

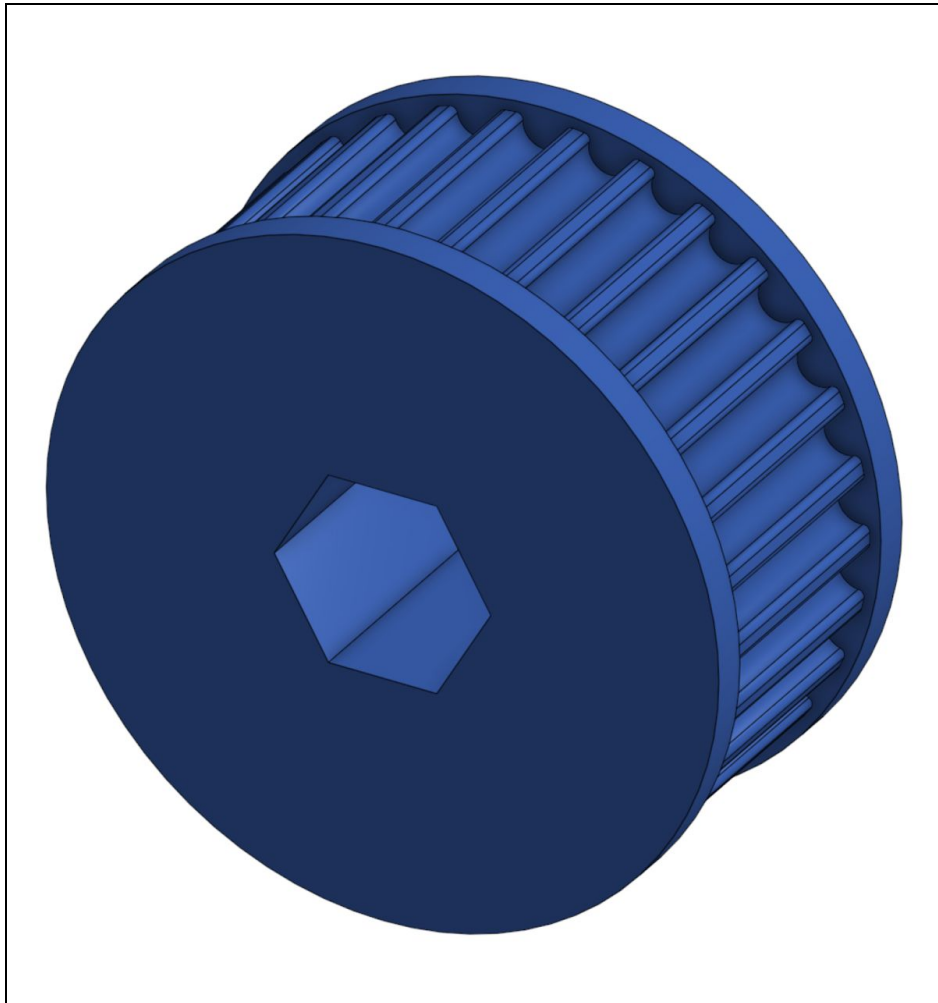
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## Onshape Pulley Fit Adjustment

Let's 3d print some pulleys, and figure out how to design with them.

For this example, we'll make an 18:30 ratio using HTD-5mm pulleys and a 45t belt, using pulleys printed on the Monoprice printer.

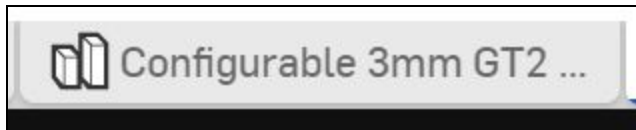
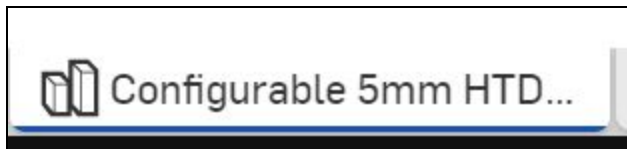


# 1. Generate your pulley

Onshape - MKCad - Pulleys



HTD - 5mm and GT2 - 3mm are our most common belt sizes.



## Key dimensions:

For 15mm wide belts, set a Width of 0.67"

For 9mm wide belts, set a Width of 0.45"

Bore diameter should be 0.010" or 0.015" oversized.

