



5 Watt

3dprintable Wind Turbine.

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Introduction

This document contains the Manufacturing, Assembly and Operational instructions for 3dp's Wind Turbine.

This fully functional wind turbine has been specifically design to be manufactured, assembled and operated at home with its unique 3d printable design. The wind turbine is optimized to produce a power output of 5 Watt (12volt ~4amps) at 5m/s wind speeds, perfect for battery charging applications.

The wind turbine has been designed with a unique Passive Variable Pitch (PVP) design. The PVP maintains an optimum power output through control of the turbines rotational speed. Whilst optimizing power output the PVP also protects the Turbine from dangerous over speed conditions, limiting its maximum revolutions per minute in wind speeds greater than 5m/s.

The main components of the turbine have been designed for Additive Layer Manufacturing (ALM) methods using PLA plastic. 95% of the ALM components require no post processing as these parts do not require 'print supports' reducing material usage whilst improving the overall finish of the part.

MKII Design Improvements

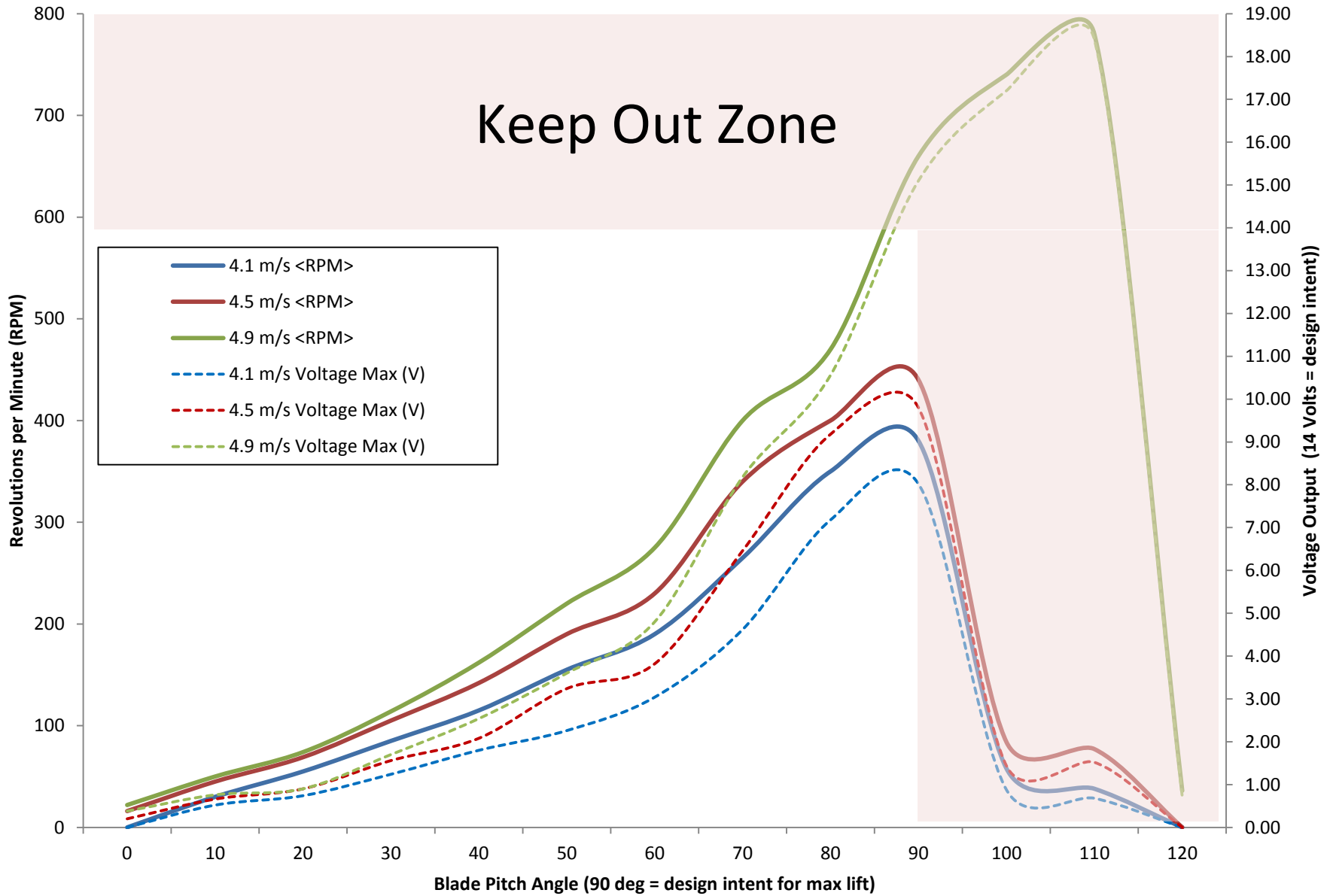
The MkII has three design improvements, the first is an all important tail fin to allow the turbine to turn into the wind and extract the maximum wind energy in changeable conditions, the second is a stiffer tower structure with bigger bearings and increased diameter locating pin to support the increased loads from the tail whilst allowing for the third improvement which is the inclusion of Split Ring Electronics. The Split Ring Electronics allows the turbine to spin around the tower axis without any limitations it brings the power electronics into the tower where there is more space and its easier to access.

The MkII requires the following new parts:

- Structure
- Rear Structure
- Tower Header
- Nacelle

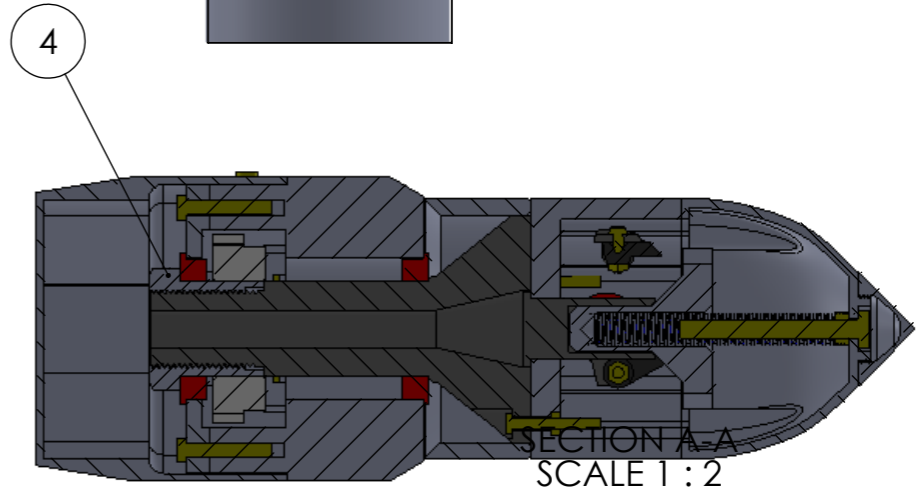
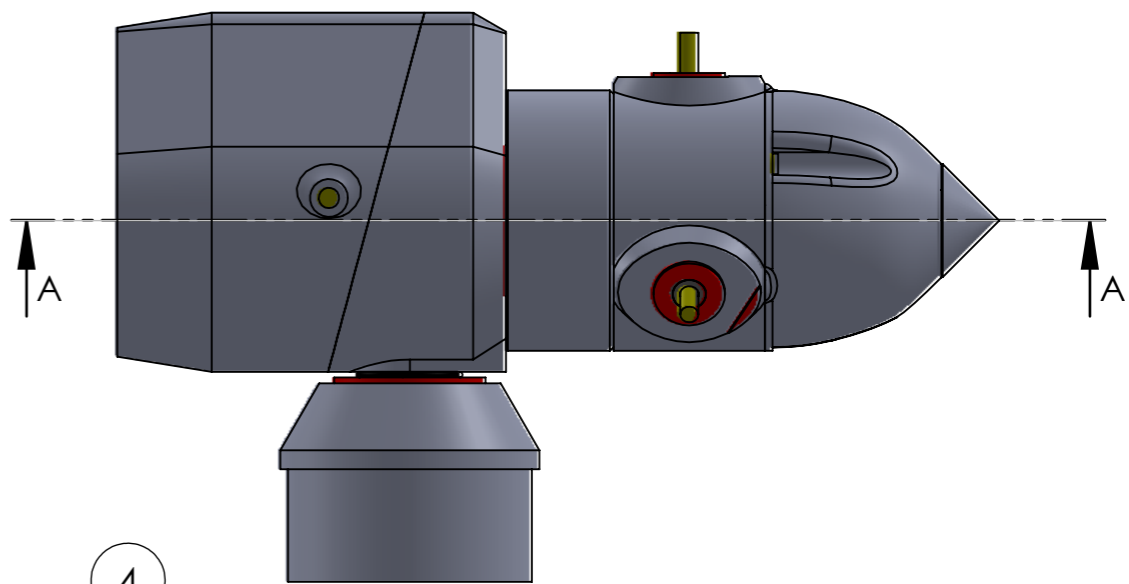
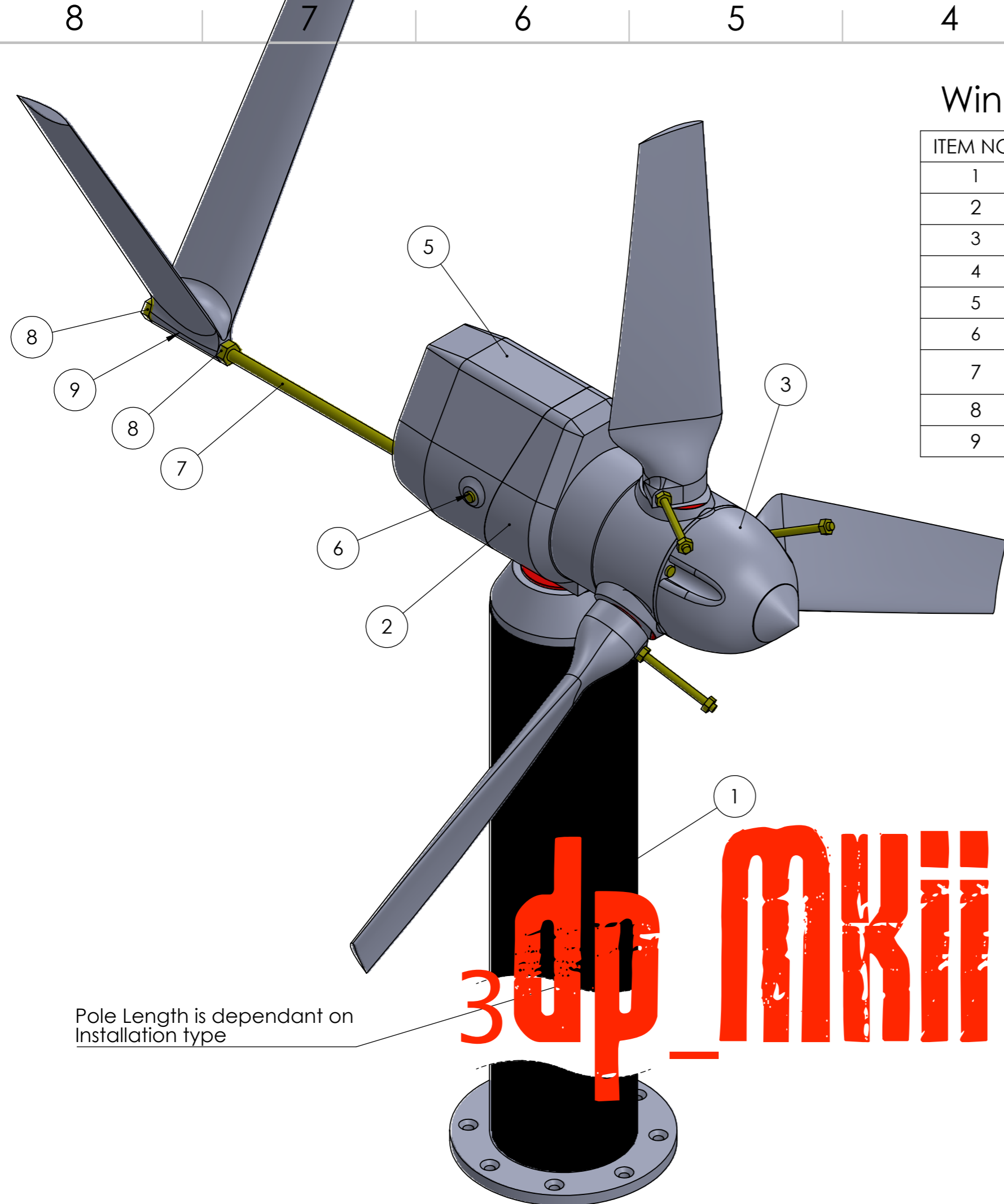
Wind Turbine Test Data

