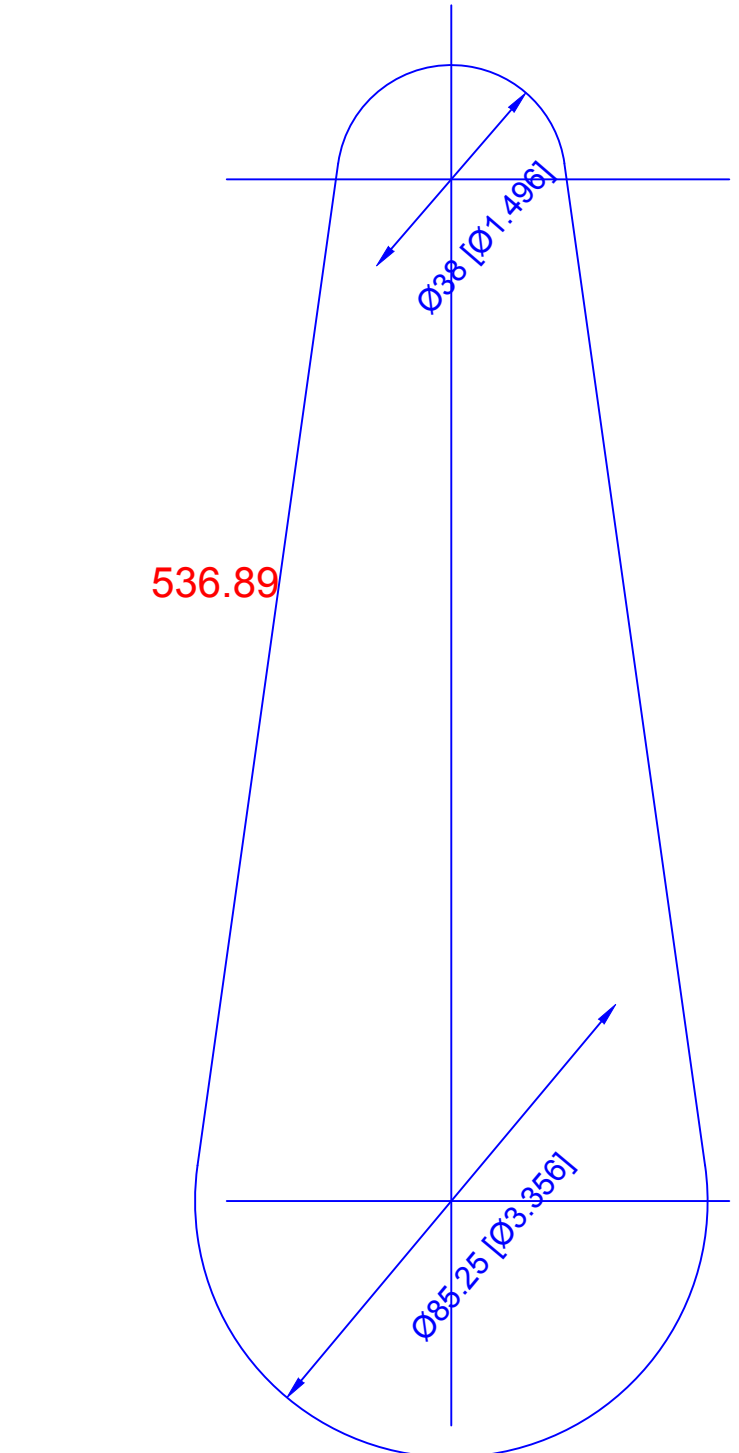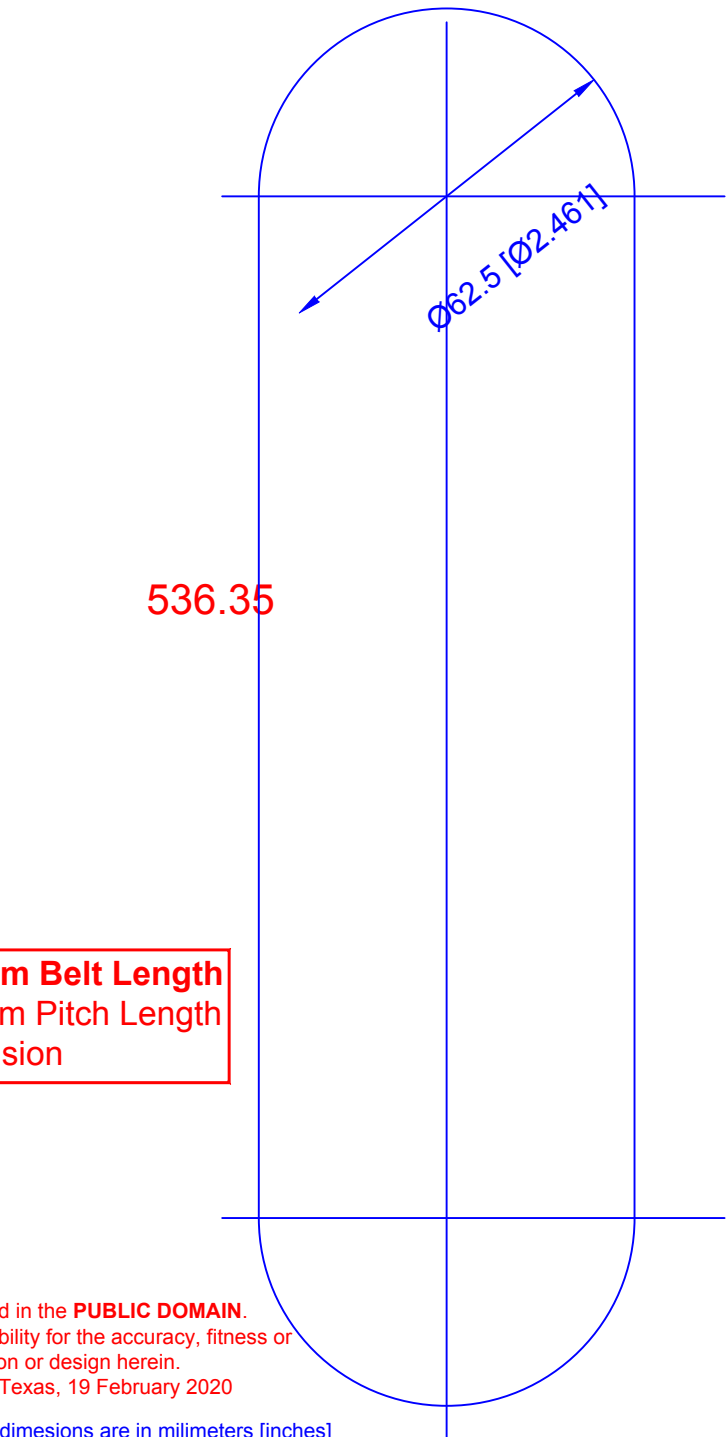