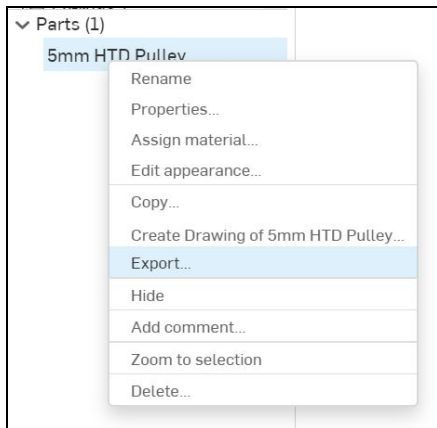
Flange width should be 0.1" for most applications.

Fit adjustment should be -0.025".

Teeth	30
Width	0.67 in
Bore	Hex ▼
Bore Diameter	0.515 in
<input checked="" type="checkbox"/> Flanged	
Flange Width	0.1 in
Fit Adjustment	-0.025 in

Export it:

Right-click on the Part, and Export



Rename it to be helpful: ***XXt YYmm -0ZZfit - 5mm HTD Timing Pulley***

XX = pulley teeth

YY = belt width

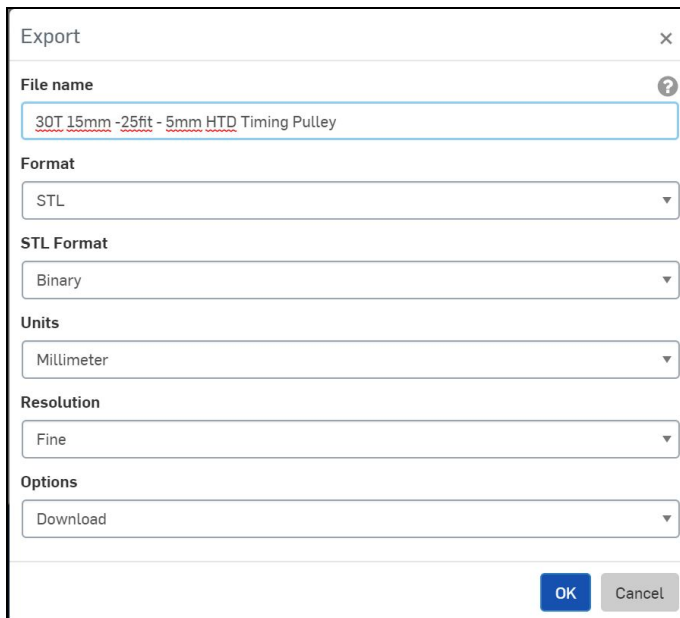
ZZ = fit adjustment

*Format = STL*

*STL Format = Binary*

*Units = Millimeter*

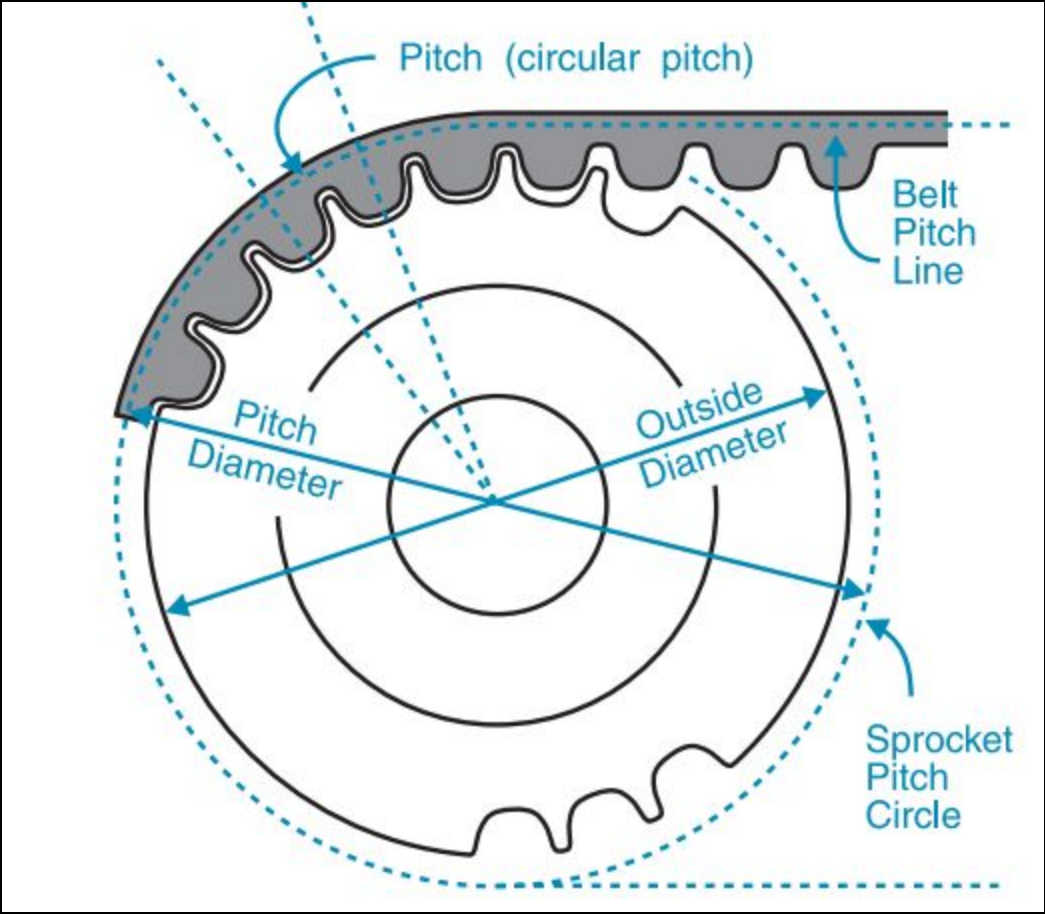
*Resolution = Fine*



Hey! Now you have a file you can 3dprint, or include in CAD.

# Design Adjustments

The pulley fit adjustment messes up the pulley pitch diameter. That changes what the center-to-center spacing between pulleys needs to be.



## What's the "nominal" spacing?

<https://www.wcproducts.com/how-to-belts>

So for our 18:30 HTD5 pulleys that we're trying to use with a 45t belt, that nominally looks like this, with a 2.032" center distance:

Belt Calculator					
5mm HTD/GT2 ▾					
Pulley 1		Pulley 2		Center Distance	
Number of Teeth	<input type="text" value="18"/>	Number of Teeth	<input type="text" value="30"/>	Desired Center	<input type="text" value="2.9177"/>
Outer Diameter	<input type="text" value="1.0830"/>	Outer Diameter	<input type="text" value="1.8348"/>	Center Add	<input type="text" value="0.0"/>
Pitch Diameter	<input type="text" value="1.1279"/>	Pitch Diameter	<input type="text" value="1.8798"/>	Ratio	<input type="text" value="0.6000"/>