Keep Out Zone



Wind Turbine Assy Drawing

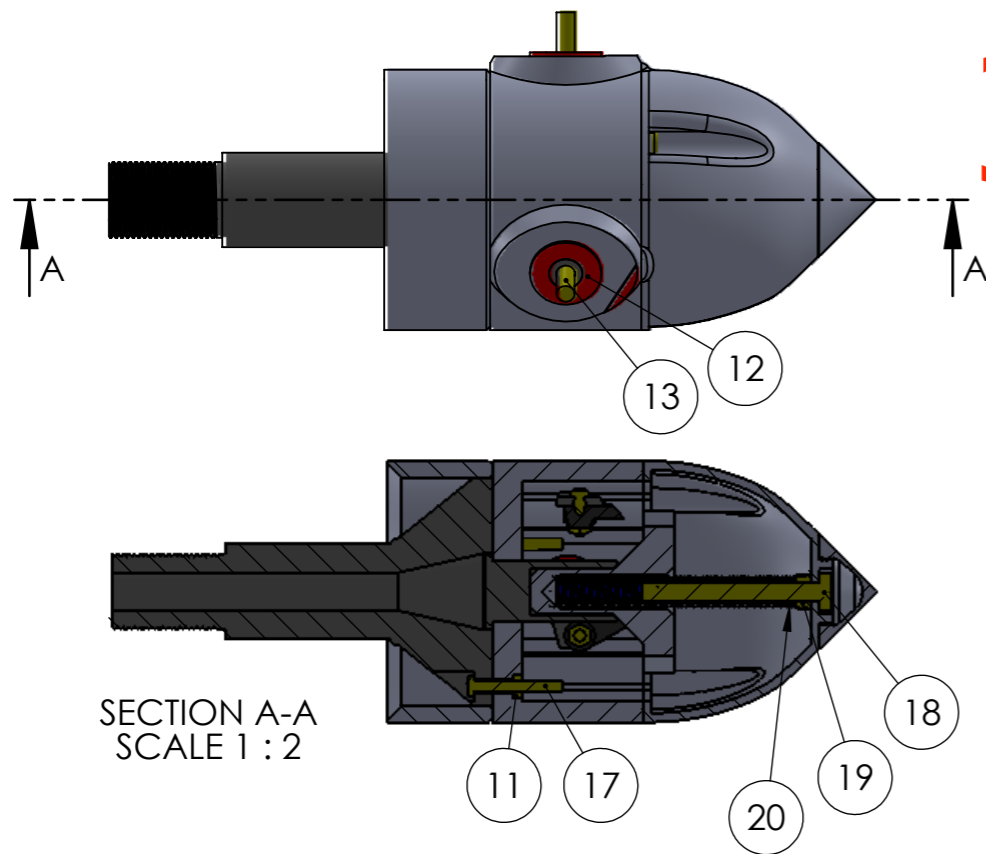
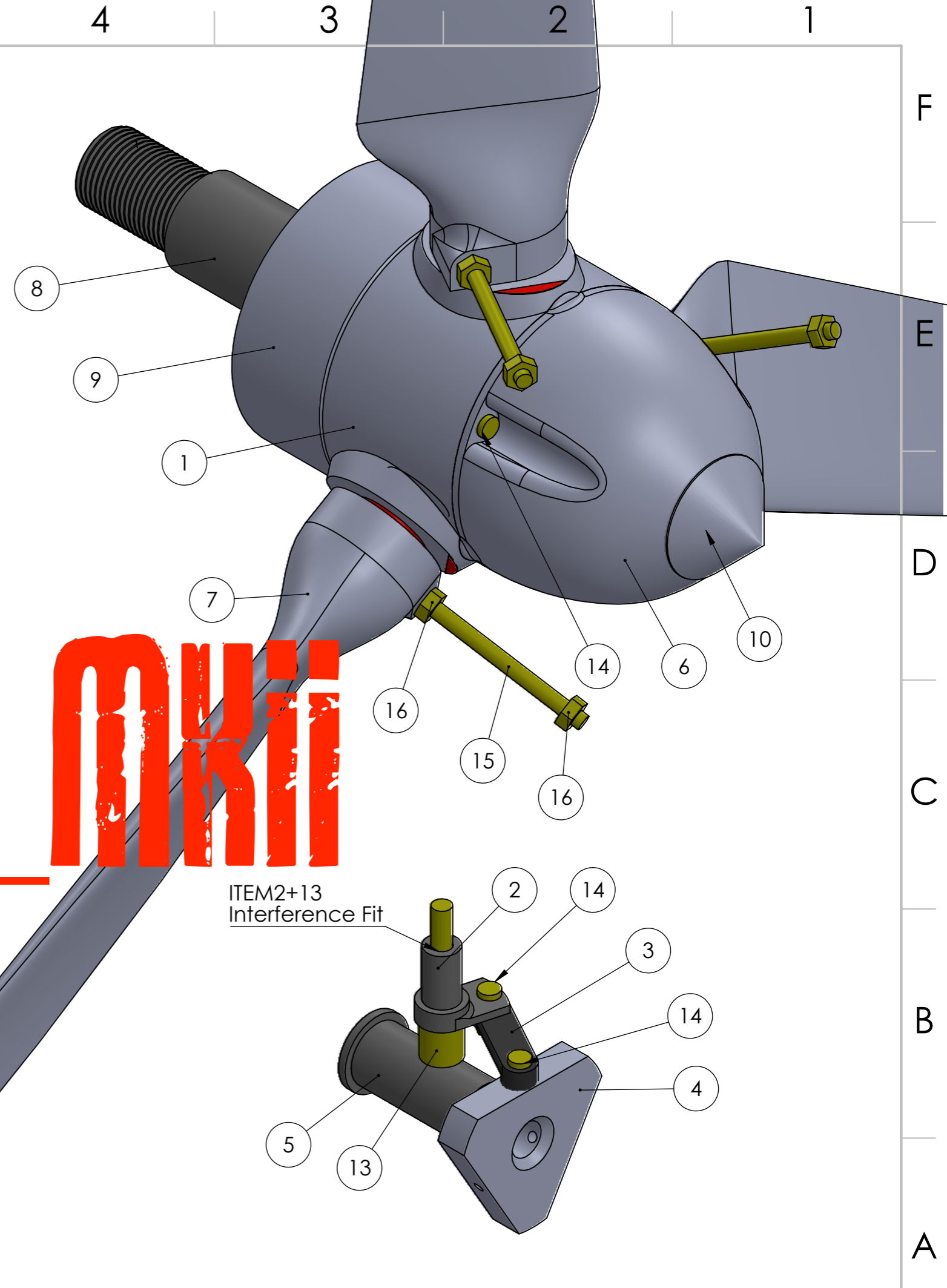
ITEM NO.	PART NUMBER	PRINTED	QTY.
1	Tower Assy	SEE ASSEMBLY DRAWING	1
2	Structure Assy	SEE ASSEMBLY DRAWING	1
3	Rotor Assy	SEE ASSEMBLY DRAWING	1
4	Shaft Nut	Y	1
5	Nacelle	Y	1
6	M3 12mm		2
7	M6 300mm Threaded Rod		1
8	M6 Nut		4
9	Tail Fin	Y	1



