

Tangential Turbine

By Thor Hansen

On the ME forum I came across Turbine Guys postings of his small turbines, I sent him a message and he kindly designed a somewhat larger turbine for me and e-mailed the drawings to me. I didn't follow his drawings in all detail, I didn't make a round turbine housing, I used a piece of marine aluminium alloy I had.

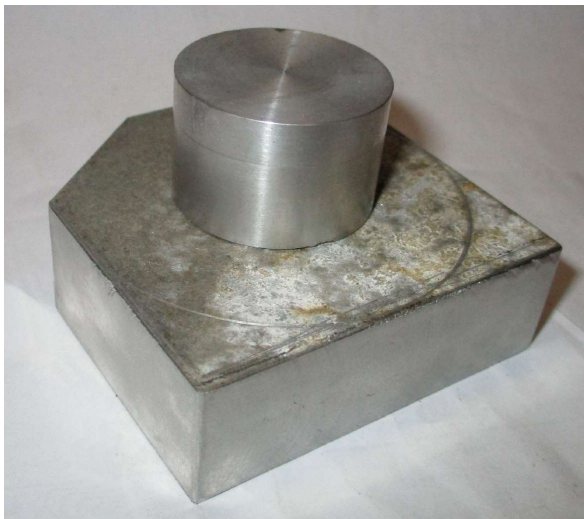
Many thanks to Byron Hanchett for allowing me to use his drawings and to Graham Meek for his advice.

Materials

For the turbine shaft I used a piece of 8mm dia. mild steel I found in my scrap box, the 20mm thick marine aluminium alloy was a gift from a friend, the light alloy for the turbine wheel was a piece left over from another project. The only things purchased were two 6mm I.D. flanged ball bearings (SMF106ZZ) and some screws.

Turbine housing

A friend of mine used to work offshore on an oil platform and when some under water light alloy part needed replacement, he saved the part and we used an angle grinder and a hacksaw to cut it into two pieces, one for each of us. The main part was 20 mm thick and of varying shape, I used a hacksaw to cut off one corner. One corner of the off cut was then cut off since I wanted a bearing housing at the rear of the turbine housing – right photo.



The alloy surface was a bit tarnished after spending quite a few years in the sea, but underneath the surface the material was like new.

The smallest piece was clamped in the 4-jaw and turned to a diameter of 30mm.

The larger piece was marked and the sawn edges milled to give 62 x 62mm (by 20mm thick).

Then the turbine housing was clamped in the



4-jaw and a pilot hole drilled through what would become the centre of the ball bearings. A 4.5mm deep cavity with a diameter of 45 mm was turned, this will become the cavity where the turbine wheel will rotate. The work was then turned 180 deg. so the 5mm deep cavity for the 30mm dia. bearing housing could just be turned. The bearing housing was a tight push fit. I used a few drops of anaerobic glue before pushing the bearing housing home and then let the glue cure to the next day. I drilled three 2.5 mm countersunk holes and tapped M3. The countersunk M3 screws will make sure that the bearing housing doesn't move. The work could now be turned 180 deg. and gripped by the 30mm dia. bearing housing and centred using the pilot hole.



The cavity for the turbine wheel could now be turned to dimensions, and the pilot hole opened up to 9mm. The 9mm through hole was then bored to around 10mm to give a push fit for the ball bearings. The hole for the nozzle was drilled later.

Turbine wheel

The turbine wheel was made from a piece of 6mm thick marine aluminium alloy that was left over from another project. I used a hacksaw to cut the piece square and then cut off the corners. The work could then be clamped in the 4-jaw and one side was faced – right photo.

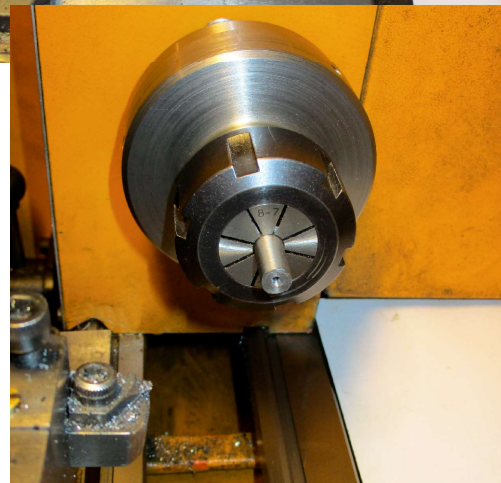


The work was then turned round 180 deg. and the other side faced and a 5.8mm hole drilled through. The hole was reamed to 6mm.

