5 Watt

3dprintable Wind Turbine.

Product Liability Waiver

This agreement releases ‘3dp’ from all liability relating to injuries that may occur during the use of this Prototype Wind Turbine. By downloading the plans for this Prototype you agree to hold ‘3dp’ entirely free from any liability, including financial responsibility for injuries incurred.

The user acknowledges the risk involved in operating a product of this type. These include but are not limited to the release of high-energy debris or electric shock. The buyer participates voluntarily, and accepts all risks.

By downing these plans you understood and agree to the above terms.


nano T
3dp

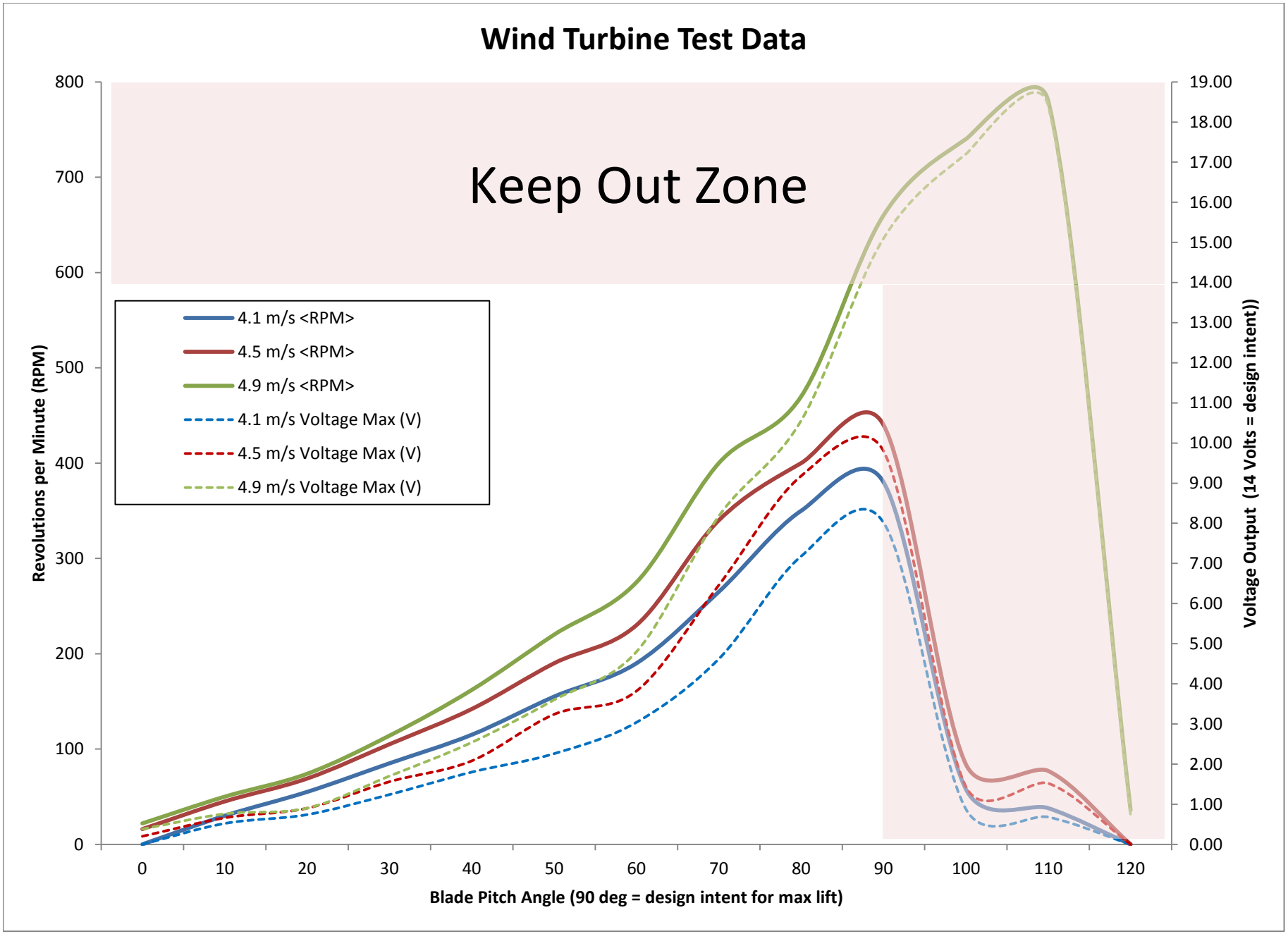
Introduction

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.