3dp MKII

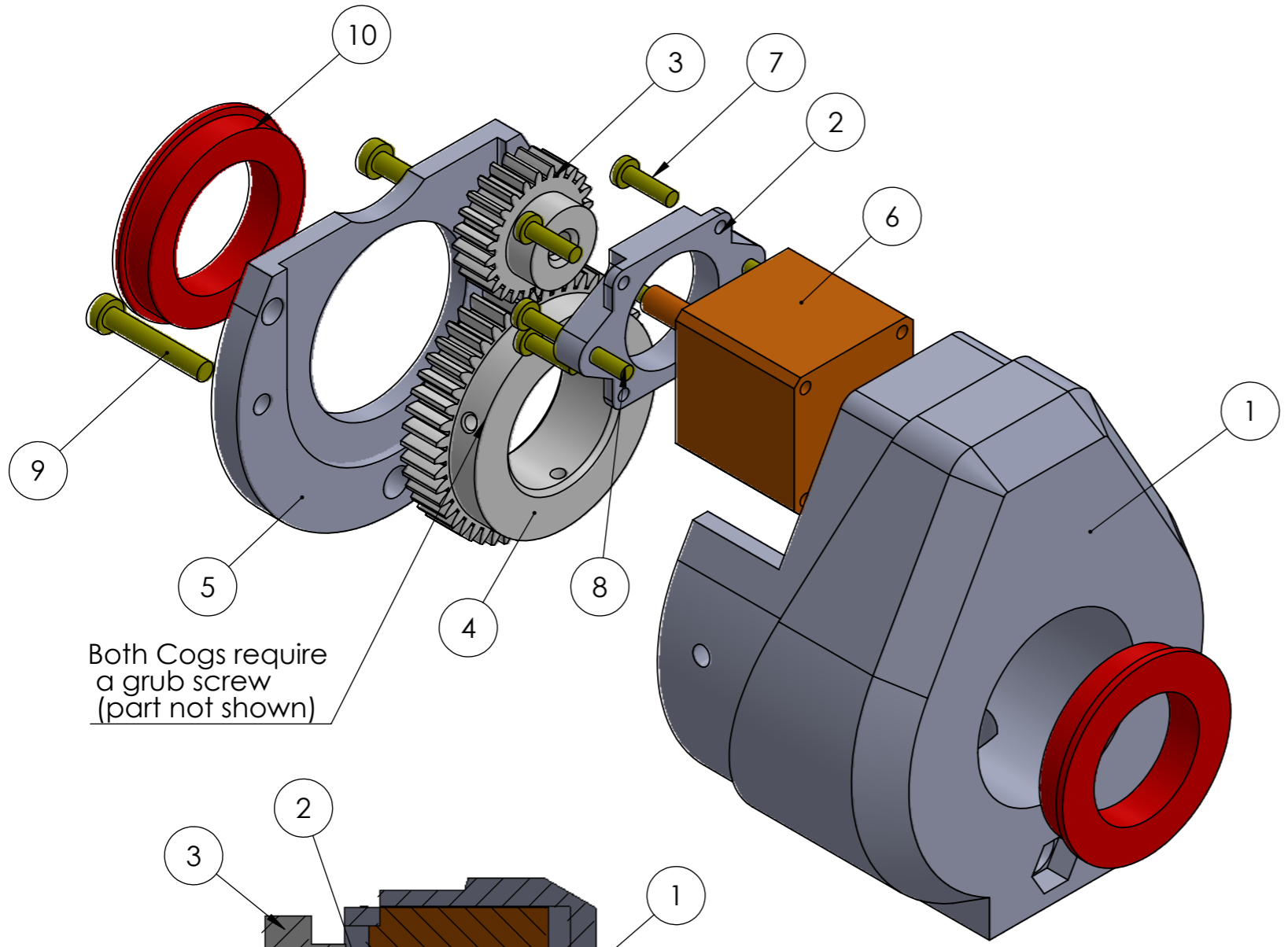
Rotor Assembly

ITEM NO.	PART NUMBER	PRINTED	QTY.
1	Disc	Y	1
2	Crank	Y	3
3	Pitch Arm	Y	3
4	Piston	Y	1
5	Piston Cover	Y	1
6	Nose Cone	Y	1
7	Blade	Y WITH ENBEDDED NUT	3
8	Shaft	Y	1
9	Shaft Shroud	Y	1
10	Nose Cone Tip	Y	1
11	M3 Nut		6
12	Pitch Bearing		6
13	M5 40mm		3
14	M3 12mm	Self taping	9
15	M4 50mm		3
16	M4 Nut		6
17	M3 25mm		3
18	M5 50mm		1
19	M5 Nut		1
20	Pitch Spring		1

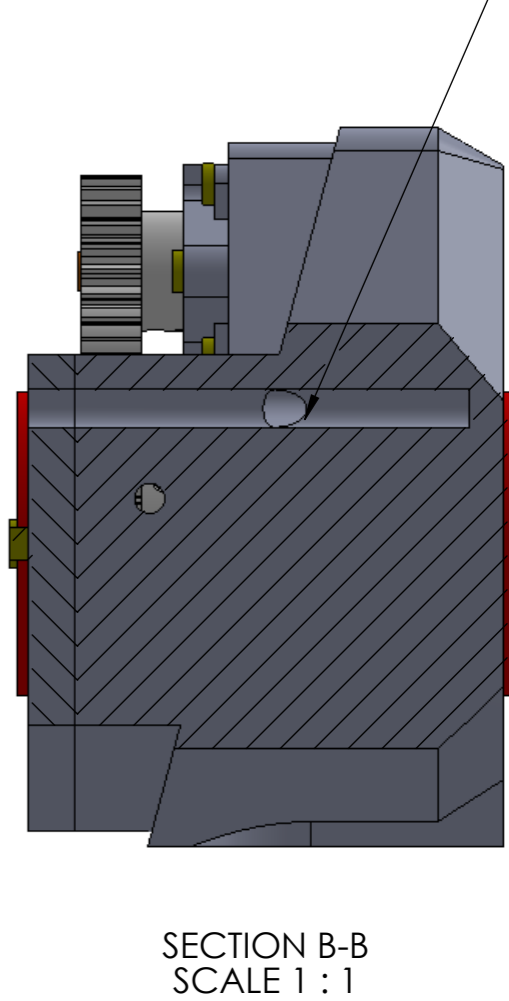
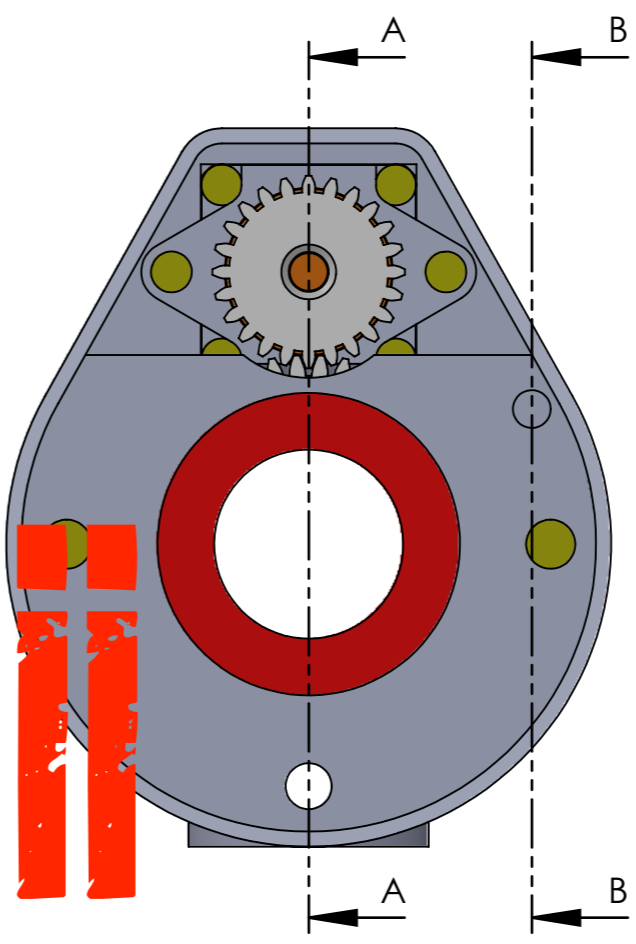
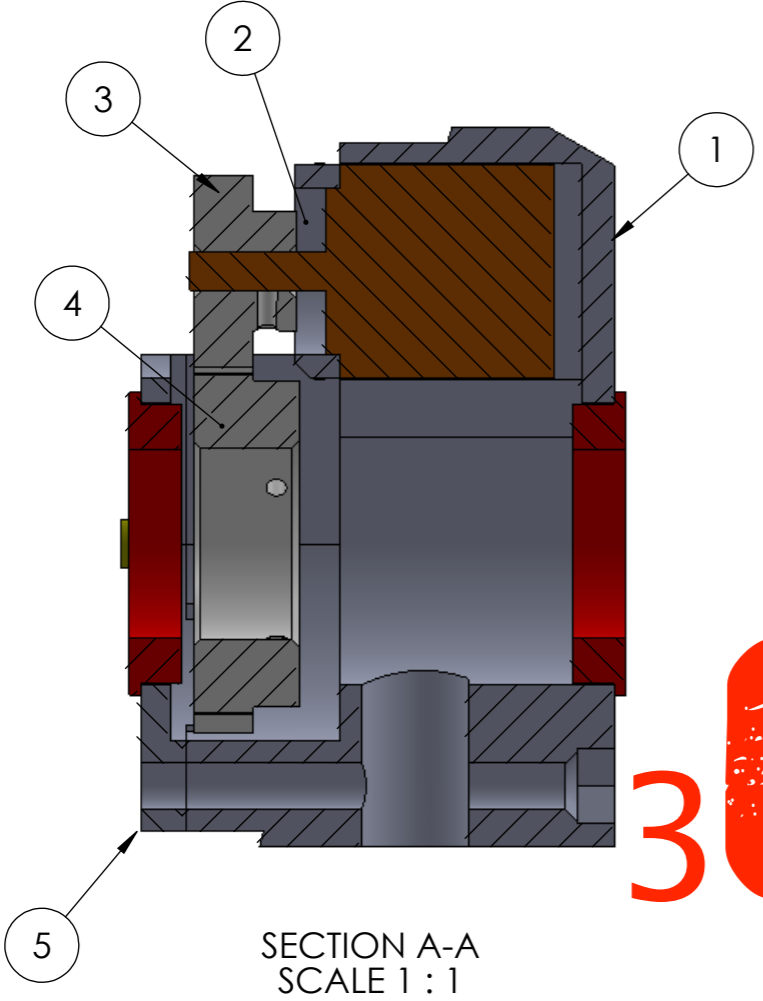