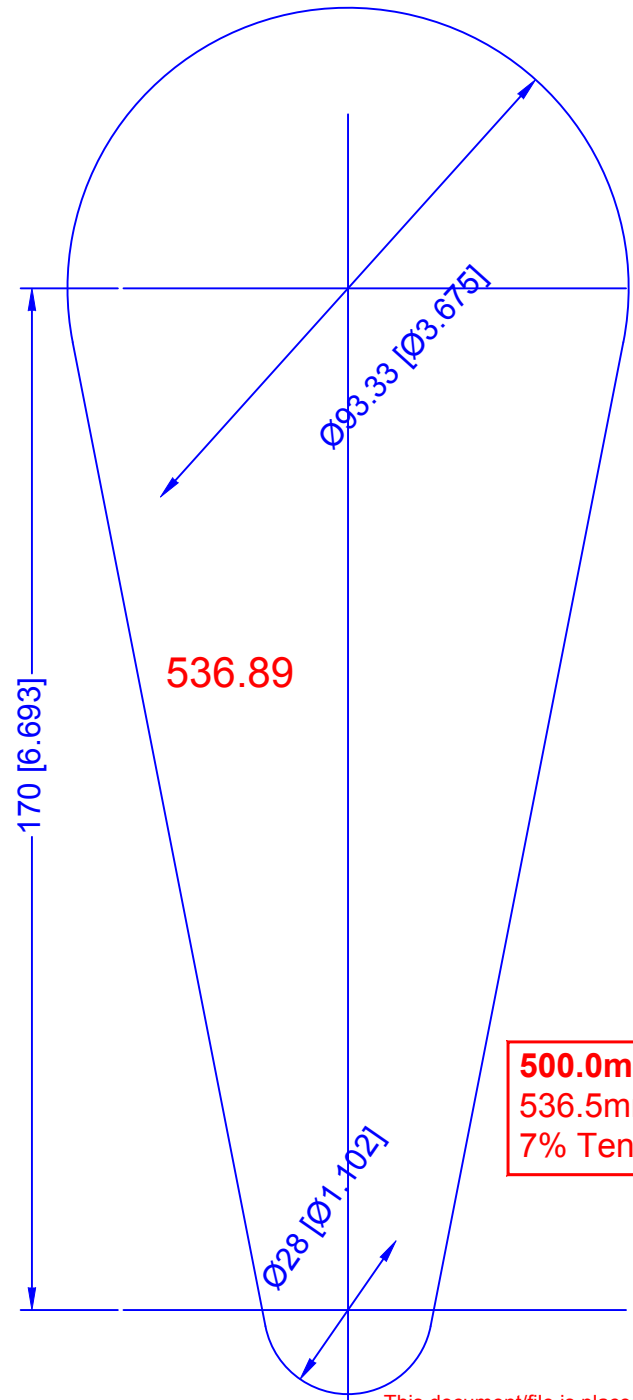# Custom 3 Step Pulley Set for CS1000 Motor with 5mm Round Belt