When the wheel is pressed onto the turbine shaft it can be turned to dimension.

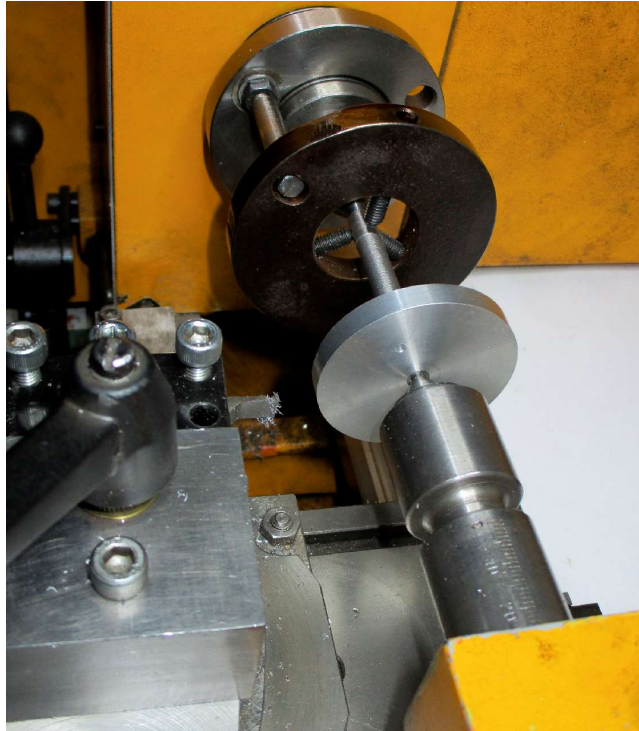
Turbine shaft

The turbine shaft was turned from a piece of 8mm dia. mild steel from my scrap box. I started by clamping the work in my ER-32 chuck and faced the end and drilled a centre hole – right photo. The work was clamped with the other end facing the tailstock and the end faced and centre drilled. The end was then turned down to a press fit in the 6mm hole in the turbine wheel and the shaft pressed into the wheel. I put a drop of anaerobic glue on the shaft before pressing it in. I let the glue cure to the next day.



After the glue had cured the work was mounted between centres and the turbine wheel was turned to dimensions – right photo.

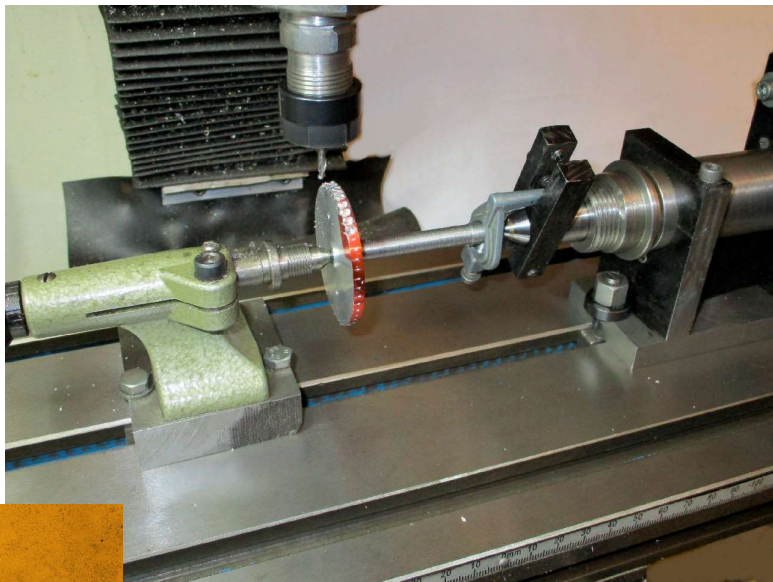
To be able to use a lathe dog when I later turned the turbine shaft down to 6mm I drilled two 2.5mm holes in the wheel and tapped M3.