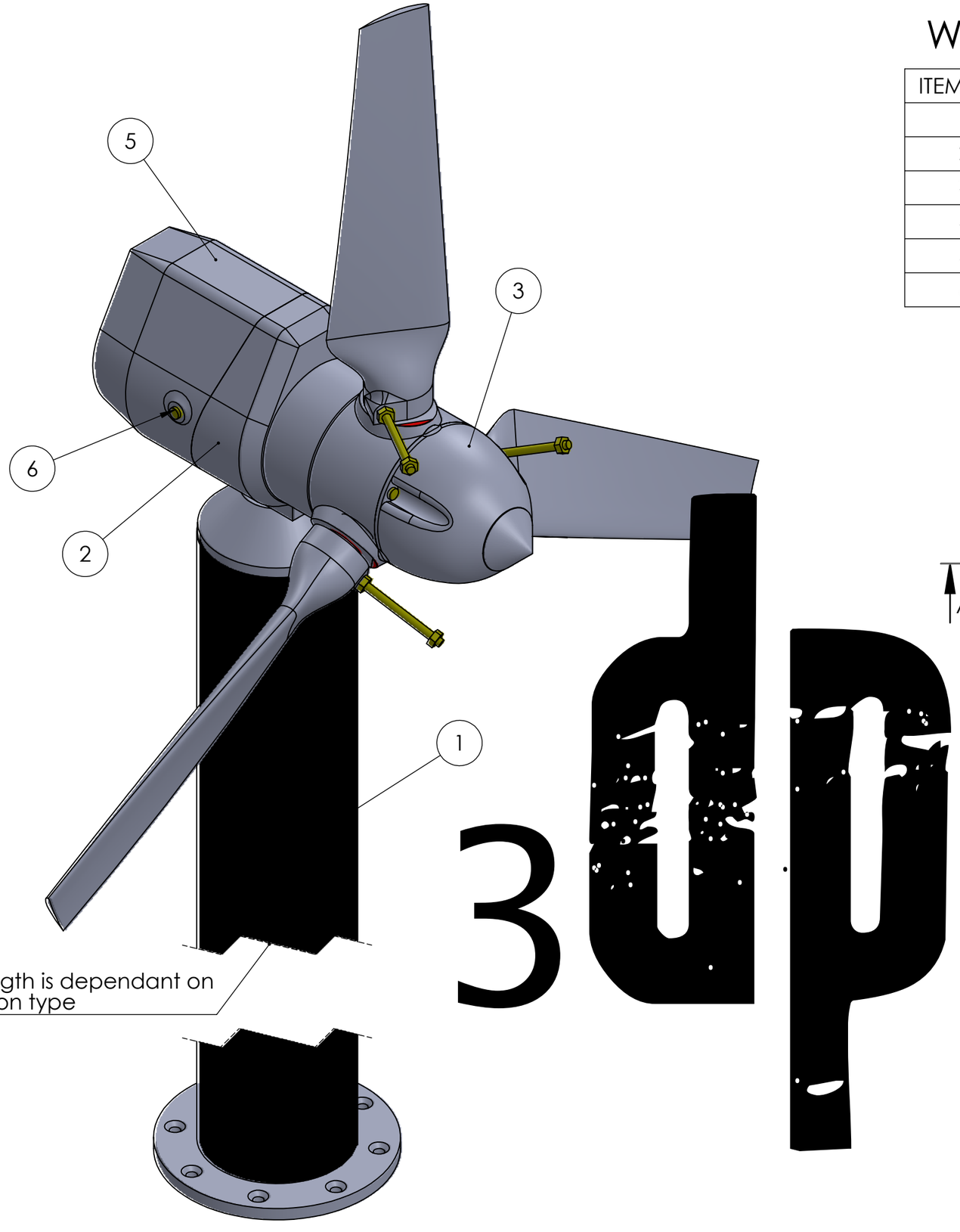
The wind turbine has been designed with a unique Passive Variable Pitch (PVP) design. The PVP maintains an optimum power output through control of the turbines rotational speed. Whilst optimizing power output the PVP also protects the Turbine from dangerous over speed conditions, limiting its maximum 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.

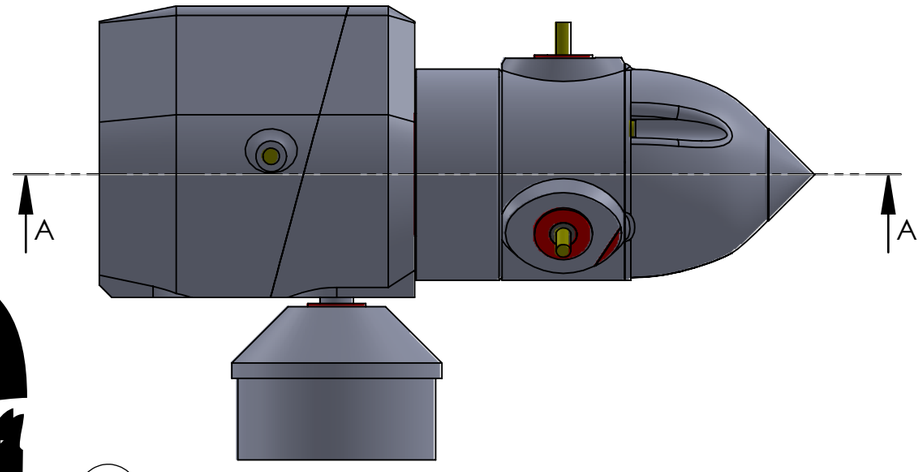

Wind Turbine Test Data
Keep Out Zone
4.1 m/s <RPM>
4.5 m/s <RPM>
4.9 m/s <RPM>
4.1 m/s Voltage Max (V)
4.5 m/s Voltage Max (V)
4.9 m/s Voltage Max (V)
Revolutions per Minute (RPM)
Voltage Output (14 Volts = design intent))
Blade Pitch Angle (90 deg = design intent for max lift)
0
100
200
300
400
500
600
700
800
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
11.00
12.00
13.00
14.00
15.00
16.00
17.00
18.00
19.00
0
10
20
30
40
50
60
70
80
90
100
110
120