Structure assembly

ITEM NO.	PART NUMBER	PRINTED	QTY.
1	Structure	Y	1
2	Stepper Motor Bracket	Y	1
3	Generator Cog Driven	Y	1
4	Generator Cog Driving	Y	1
5	Structure Rear	Y	1
6	Stepper Motor NEMA11		1
7	M3 12mm		4
8	M3 25mm		2
9	M4 25mm		2
10	Main Location Bearing		2



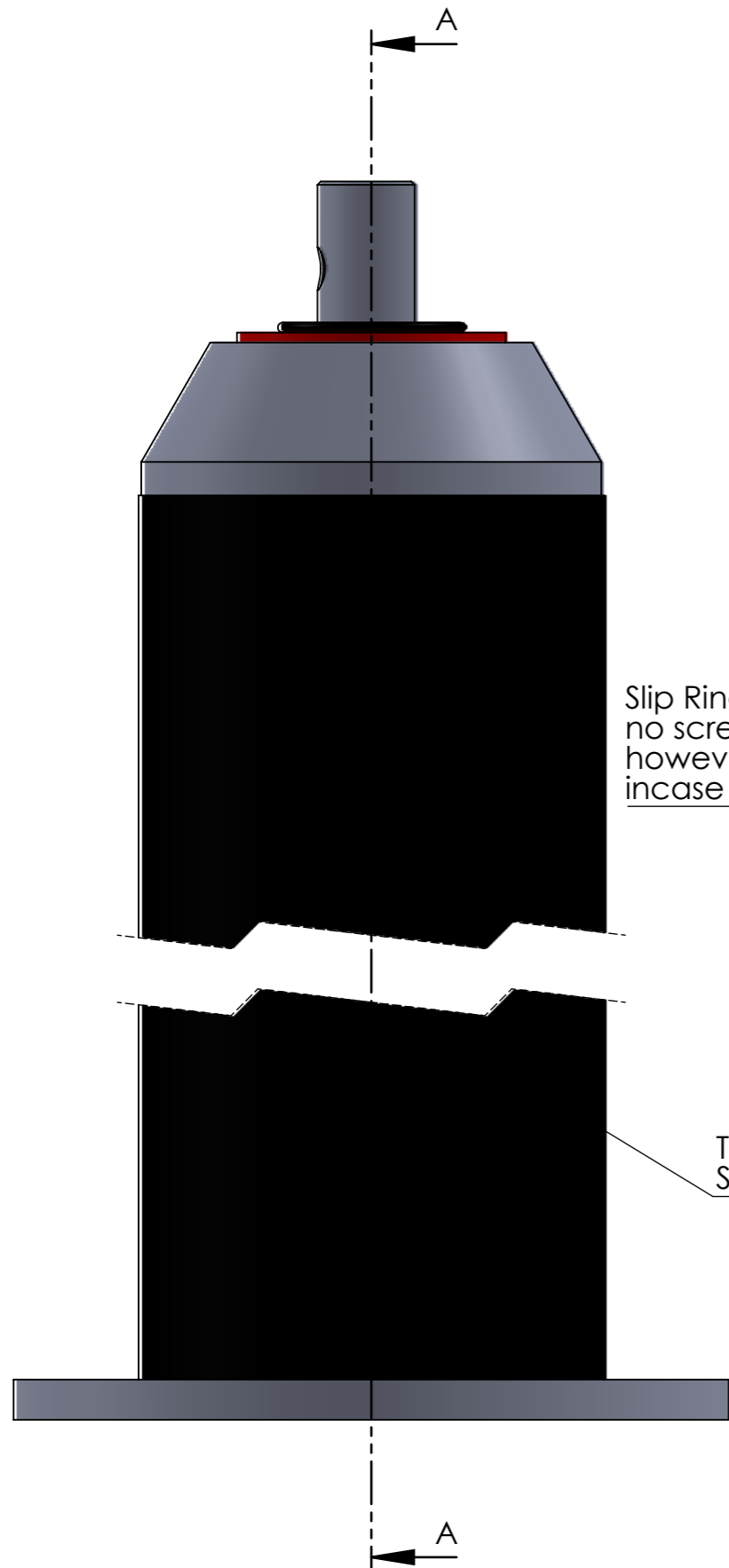
NEMA Stepper motor wiring routed here.