After turning the turbine wheel to dimensions I mounted the wheel and shaft on my milling machine table. The work was mounted between centres using my home-made dividing head – right photo.

The lathe dog is clamped in the carrier by a grub screw.

The 48 pockets were then milled using a 3mm slot drill.



The work was then transferred back to the lathe and the turbine shaft turned down to approximately 6mm to give a push fit for the ball bearings – left photo.

The section of the shaft between the bearings were turned down to just under 6mm so the bearing closest to the turbine wheel could easily slide over. I used a piece of tube with an inner dia. of just over 6mm to press the bearing home.

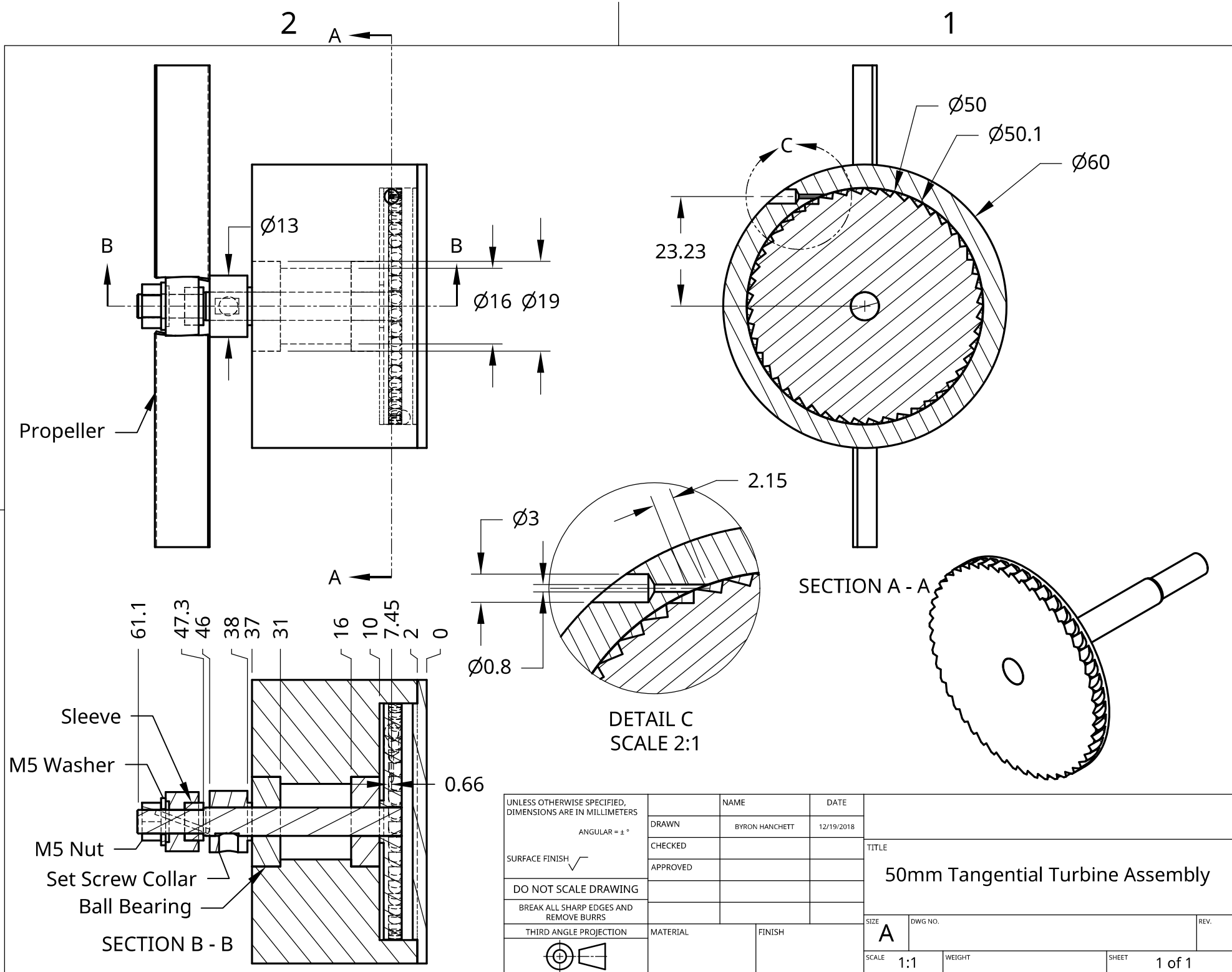
The other end of the shaft was turned down to 5mm and screw cut M5. A flat for the bush grub screw was filed on the shaft just outside the other ball bearing.