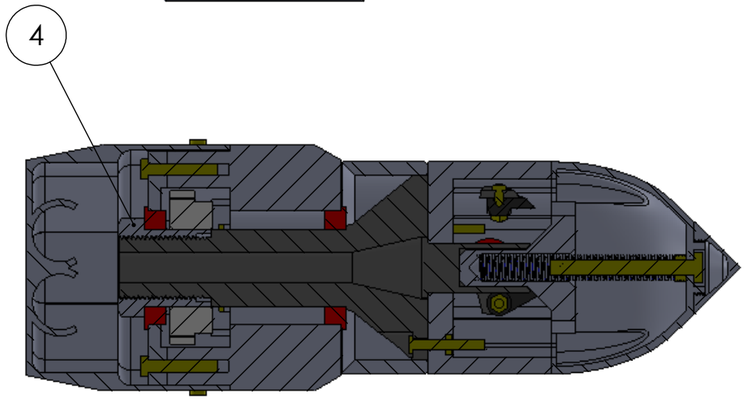
Wind Turbine Assy Drawing

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



Pole Length is dependant on
Installation type

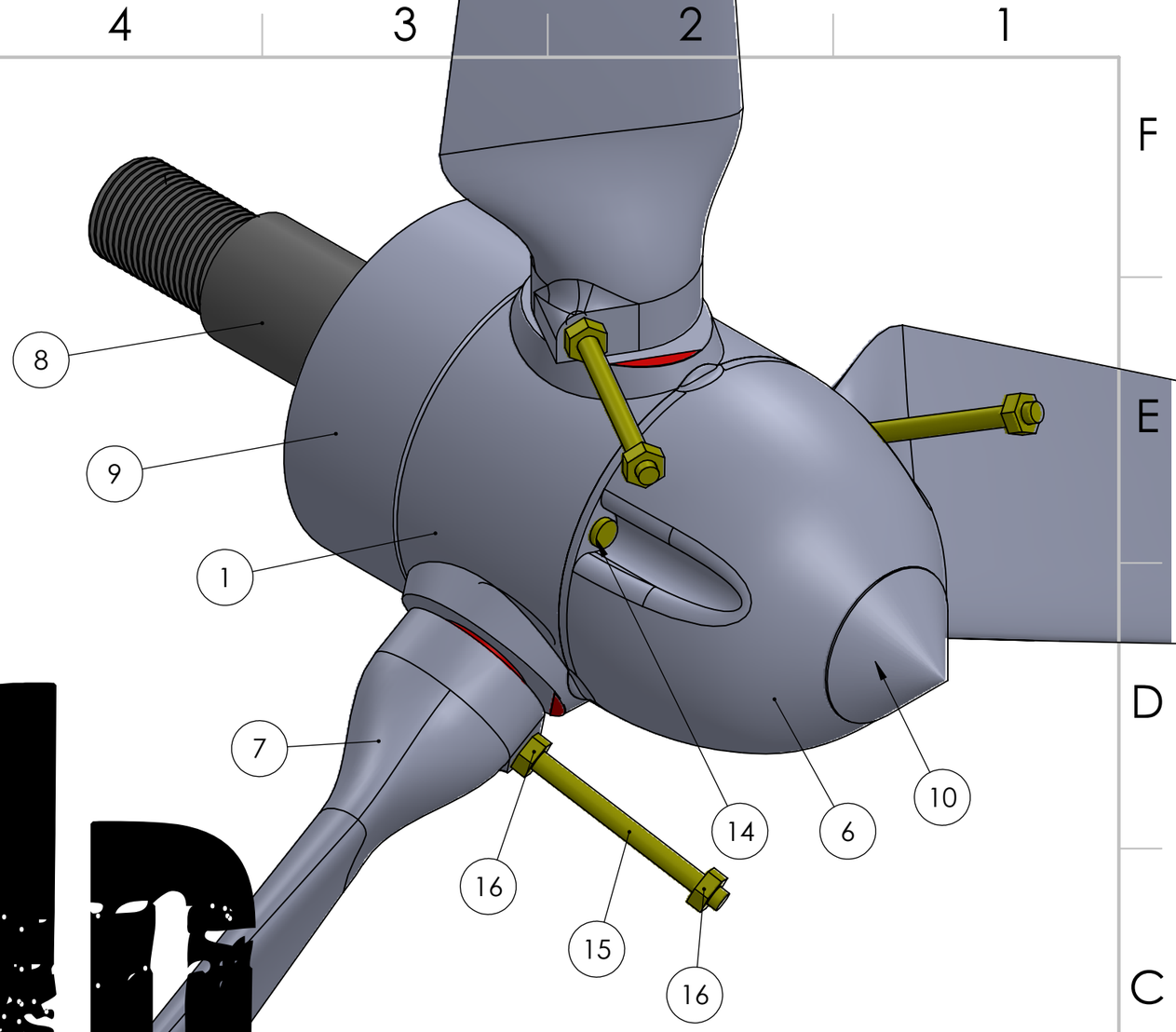


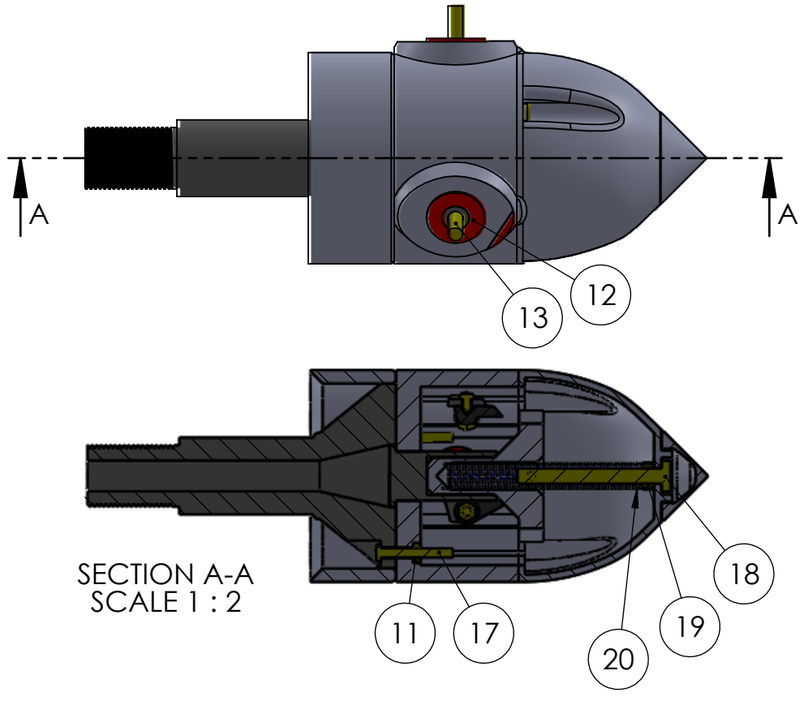


SECTION A-A
SCALE 1 : 2

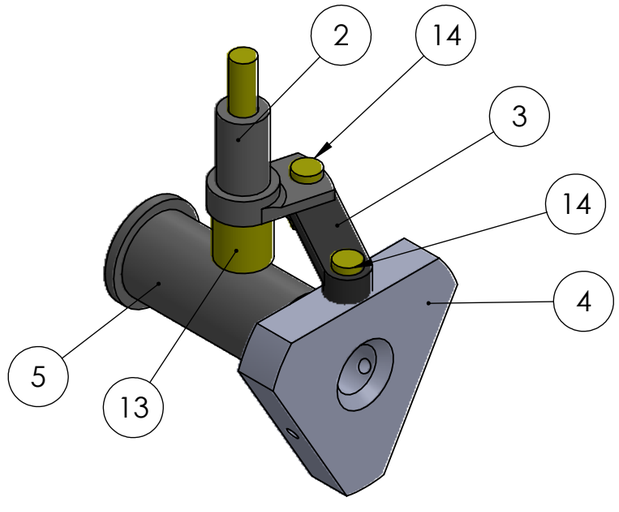
Rotor Assembly

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		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