"Engineering is the art of planning and forethought"

The design goal here was to come up with a pulley set for my Taig Lathe Plan "E" layout that would enable the full range of speeds from 60 to 10,000 RPM while not requiring a pulley tensioner. Round polyurethane belts are sometimes used on sewing machines as replacements for the standard V-belts. The 5mm belting offers the advantage that it can be purchased in running lengths and the appropriate closed loop belt fabricated as the need arises. The fabricated length is usually a percentage shorter than the actual pitch length required. The belt is then stretched over the pulleys to provide the force required to hold it in place and keep it from slipping.

The pitch diameters in this set were carefully selected such that actual required pitch length would closely match with a 170mm distance between the pulleys centers. The smallest 28mm diameter pitch circle is the smallest that can be practically fitted to the 15mm motor shaft. The other diameters in the high and low ranges were then derived from this diameter to achieve the 0.300 and 2.243 drive ratios. Lastly a center 1:1 range was added. The pitch diameters were then carefully adjusted so that all three ranges have a matching pitch length with the fixed center to center distance.
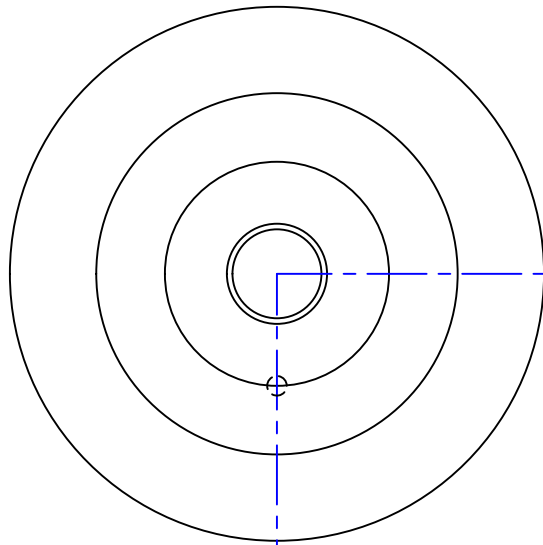
Position Number	Primary Pulley Diameter	Primary Pitch Diameter	Secondary Pitch Diameter	Drive Ratio	Calculated Spindle RPM Note: Recommended 7,000 Max Spindle RPM Bearing Max: 10,000 RPM				
				> Motor Shaft RPM >	200	1,275	2,350	3,425	4,500
Custom two groove Pulley Set for 5mm round polyurethane belt									
Primary Shaft RPM (see reduction)					200	1,275	2,350	3,425	4,500
1	30.00	28.00	93.33	0.300	60	383	705	1,028	1,350
2	87.25	85.25	38.00	2.243	449	2,860	5,272	7,684	10,095
Jack-shaft reduction		1.00	1.00	1.000					
Custom three groove Pulley Set for 5mm round polyurethane belt									
Primary Shaft RPM (see reduction)					200	1,275	2,350	3,425	4,500
1	30.00	28.00	93.33	0.300	60	383	705	1,028	1,350
2	64.50	62.50	62.50	1.000	200	1,275	2,350	3,425	4,500
3	87.25	85.25	38.00	2.243	449	2,860	5,272	7,684	10,095
Jack-shaft reduction		1.00	1.00	1.000					