I also turned a bush and drilled and tapped a hole for the M4 grub screw.

On the turbine housing I measured and marked out the position of the nozzle and drilled a 3mm hole first and then a 0.8mm hole through into the turbine wheel cavity. On either side of the nozzle hole I drilled two 2.5mm holes that were tapped M3 so I could mount a small adapter for my airbrush compressor – right photo.

I connected the turbine to the compressor and the turbine started, I put a finger on the shaft to prevent it from turning too fast. The next job is to source a suitable piece of wood to make a propeller and may be make some kind of end cover for the turbine housing.

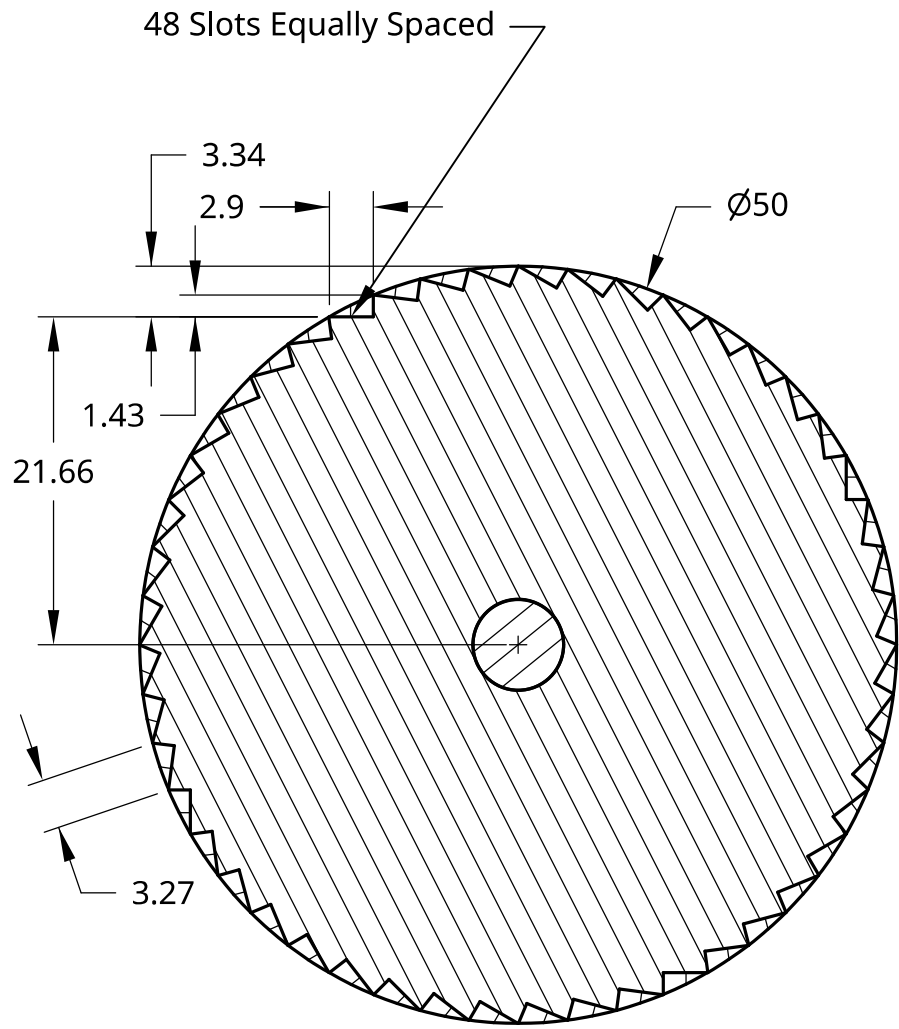




UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN MILLIMETERS ANGULAR = ± ° SURFACE FINISH  DO NOT SCALE DRAWING BREAK ALL SHARP EDGES AND REMOVE BURRS THIRD ANGLE PROJECTION 		NAME		DATE		TITLE 50mm Tangential Turbine Assembly									
		DRAWN		BYRON HANCHETT						12/19/2018					
		CHECKED													
		APPROVED													
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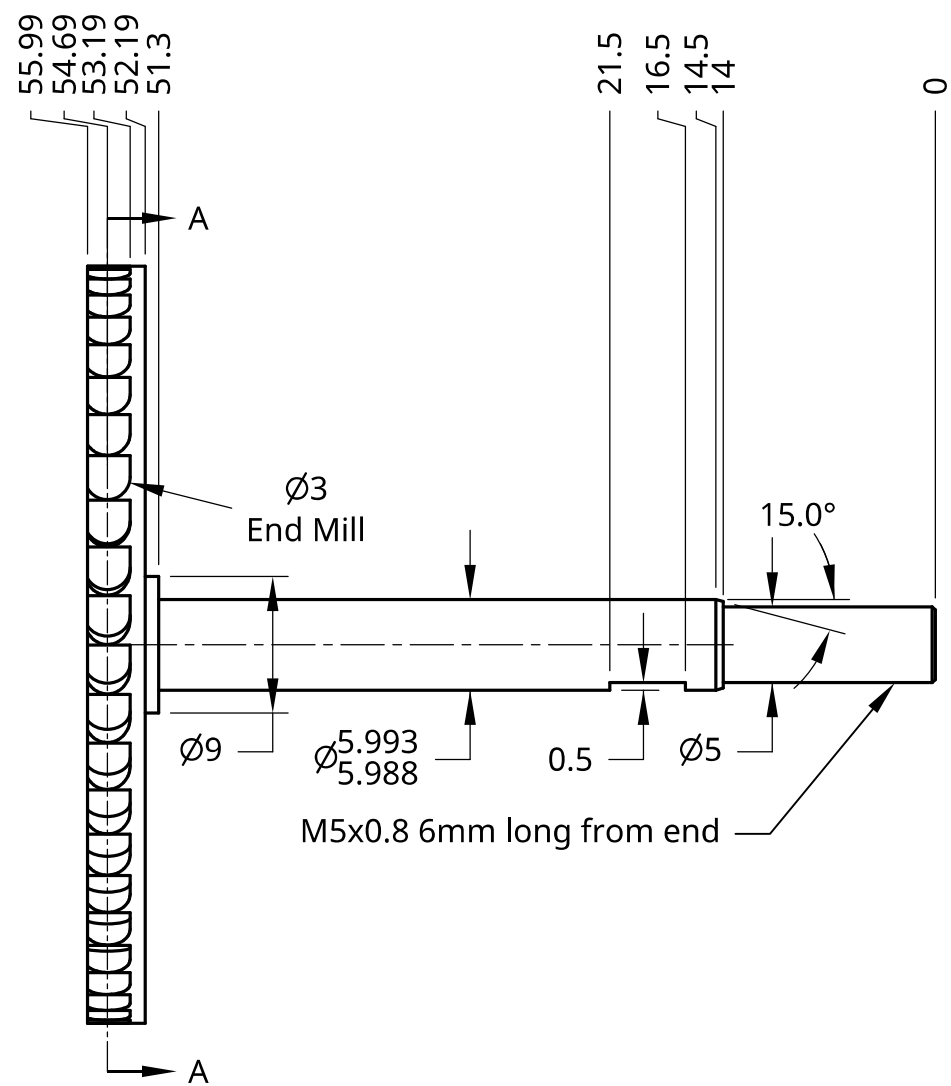


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

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UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN MILLIMETERS ANGULAR = ± ° SURFACE FINISH  DO NOT SCALE DRAWING BREAK ALL SHARP EDGES AND REMOVE BURRS THIRD ANGLE PROJECTION 		NAME	DATE	TITLE 50mm Rotor		
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