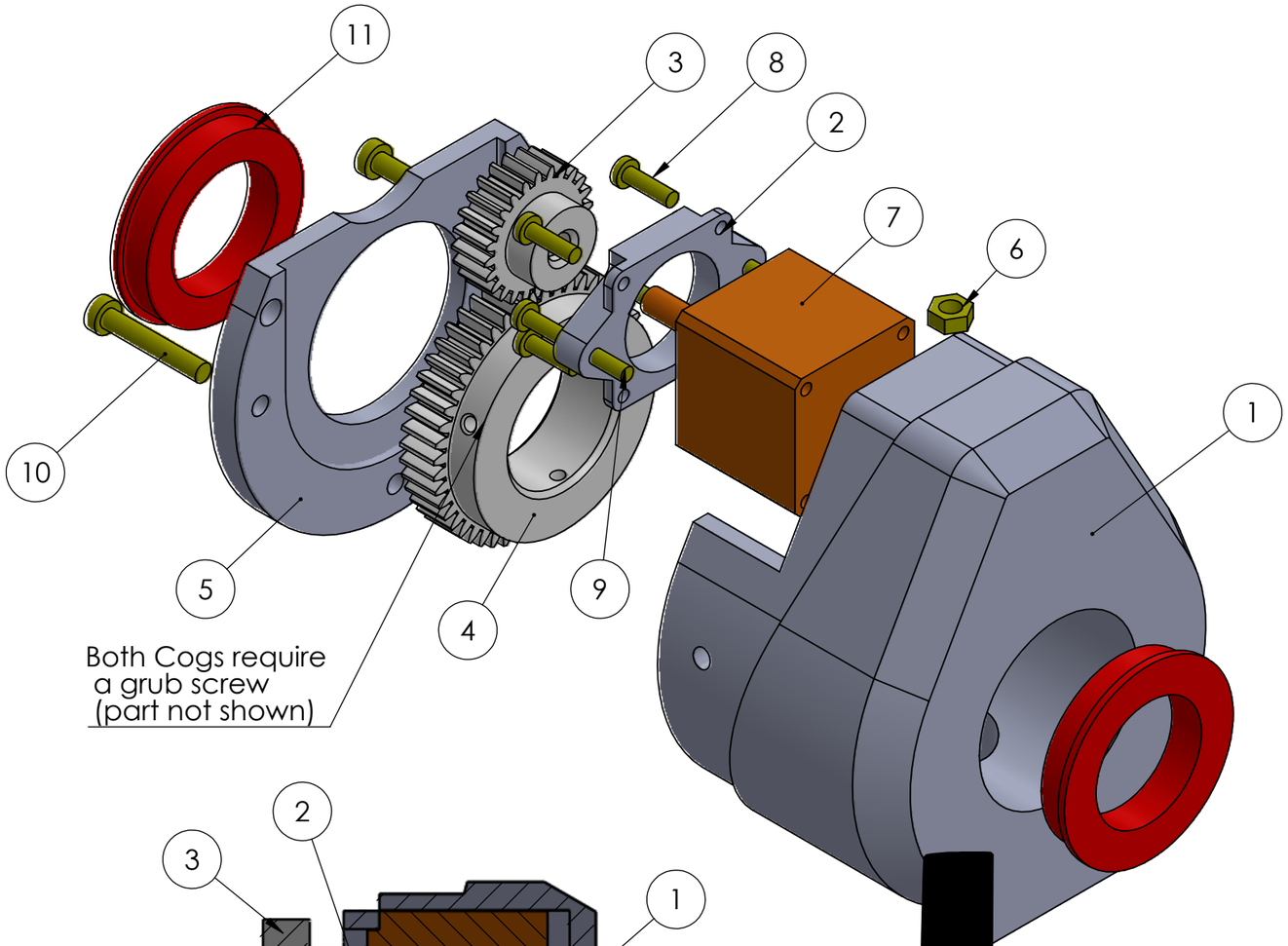


SECTION A-A
SCALE 1 : 2



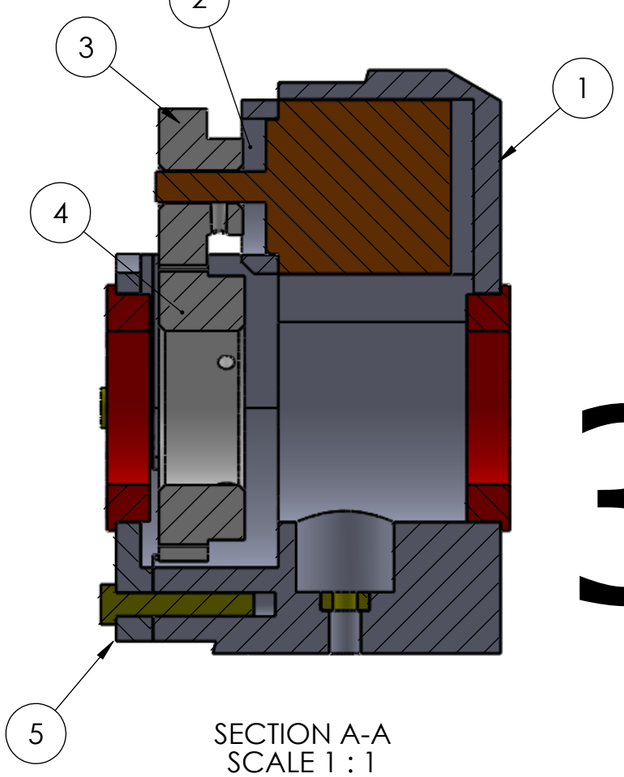
Structure assembly

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	M4 Nut		1
7	Stepper Motor NEMA11		1
8	M3 12mm		4
9	M3 25mm		2
10	M4 25mm		3
11	Main Location Bearing		2