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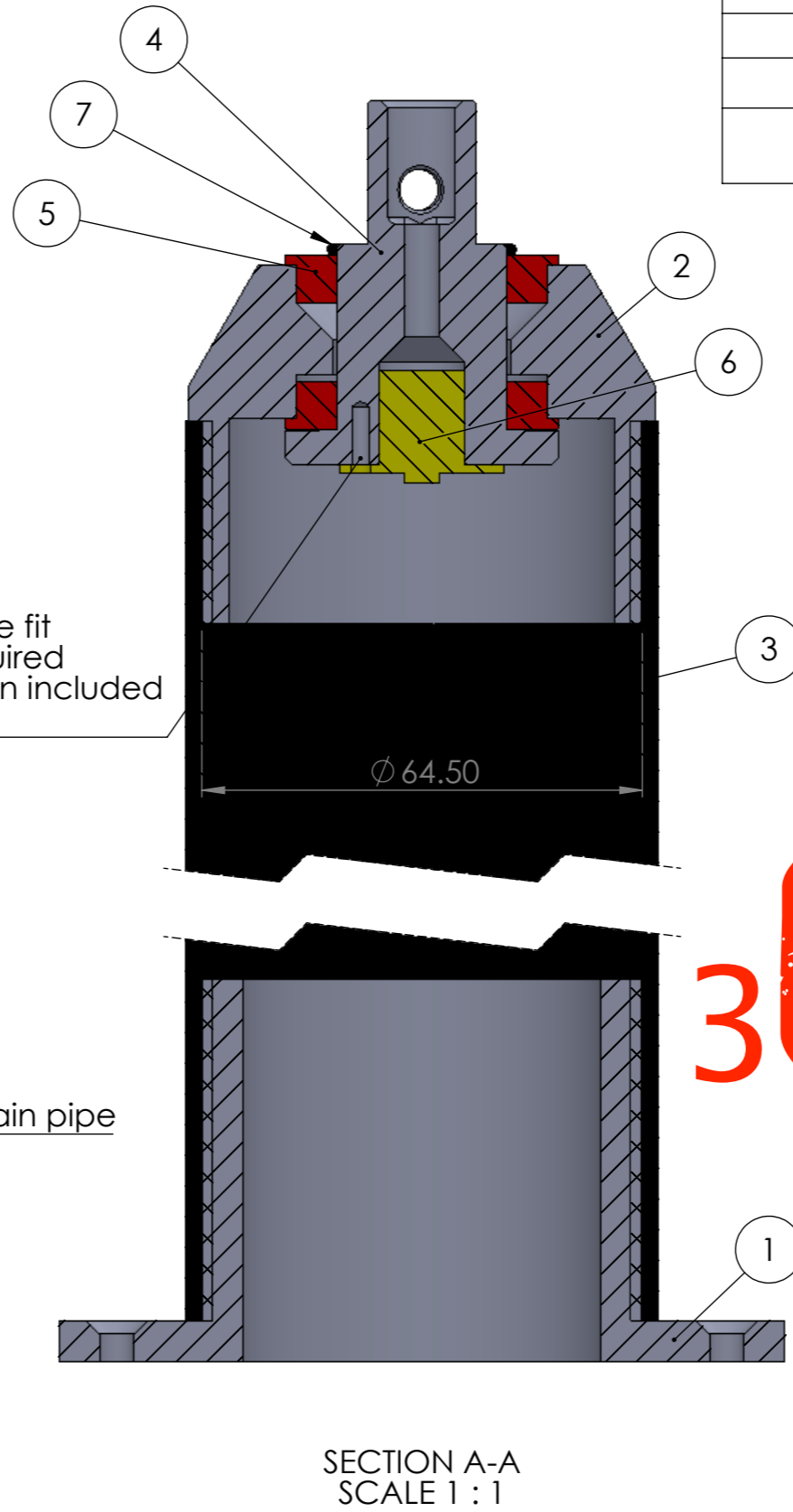
Tower Assy Drawing

ITEM NO.	PART NUMBER	PRINTED	QTY.
1	Tower Footer	Y	1
2	Tower Header	Y	1
3	Tower Pole		1
4	Tower Shaft	Y	1
5	Main Tower Bearing		2
6	Slip Ring		1
7	Tower O-Ring Setting & Seal		1



Slip Ring is an interference fit
no screws should be required
however holes have been included
incase they are required

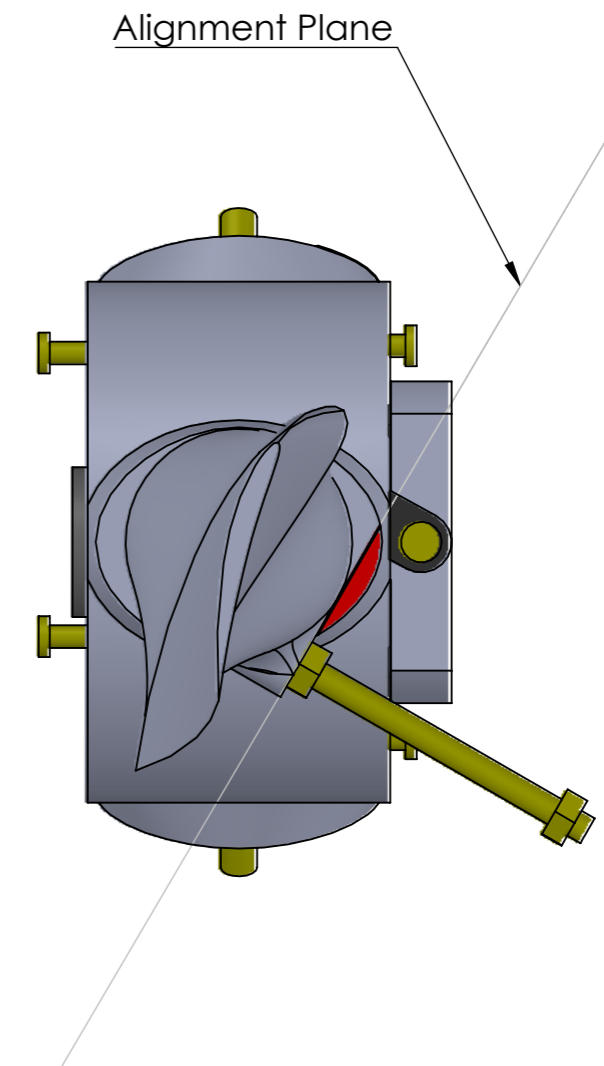
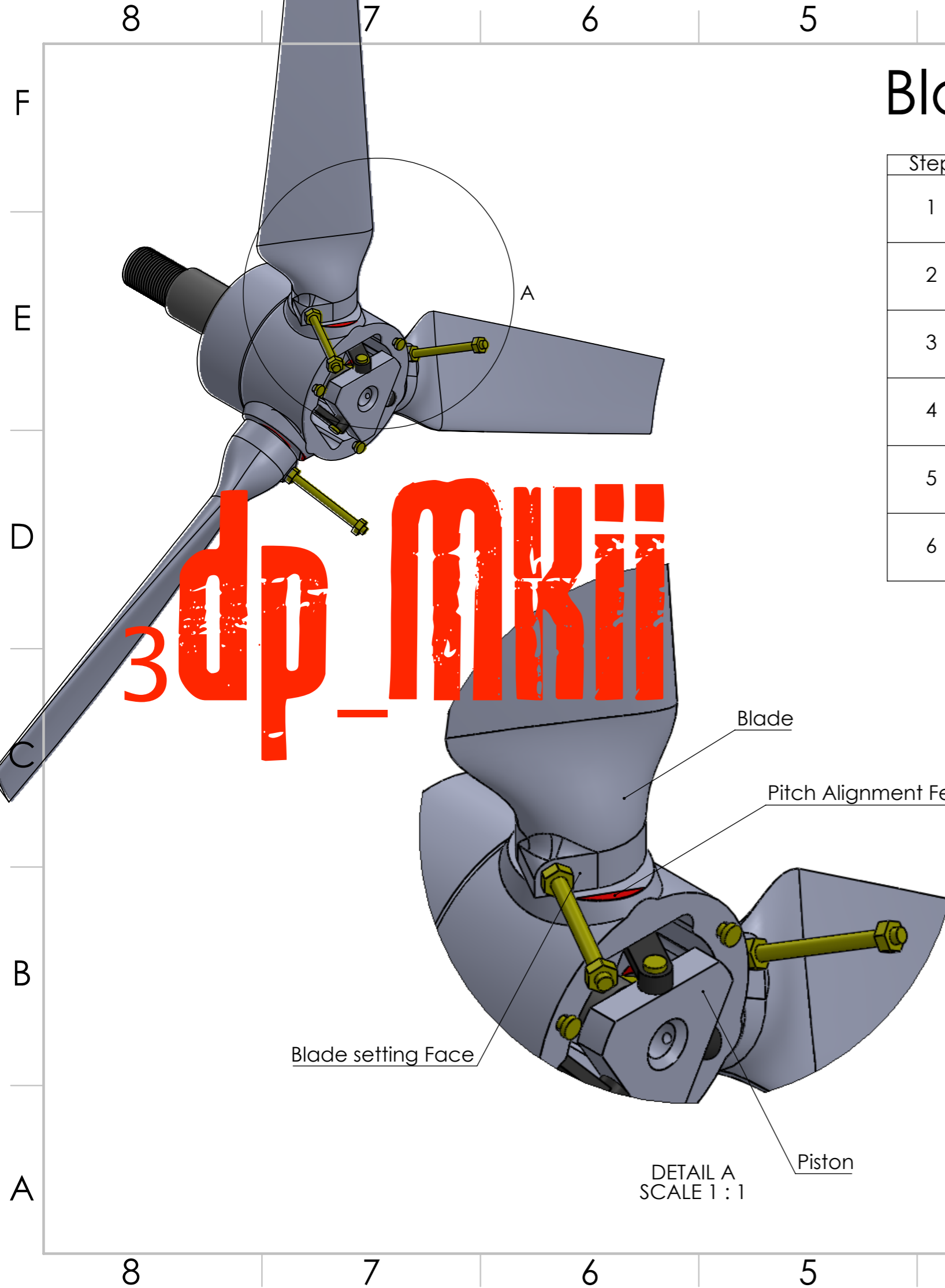
Tower Pole
Standard home drain pipe