Ø93.33 [Ø3.675]

536.89

170 [6.693]

Ø28 [Ø1.102]

500.0mm Belt Length
536.5mm Pitch Length
7% Tension

Ø62.5 [Ø2.461]

536.35

Ø38 [Ø1.496]

536.89

Ø85.25 [Ø3.356]

Spindle Pulley

26.50 [1.043]
19.50 [0.768]
12.50 [0.492]
93.33 [3.675]
62.50 [2.461]
38.00 [1.496]
95.33 [3.753]
64.50 [2.539]
40.00 [1.575]
15.88 [0.625]
30.00 [1.181]
20.00 [0.787]
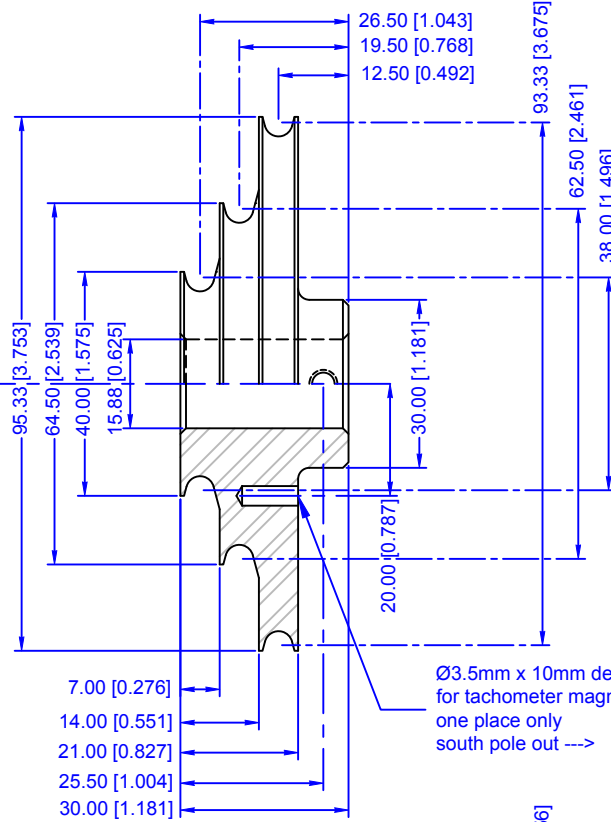
Ø3.5mm x 10mm deep bore
for tachometer magnet
one place only
south pole out --->

7.00 [0.276]
14.00 [0.551]
21.00 [0.827]
25.50 [1.004]
30.00 [1.181]