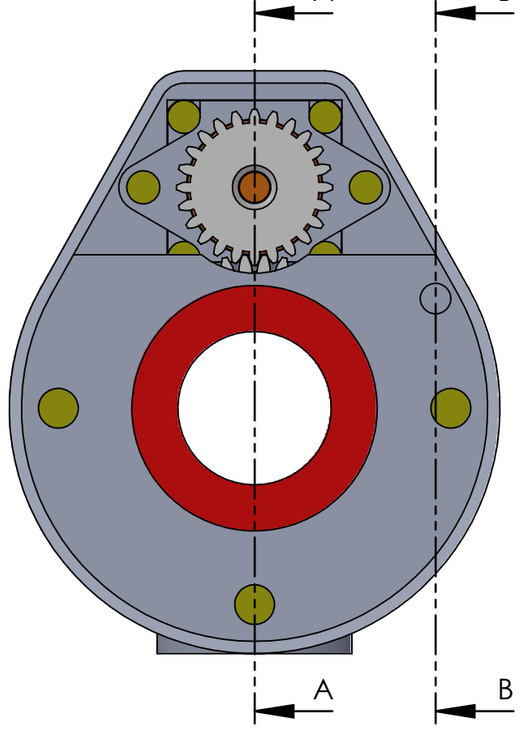


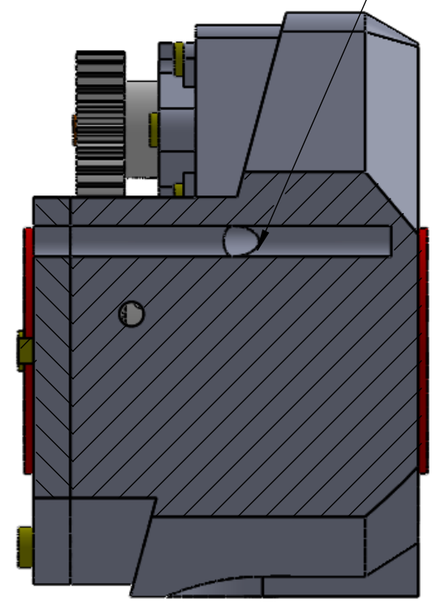
Both Cogs require
a grub screw
(part not shown)

NEMA Stepper motor wiring
routed here.