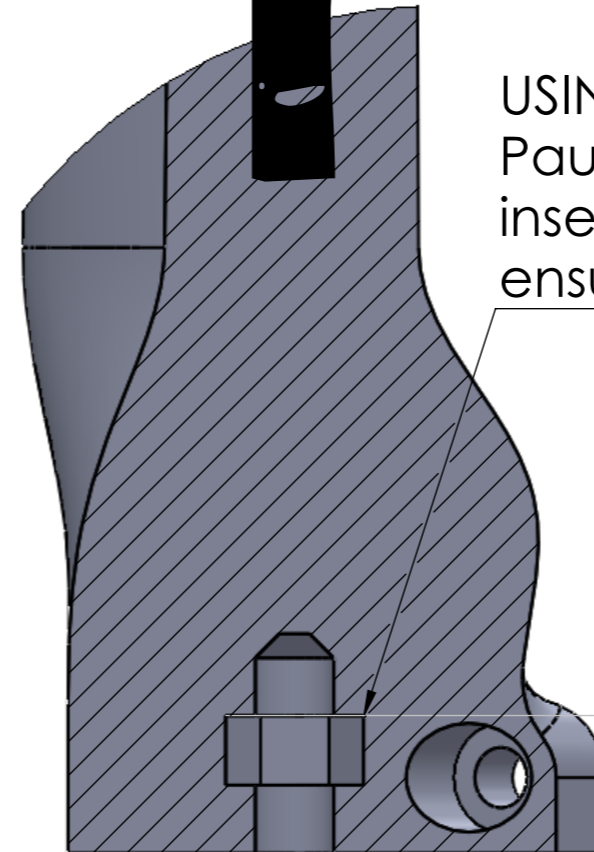
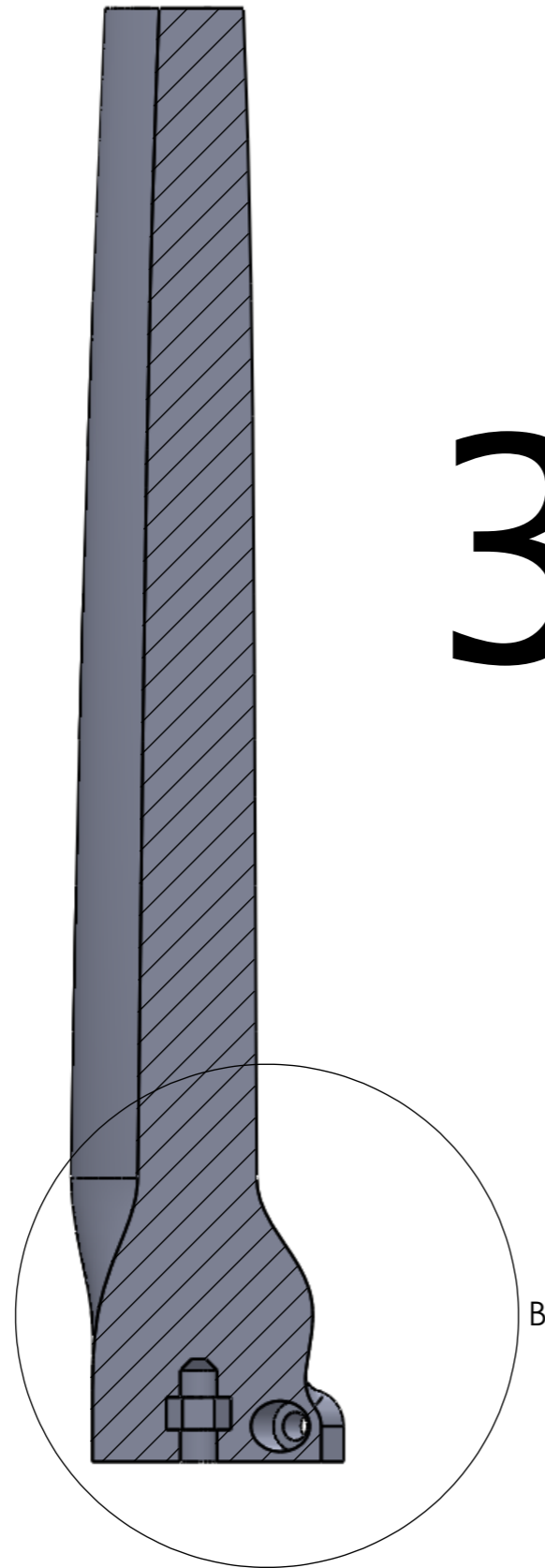
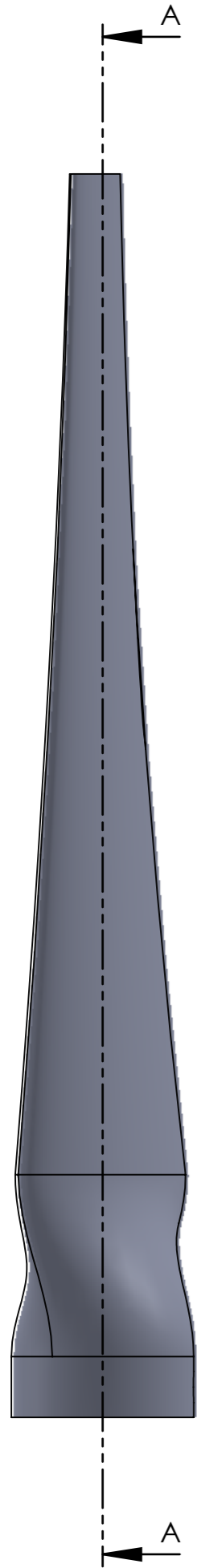
3dp_mkii

Blade Setting Instructions

Step	Task Description
1	Depress the Piston to the stop
2	Hold the piston in the depressed position throughout the operation
3	Thread each blade onto the M5 bolt and tighten down
4	Align Blade Setting Facing face with Pitch Alignment Feature on the Disc
5	Use a spring washer, washer or rubber o-ring to ensure the blade is aligned and tight. This is likely to take a number of attempts.
6	Repeat the operation for all Three blades



Blade Drawing



USING SLICER SOFTWARE PLUG-IN.
Pause the print at a height of 9.1mm
insert M5 nut. Before resuming the print
ensure the nut is below the print surface.