Motor Pulley

26.5 [1.043]
19.5 [0.768]
12.5 [0.492]
85.25 [3.356]
62.50 [2.461]
28 [1.102]
87.25 [3.435]
64.50 [2.539]
15.05 [0.593]
30.00 [1.181]
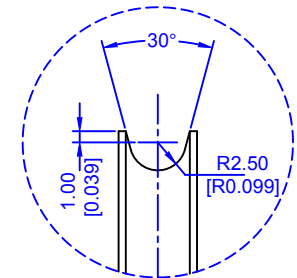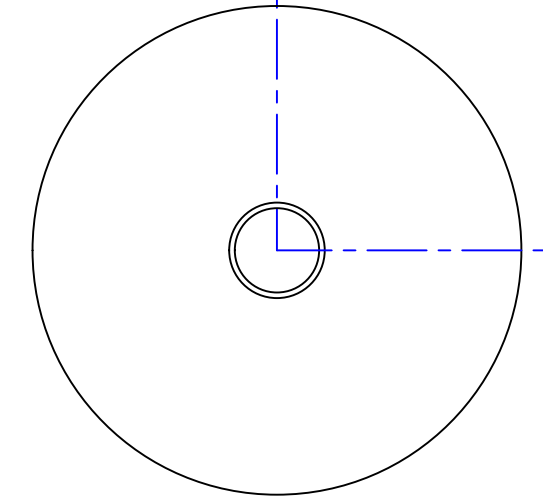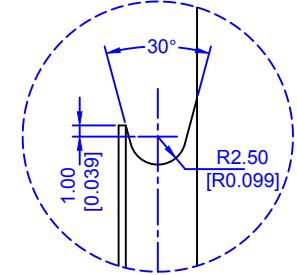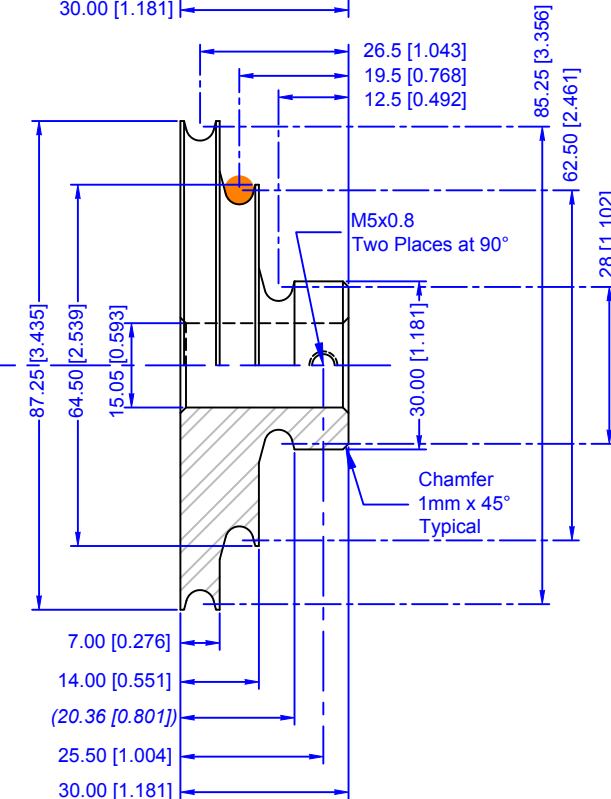
M5x0.8
Two Places at 90°

Chamfer
1mm x 45°
Typical

7.00 [0.276]
14.00 [0.551]
(20.36 [0.801])
25.50 [1.004]
30.00 [1.181]

Groove Details

30°
1.00 [0.039]
R2.50 [R0.099]

30°
1.00 [0.039]
R2.50 [R0.099]
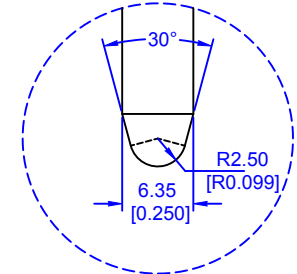
**HSS Tool
for cutting grooves**

30°
6.35 [0.250]
R2.50 [R0.099]

This is a set of pulleys intended for use on a Taig
Micro Lathe driven by a CS1000 brushless DC
motor. These pulleys are designed for 5mm round
polyurethane belts. They are designed to have
150° contact area rather than the 120° found on
standard pulleys of this type.