SECTION A-A
SCALE 1 : 1



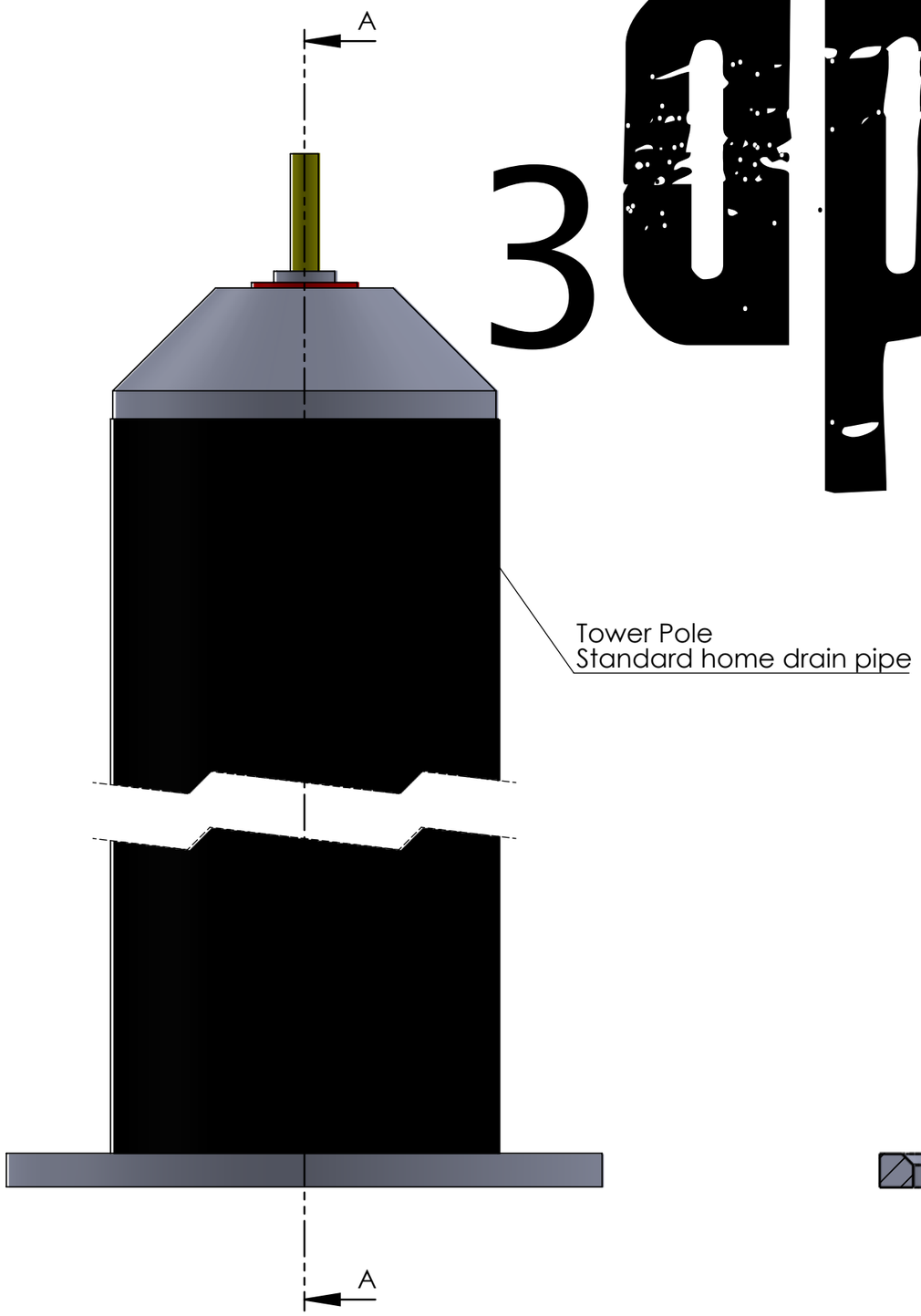


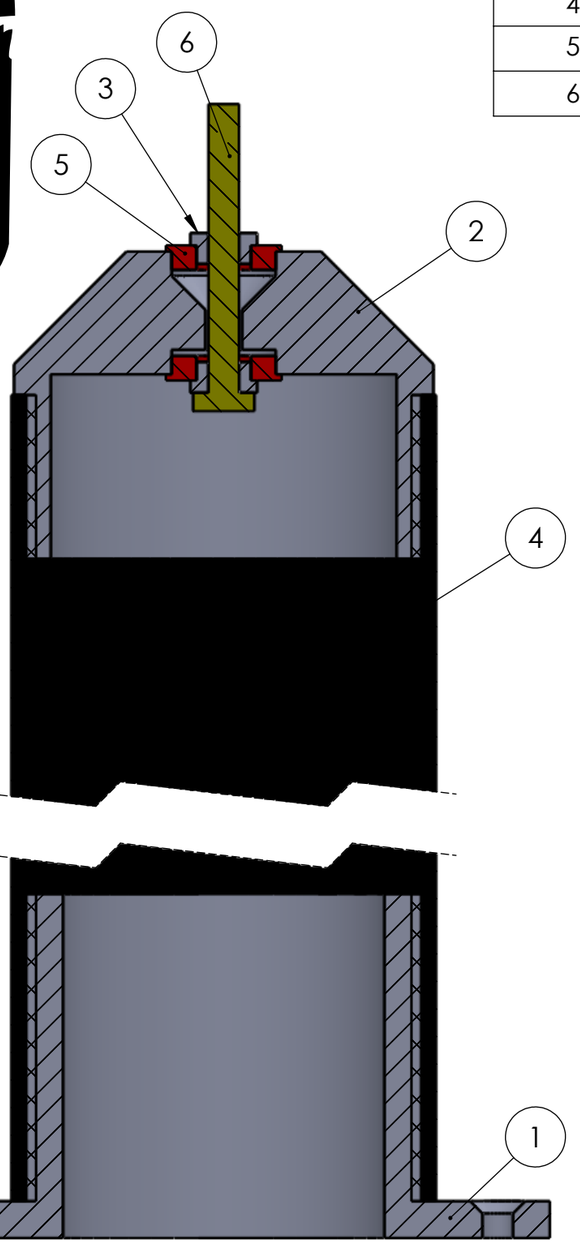
SECTION B-B
SCALE 1 : 1

3dp

Tower Assy Drawing

ITEM NO.	PART NUMBER	PRINTED	QTY.
1	Tower Footer	Y	1
2	Tower Header	Y	1
3	M5 Tower Shroud	Y	2
4	Tower Pole		1
5	Pitch Bearing		2
6	M5 50mm		1