Smaller Belt		Larger Belt			
# of Teeth	<input type="text" value="45"/>	# of Teeth	<input type="text" value="55"/>		
Center Distance	<input type="text" value="2.0320"/>	Center Distance	<input type="text" value="3.0278"/>		
P1 Teeth in Mesh	<input type="text" value="7.9338"/>	P1 Teeth in Mesh	<input type="text" value="8.2867"/>		
P2 Teeth in Mesh	<input type="text" value="16.7770"/>	P2 Teeth in Mesh	<input type="text" value="16.1888"/>		

## Center Distance adjustment

But we know our pulleys are smaller!

So let's take those pitch diameters (PD):  
1.1279", 1.8798"

Our fit adjustment is -0.025", which applies to the radius. So we'll subtract 0.050" from each PD:  
1.0779", 1.8298"

Now we have to mess with the WCP calculator to get those pitch diameters, by using fractional teeth.

Belt Calculator					
5mm HTD/GT2 ▼					
Pulley 1		Pulley 2		Center Distance	
Number of Teeth	17.2	Number of Teeth	29.2	Desired Center	2.9177
Outer Diameter	1.0329	Outer Diameter	1.7846	Center Add	0.0
Pitch Diameter	1.0778	Pitch Diameter	1.8297	Ratio	0.5890
Smaller Belt			Larger Belt		
# of Teeth	45	# of Teeth	55		
Center Distance	2.1121	Center Distance	3.1071		
P1 Teeth in Mesh	7.6202	P1 Teeth in Mesh	7.9359		
P2 Teeth in Mesh	16.2633	P2 Teeth in Mesh	15.7274		

So there we go, 18 and 30 with a fit adjustment give us effectively a 17.2 and 29.2 tooth pulley, from the perspective of the pitch diameter.

The center distance grows from 2.032" to 2.112", or an increase of 0.080".