SECTION A-A
SCALE 1:1

DETAIL B
SCALE 2:1



BILL OF MATERIAL

Shell thickness **1.2mm**
 Bottom/Top Thickness **1.2mm**

* Component requires an embedded nut, see blade drawing.

Description	Item No.	Part Name	Printed	QTY	Print Settings			
					Layer Height (mm)	Fill Density (%)	Print Speed (mm/s)	Support type
Wind Turbine Assembly	1	Tower Assy	NA	1				
	2	Structure Assy	NA	1				
	3	Rotor Assy	NA	1				
	4	Shaft Nut	Y	1	0.1	100	20	None
	5	Nacelle	Y	1	0.1	30	50	None
	6	M3 12mm	N	2				
	7	M6 300mm Threaded Rod	N	1				
	8	M6 Nut	N	4				
	9	Tail Fin	Y	1	0.1	15	50	None
Tower Assy	1	Tower Footer	Y	1	0.3	30	50	None
	2	Tower Header	Y	1	0.3	30	50	None
	4	Tower Shaft	Y	1	0.1	80	50	None
	3	Tower Pole	N	1				
	5	Tower Location Bearing	N	2				
	6	Slip Ring	N	1				
	7	O-Ring	N	1				
Structure Assy	1	Structure	Y	1	0.1	50	50	None
	2	Stepper Motor Bracket	Y	1	0.1	100	50	None
	3	Generator Cog Driven	Y	1	0.1	100	20	None
	4	Generator Cog Driving	Y	1	0.1	100	20	None
	5	Structure Rear	Y	1	0.1	50	50	None
	6	Stepper Motor NEMA11	N	1				
	7	M3 12mm	N	4				
	8	M3 25mm	N	2				
	9	M4 25mm	N	2				
	10	Main Location Bearing	N	2				
	1	Disc	Y	1	0.1	70	50	None
	2	Crank	Y	3	0.1	100	20	None
	3	Pitch Arm	Y	3	0.1	100	20	None

Rotor Assy

4	Piston	Y	1	0.1	100	50	None
5	Piston Cover	Y	1	0.1	50	50	None
6	Nose Cone	Y	1	0.1	100	50	Touching Build Plate
7	Blade	Y*	3	0.1	30	50	None
8	Shaft	Y	1	0.1	50	50	None
9	Shaft Shroud	Y	1	0.1	15	50	None
10	Nose Cone Tip	Y	1	0.1	100	20	Touching Build Plate
11	M3 Nut	N	6				
12	Pitch Bearing	N	6				
13	M5 40mm	N	3				
14	M3 12mm	N	9				
15	M4 50mm	N	3				
16	M4 Nut	N	6				
17	M3 25mm	N	3				
18	M5 50mm	N	1				
19	M5 Nut	N	1				
20	Pitch Spring	N	1				

MAIN LOCATION BEARING

Brand: EU Budget

Inside Diameter: 25mm

Outside Diameter: 37mm

Width: 7mm

Seals / Shields: Rubber Sealed

http://simplybearings.co.uk/shop/advanced_search_result.php?search_in_description=1&keywords=F68052RS

PITCH BEARING

Brand: EU Budget

Inside Diameter: 9mm

Outside Diameter: 17mm

Width: 4mm

Seals / Shields: Non

http://simplybearings.co.uk/shop/advanced_search_result.php?search_in_description=1&keywords=F689

PITCH SPRING

RS Pro Steel Alloy Compression Spring, 80.5mm x 8.63mm, 0.17N/mm

<http://uk.rs-online.com>

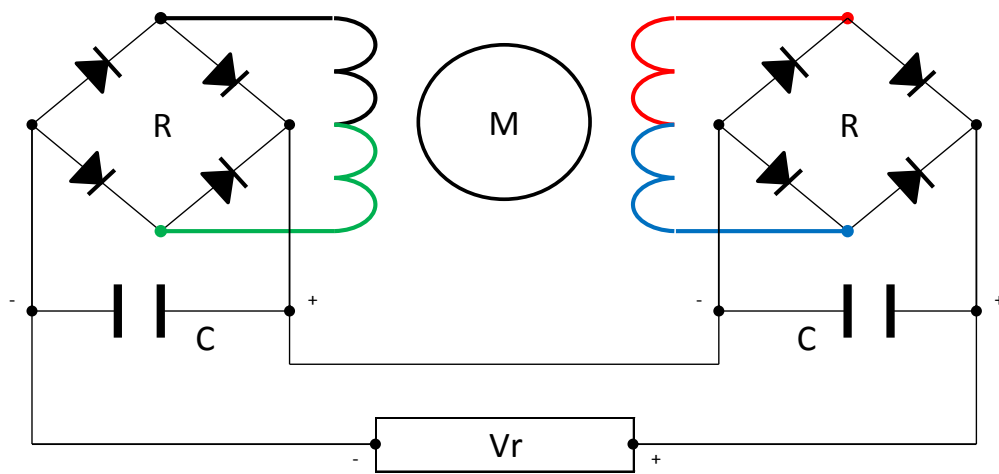
SLIP RING

[file:///localhost/link http://www.dx.com:p:4-wires-1-5a-240v-d12-5mm-micro-capsule-slip-ring-for-cctv-monitoring-robot-black-388255 - .WDXzrHcTmRu](http://localhost/link%20http://www.dx.com:p:4-wires-1-5a-240v-d12-5mm-micro-capsule-slip-ring-for-cctv-monitoring-robot-black-388255-.WDXzrHcTmRu)

Electrical

The Turbine Power Circuit shown is used to convert Alternating Current from each of the two-stepper motor coils to Direct Current, smooth the signal and regulate the output.

Turbine Power Circuit



M Stepper Motor	NEMA11	
R Full Wave Rectifier	Vishay VS-2KBP005, Bridge Rectifier, 2A 50V, 4-Pin D 44	Stock no.: 468-1603
C Capacitor	Panasonic 4700?F 25 V dc Aluminium Electrolytic Capacitor, FC Radial Series 5000h	Stock no.: 315-0669
Vr Voltage Regulator	Magnatec L78S12CV, Single Linear Voltage Regulator, 2A 12 V, 3-Pin TO-220	Stock no.: 633-032

RS Components Stock Numbers