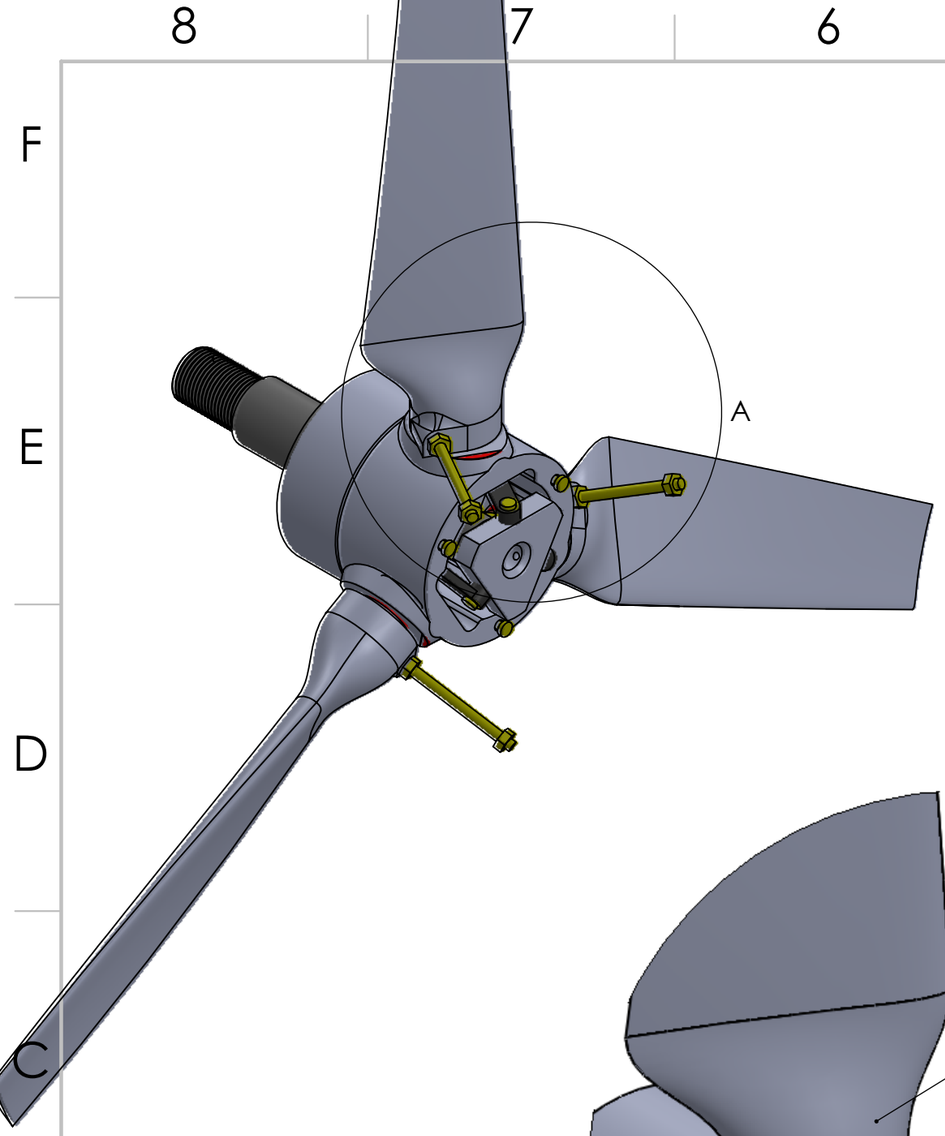


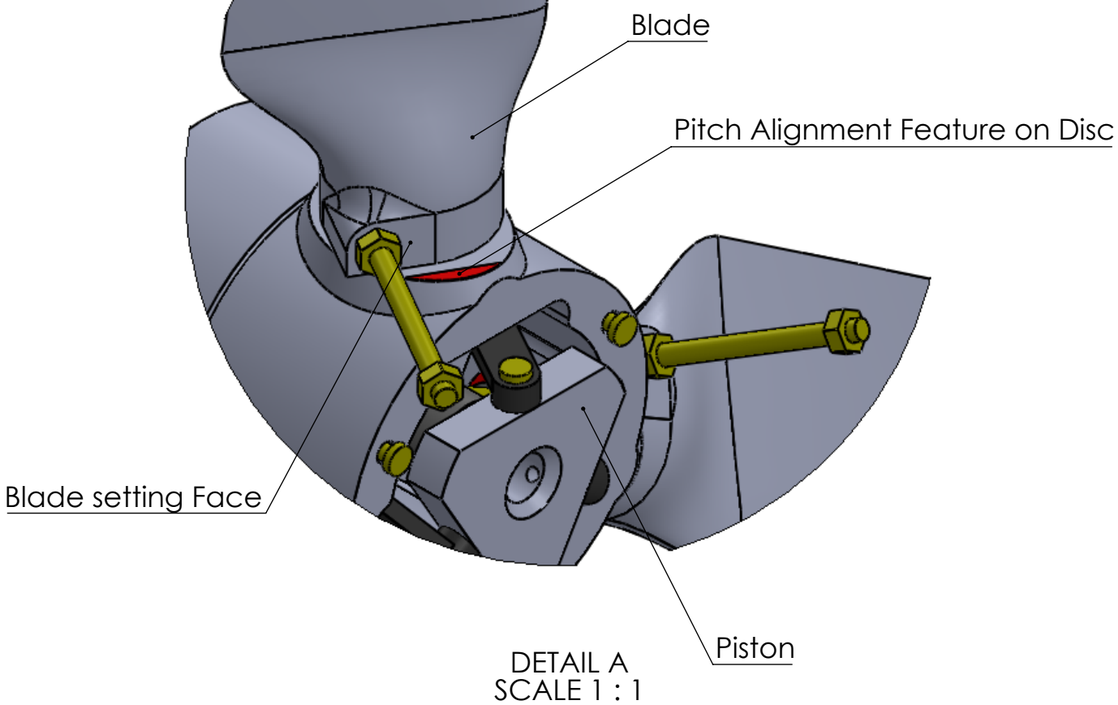


SECTION A-A
SCALE 1 : 1

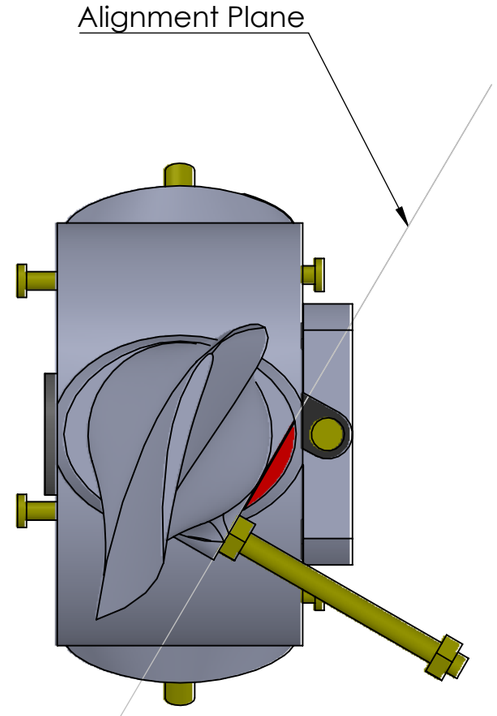
Blade Setting Instructions

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 attemps.
6	Repeat the operation for all Three blades

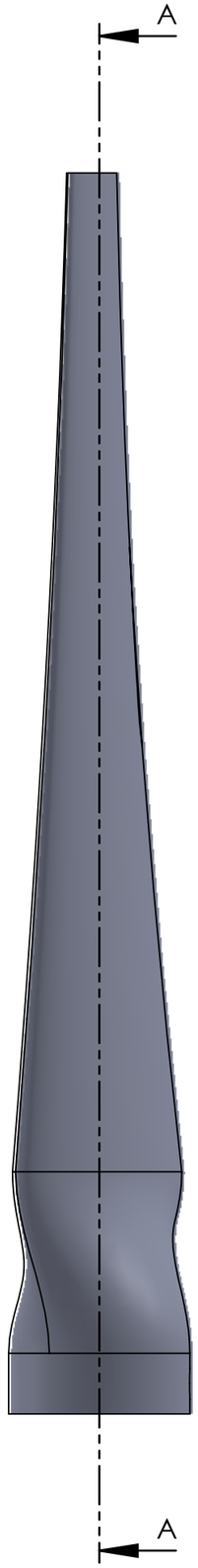


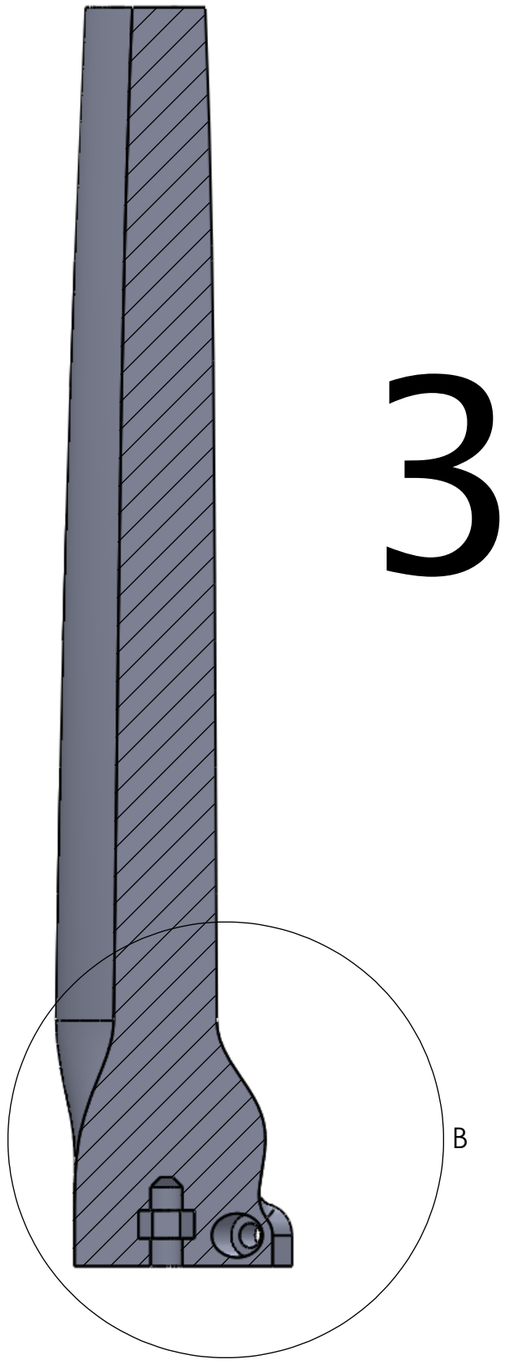


DETAIL A
SCALE 1 : 1

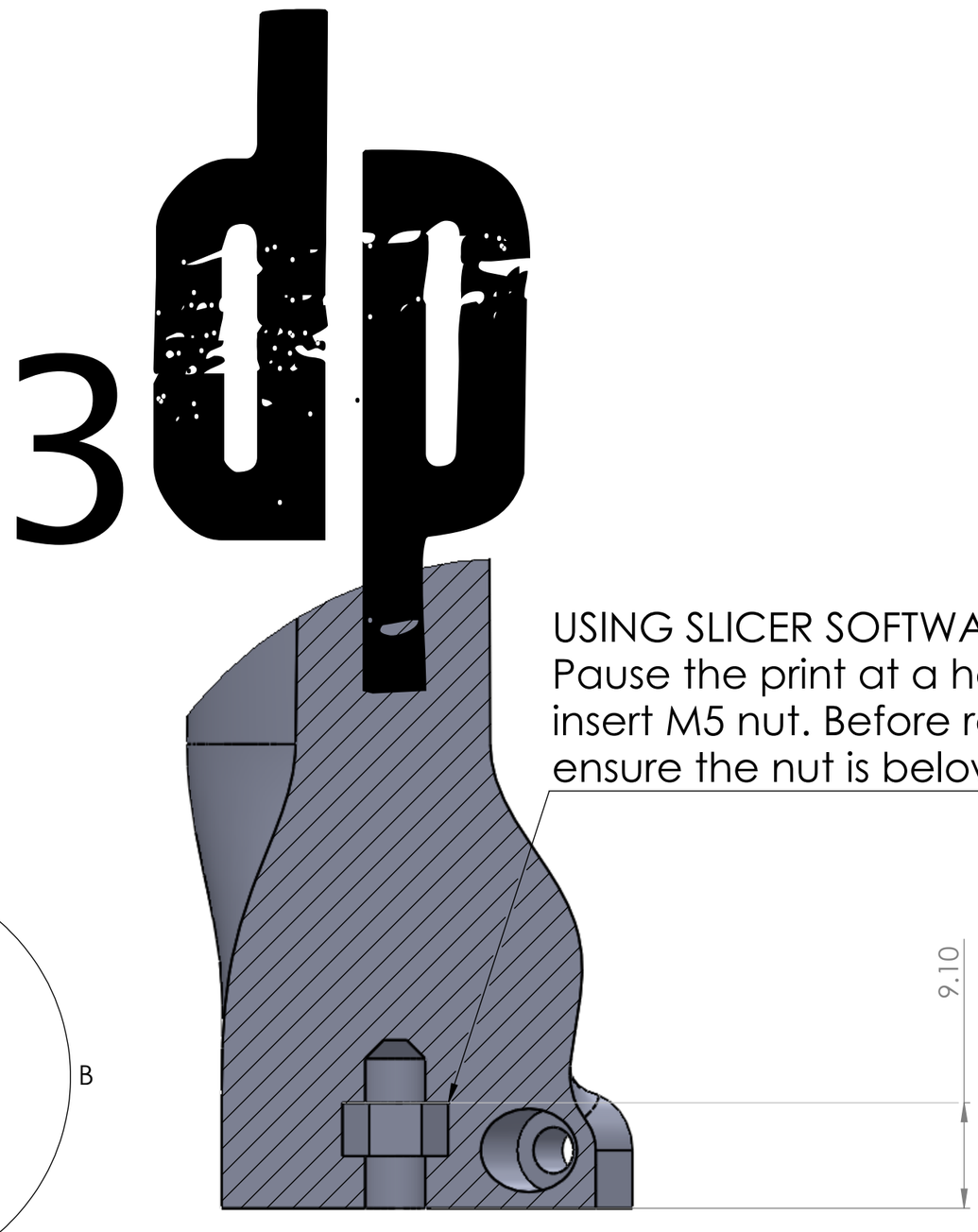


Blade Drawing





SECTION A-A
SCALE 1 : 1



DETAIL B
SCALE 2 : 1

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.

BILL OF MATERIAL - PRINT SETTINGS

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

* Component requires an embedded nut, see blade drawing.

					Print Settings			
Description	**Item No.**	**Part Name**	**Printed**	**QTY**	**Layer Height (mm)**	**Fill Density (%)**	**Print Speed (mm/s)**	**Support type**
Wind Turbine Assembly	4	Shaft Nut	Y	1	0.1	100	20	None
	5	Nacelle	Y	1	0.1	30	50	None
Tower Assy	1	Tower Footer	Y	1	0.3	30	50	None
	2	Tower Header	Y	1	0.3	30	50	None
	3	M5 Tower Shroud	Y	2	0.1	100	50	None
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
Rotor Assy	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
	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

BILL OF MATERIAL NONE PRINTED PARTS

Description	Item No.	Part Name	Printed	QTY
Wind Turbine Assembly	6	M3 12mm	N	2
	NA	Cable Gland M20x1.5**	N	1
Tower Assy	4	Tower Pole	N	1
	5	Pitch bearing	N	2
	6	M5 50mm	N	1
Structure Assy	6	M4 Nut	N	1
	7	Stepper Motor NEMA11	N	1
	8	M3 12mm	N	4
	9	M3 25mm	N	2
	10	M4 25mm	N	3
	11	Main Location Bearing	N	2
Rotor Assy	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
	NA	GrubScrew M3**	N	2

* Component requires an embedded nut, see blade drawing.

** Not Shown on Drawings

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

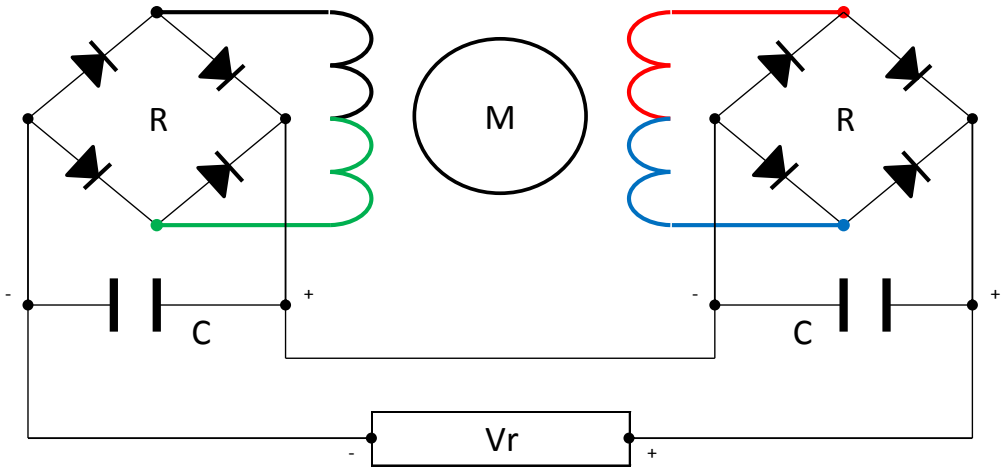
RS Pro Steel Alloy Compression Spring, 80.5mm x 8.63mm, 0.17N/mm

http://uk.rs-online.com

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