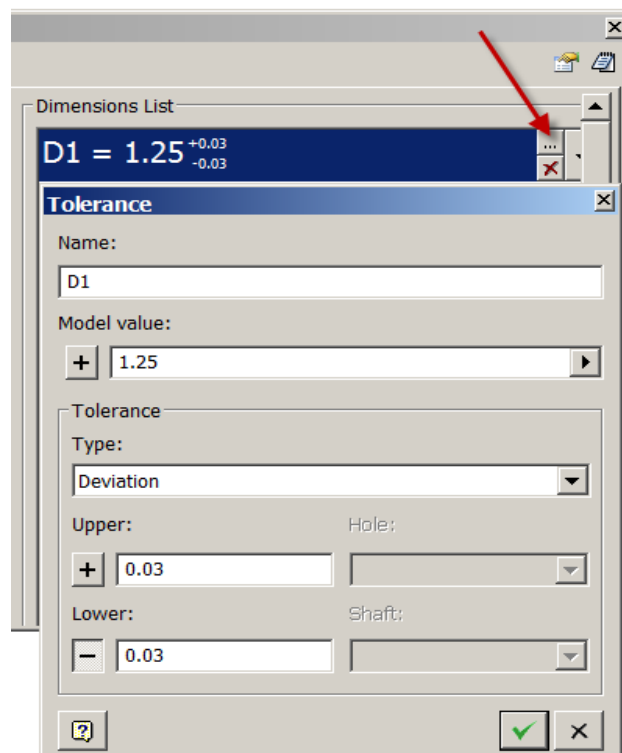
So in the Dimension List section, click on "Click to add dimension"



There are 4 sections to complete the Tolerance Analysis.

Add the tolerance values for each shaft segment.

Click on the  icon to open the Tolerance Dialogue Box:





# Design Accelerator: Tolerance Calculator

Enter all Tolerance Values:

- Add a Name
- Model Value (Note the + Plus Sign, this keep all dimension in the same direction)
- Tolerance Type: Symmetric, Deviation, or Limits/Fits
- Upper and Lower Limits based on Tolerance Type

**Tolerance**

Name:  
D1

Model value:  
+ 2.953

Tolerance  
Type:  
Deviation

Upper: Hole:  
+ 0.003

Lower: Shaft:  
+ 0

Help OK Cancel

Click the Green Check Mark to accept

The Black Down Arrow will let you choose what type of dimension it will be:

Dimensions List

D1 = 2.953 <sup>+0.003</sup><sub>-0.002</sub>

D2 = 1.25 <sup>+0.03</sup><sub>-0.03</sub>

D3 = 1.25 <sup>+0.03</sup><sub>-0.03</sub>

D4 = 1.25 <sup>+0.03</sup><sub>-0.03</sub>

Click to add a dimension

Normal  
 Closing  
 Resultant

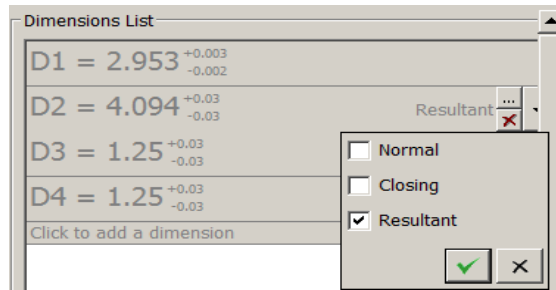
OK Cancel

D1 in this example will be Normal

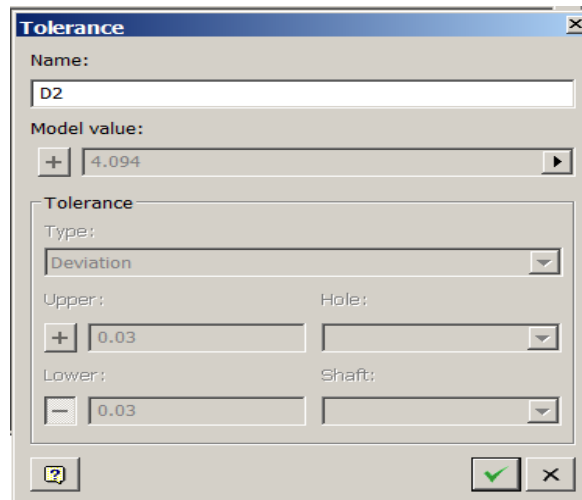


# Design Accelerator: Tolerance Calculator

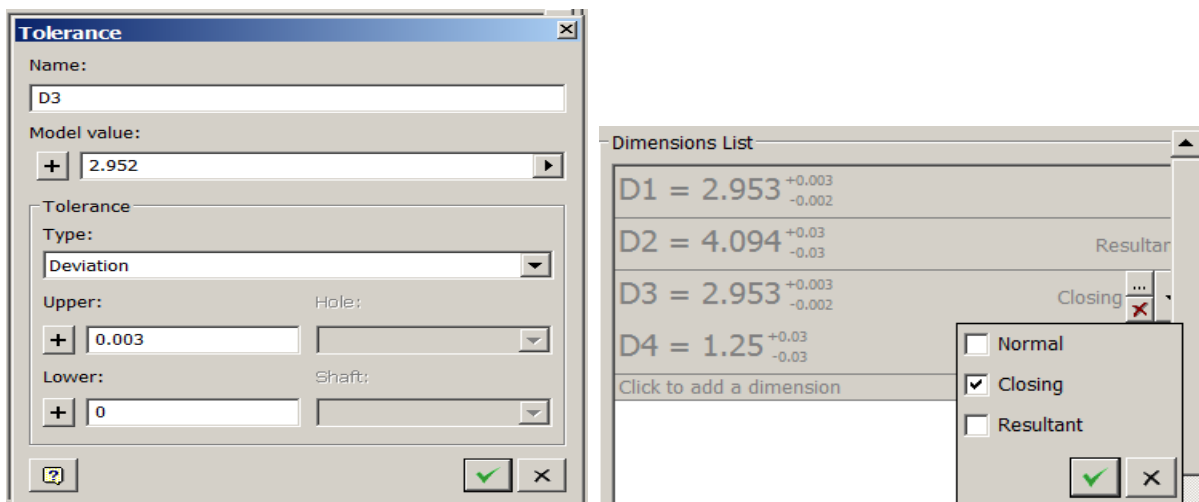
D2 will be the Resultant Tolerance, so Resultant will be checked:



Since D2 is now the Resultant, all Values are grayed-out except for its Nominal Dimension:



Fill in Values for D3, which for this example is a Normal Dimension:





# Design Accelerator: Tolerance Calculator

The Last Value to be filled in is D4. D4 is the overall length that the other D1 and D3 will be subtracted from to find the Resultant of D2.

Note Model Value has been changed to a Negative!

And also the Tolerance type is Symmetric:

**Tolerance**

Name: D4

Model value: - 10.000

Tolerance Type: Symmetric

Upper: + 0.005      Hole:

Lower: - 0.005      Shaft:

D4 is also the Closing Dimension

D4 = -10<sup>+0.005</sup>/<sub>-0.005</sub> Closing

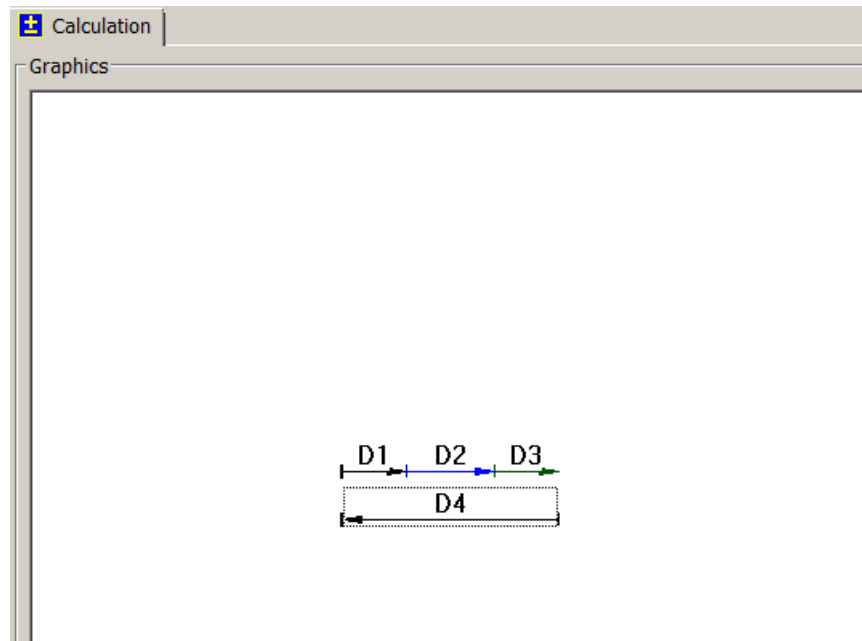
Click to add a dimension

- Normal
- Closing
- Resultant



# Design Accelerator: Tolerance Calculator

The Graphics area now shows us the correct configuration to find the Tolerances of D2:



CLICK CALCULATE!

The design is within Design Compliance, and we can see our Results of D2:

The screenshot shows the 'Tolerance Calculator' window. The 'Graphics' area on the left contains the same dimension diagram as the previous image. On the right, the 'Dimensions List' panel displays the following results:

Dimension	Value	Upper Tolerance	Lower Tolerance	Status
D1	2.953	+0.003	0	
D2	4.095	-0.001	-0.005	Resultant
D3	2.952	+0.003	0	
D4	-10	+0.005	-0.005	Closing

Below the dimensions list, a message box states: "11:15:23 AM Calculation: Calculation indicates design compliance!". At the bottom of the window, there are buttons for 'Calculate', 'OK', and 'Cancel'.





# Design Accelerator: Tolerance Calculator

Click on the Results Icon, and the HTM Report is displayed:

## Tolerance Calculation (Version: 2012 (Build 160160000, 160))

5/30/2011

### Project Info

### Dimensions

Name	Value	Limits	Lower	Upper	Remark
D1	2.953		0	+0.003	
D2	4.095		-0.005	-0.001	Resultant
D3	2.952		0	+0.003	
D4	-10		-0.005	+0.005	Closing
Check Calculation			Positive		

### Summary of Messages

11:21:04 AM Calculation: Calculation indicates design compliance!

The Tolerance Result is also displayed in the Model Browser:

