


# AS-80 & AS-160 Hybrid Street-light Installation & Maintenance Manual

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Product Details Summary		Manufacturer	Authorised Representative
Business Name:	<b>Flex</b>		
Full Address:	<b>Kilbarry Business Park, Dublin Hill, Cork Co. Cork Ireland T23 CV63</b>		
Model	Wind Turbine Terminals Rated Voltage:	IEC wind turbine class:	
<b>RPU</b>	<b>48 V</b>	<b>Class III</b>	
Serial Number	Battery Terminals Voltage:	reference wind speed, Vref	
<b>#####-S3</b>	<b>24 V</b>	<b>37.5 m/s</b>	
Production Month/Year	frequency range at the wind turbine terminals:	Wind Turbine Hub Height	
<b>MM/YYYY</b>	<b>0 – 80 Hz</b>	<b>8.132 m</b>	
Mass of Product	Rated Wind Power	Hub Height Operating Wind speed range, Vin – Vout;	
<b>490.55 kg.</b>	<b>300W</b>		
Operating Ambient Temp Range;	Rated Solar Power	CE Mark	
<b>-40°C to 85°C (TBC)</b>	<b>260W</b>		

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## Preamble

The contents of this manual are prepared as general information only in accordance with the obligations set out to attain CE marking. The information set out herein illustrates best practice as Airsynergy envisages. Please note that this manual does not constitute advice either expressly or by implication on Statutory Obligations, Health & Safety or other applicable laws or regulations. This document furthermore is not to be construed as advice on how to install or maintain individual products and in each instance a suitably trained and qualified, reputable installer/maintenance professional should be consulted, carrying their own professional insurance and employing the use of method statements and relevant risk assessment practices.

NB:

This manual shows the installation process using a multi-piece slip jointed and flange bolted pole tower. The 300W Generator and Solar Panel are sources of electrical power and must be installed in accordance with the relevant local and national regulations.

Incorrectly installed, operated or maintained RPU systems are capable of causing serious injury or fire. Installation, service and any maintenance work should only be undertaken by a suitably qualified installation & maintenance engineers.

Ensure that you have sufficient number of personnel to complement the handling and installation method used.

## Errors and Omissions Disclaimer

While every effort has been made to ensure the accuracy of the information supplied herein, Airsynergy cannot be held responsible for any errors or omissions.

The user of this information and product assumes full responsibility and risk.

Airsynergy assumes no responsibility for problems caused by unsafe or unsatisfactory installation, improper maintenance or operation.

Disclaimer: The information in this manual is believed to be correct at the time of publication. However, Airsynergy assumes no responsibility for any inaccuracies and/or omissions. All specifications are subject to change without prior notice. Please refer to the website for the latest version OR e-mail [info@airsynergy.ie](mailto:info@airsynergy.ie).

# 1 Introduction

## 1.1 System Description

In most instances the Renewable Power Unit (RPU) will provide 80W of LED lighting for 13 hours per day for 3 days, but it is designed to provide up to 160W of LED lighting. This is achieved by using a 300W wind turbine generator and a 260W PV panel. The RPU Wind-Solar hybrid street light uses highly efficient LED lights and battery technology coupled with smart power management techniques to satisfy consumer requirements. This software control can conserve energy by dimming the lights until there is a requirement for more light. It then increases the light for the period required. After the requirement is met it then dims the lights again. Please consider obstacles to wind and solar generation at the install location as these can affect the performance.


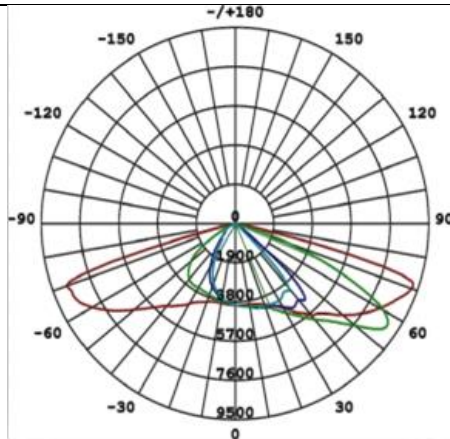
## 1.2 Systems Components

### Parts Manifest

Item	Description	Material	End of Life	Maintenance/Year
1	Enhancement Unit	Polycarbonate (Needs replaced if severely cracked)	Recyclable	Visual Inspection of Fixings and for Cracks
2	Generator	Aluminium, Steel, Copper, Magnets	Recyclable	None
3	Blades & Nose Cone	Glass Reinforced Polyamide (Needs replaced if cracked)	Recyclable	Visual Inspection of Fixings and for Cracks
4	Hub	Silumin alloy	Recyclable	Visual Inspection of Fixings
5	Bearing	Steel	Recyclable	Mobil EP-2 Grease
6	Pole	Steel / Q345C	Recyclable	Visual Inspection of Fixings
7	Controller	Aluminium Cover, Electronic Components	Contact local authority for recycling method	None
8	Wiring Loom (Safety System)	Copper, Insulation, Plastic Connectors (Needs replaced if damaged)	Recyclable	Visual Inspection for Cable Cuts & Tears Test Shutdown
9	3 Phase Slip Ring (Safety System)	Copper, Stainless Steel Cover & Connectors (Needs replaced if damaged)	Recyclable	Check Shutdown and Line to line resistance A-B:1.923Ω B-C:1.924Ω A-C:1.923Ω
10	Battery	Lead – Acid	Contact local authority for recycling method	None
11	PV Panel	Various (Needs replaced if damaged and efficiency fails significantly)	Contact local authority for recycling method	Clean & Visual Inspection of Fixings and for Cracks
12	LED Light	Various (Needs replaced if damaged and fails to light).	Contact local authority for recycling method	Visual Inspection for full operation and armature fixings
13	Nuts & Bolts	Various	Recyclable	Visual Inspection for Tightness

Parts Manifest

### 1.3 System General Specification

Part	Specification	Value
<b>Electrical</b>		
<b>LED Street Light (1 or 2)</b>	Power Rating	80W or 160W
	IP Rating	IP 68
	Double modular LED Street Light with	-
	LUMILEDS Luxeon T 110 +/- 51m/w	Yes
	Input	24V DC
	CCT 5700K	
		
	Beam Angle Batwing, IP Protection IP 67	
	LED Driver	Yes
	Cover	Grey
	Driver and dimming control within the light	Yes
	Driver for both ICD 120DM-120	Yes
	With terminal block for connection to driver inside the light	Yes
	Driver with PWM dimming input	Yes
<b>300W Generator x 1</b>	Rated Power	220-300 W
	Rated Voltage	48 V
	Rated RPM	400 RPM
	Efficiency > 80%	>80 %
	Shaft	304 Stainless
	Bearing with oil seal	Yes
	Finish (Anodised + Painted finish) :	White
<b>Solar Array Panel x 1</b>	Rating	260 W
<b>(Option 1 - EU)</b>	Length	1640 mm
<b>(Option 2 - US)</b>	Height	922 mm
	Thickness	35 mm

Part	Specification	Value
<b>Electrical Continued...</b>		
<b>Hybrid Charge Controller x 1</b>	Battery voltage:	24 V
	Maximum power for Wind:	1500 W
	Maximum Power for PV:	500 W
	Load Output Power:	500 W
	Maximum Voltage for Turbine:	200 V
	Light Load control by Time.	Yes
	Light Load control by Sensor of Solar Panel.	Yes
	Supports motion sensor & 0-10V and PWM dimming LED drivers	Yes
	Supports Battery temperature compensation	Yes
	Real Time Clock	Yes
	Grid Support Optional	Coming Soon
<b>Storage Battery x 2</b>	Normal Voltage	12 V
	Capacity	230 AHr
	Weight	70 kg
	Length	520
	Width	269
	Height	210
<b>Slip Ring x 1</b>	Outer Diameter	54mm & 38mm
	Length	85mm
	Circuits	3
	Current / Circuits	30 A
	Voltage	<250 V
	Max Speed	300 RPM
	IP Grade	IP68
	Temperature	-40°C to 85°C
	Humidity	10% to 85% RH
<b>Dump load:-Aluminium Housed x 2</b>	Wire wound Resistor	1000 Watts, 10 Ohms, +/- 5%
	The length of the fly lead is	1000mm
	Size:	L335 x W70 x H45 mm
<b>Mechanical</b>		
<b>Enhancement Unit (half) x 2</b>	Material	Polycarbonate
	Outside Dimensions L x W x H	365mm x 1798mm x 1786mm
	Mass	23.5 kg
<b>Tail Fin x 1</b>	Tail Fin Material as drawing 00031-A - RPU plastic tail fin	8mm Anti-UV Clear Polycarbonate

Part	Specification	Value
<b>Electrical Continued...</b>		
<b>Rotor :- x 1</b>	Blade Material	Glass Reinforced Polyamide
	Blade Diameter	1750 (TBC)
	Hub Material pressure die cast silumin alloy	(EN-AC- Al Si12 Cu1 (Fe))
	Temperature range:	-40°C to +110°C
<b>Upper Pole x 1</b>	Steel Grade	Steel / Q345C
	Length	1924mm +/- 1mm
	Mass	26.31 kg
	Finish	Galvanised S355 JO Steel / Q345C Steel
<b>Bearing SD 702-010 Rev E x 1</b>	Tilting Moment (Max.)	13.5 kN.m
	Static Axial Rating	133 kN
	Static Radial Rating	53 kN
	Dynamic Axial Rating	32 kN
	Dynamic Radial Rating	28 kN
	IP Class	IP54
	Temperature	-40 - + 80 C
<b>Main Tower x 1 (2 Parts)</b>	Steel Grade	S355 JO Steel / Q345C
	Length	6132 mm
	Finish	Galvanised S355 JO Steel / Q345C Steel
<b>Solar Bracketing Assembly x 1</b>	Steel	S235 JO Steel
	Finish	Galvanised S235 JO Steel
	Mass	23.93 kg
<b>RPU Cradle x 1</b>	Steel Grade	Galvanised S235 JO Steel



## 1.4 Operating Parameters during Normal Operation Windows

WIND ENERGY (Permanent Magnetic Generator)	
Rated power output	300W
Rated wind speed	9 m/s
Cut In wind speed	2 m/s
SOLAR POWER	
Number of panels	1
Rated power	260W
Panel size	1640mm x 922mm
LED LIGHTING	
Number of lights	1
Wattage	80W
Lumens	8000 +/- 400lm
Light colour	Cold white
CONTROL SYSTEM	
Controller	Airsynergy Hybrid Controller
Output voltage (to battery)	24V
Location	Inside pole
RECHARGEABLE POWER SOURCE	
Type	Absorbent Glass Mat
Number	2
Capacity	230Ah
Location	Inside pole
TOWER	
Material	Steel
Finish	Galvanised
Powder coating	Optional RAL colours

Could also encompass 2 lights @ 80W each.

## 1.5 General Health & Safety Information

This section outlines general health and safety guidelines that have in the past been safely and successfully followed during installations of the RPU. As such it does not attempt to cover every issue which may arise in relation to the subject. It, furthermore, does not purport to be a legal interpretation of any statutory provisions in your region and consequently, responsibility cannot be accepted for any liability incurred or loss suffered as a result of relying on any matter expressed or implied herein. The health and safety regulations required in your region should always be followed.

### Installation & Maintenance Safety

To help continue to reduce health & safety risk, note the following general health & safety points;

- Follow the health & safety regulations as required for your region **including the use of PPE Gear**.
- Avoid working if weather conditions include hail, fog, ice and especially lightning and high winds.
- Identify, control, report hazards and keep the installation site and place of work safe & tidy.
- Prevent any improper conduct or behaviour likely to increase risks.
- Regularly check our websites and follow updates to this manual that further reduces risks.
- Always wear protective clothing and equipment where necessary.
- Ensure there is a safe means of entering and leaving the installation site.
- Follow the safe system of work practices outlined here-in.
- Always read the appropriate information and ensure that you are appropriately trained.

### Hydraulic Ram Warnings and Safety Precautions

Inspect in accordance with national and local regulations also checking for damage prior to each use and replace/repair damaged/worn parts immediately, as per manufacturer. **Refer to the hydraulic ram owner's manual for details on maintenance and operation.** Use caution and common sense when using this product, as it is impossible to cover all conditions and situations that may occur.

**WARNING** : Never leave the ram unattended while supporting the tower. When lowering the tower never allow it to descend at a high speed, it could cause damage to parts when slowing or stopping.

### Turbine Start-up Operation, Failure & Safety

Once the RPU is commissioned by a suitably qualified installer, the operator may start-up by turning the 'On/Off/Short' switch to the left ('On Position'). The operator must be observant of any unusual vibrations/sounds. Please see our noise declaration analysis in Appendix F. Finding erratic system behaviour during operation **may indicate a failure**. If any of the aforementioned are observed, shutdown the system immediately and assess the problem. Record the event in the 'Log Book'.

**WARNING**: If no obvious solution is found, contact your authorised representative for assistance.

You may notice the following behaviour during normal operation:

#### Un-Loaded Operation

The turbine will not begin to charge the batteries until the rotor is spinning at approximately 350 RPM. When operating below this speed, the turbine will be unloaded and will be freewheeling. Once the turbine output voltage becomes equal to the nominal battery voltage (at around 350 RPM) the turbine will become 'loaded' and begin to deliver current to the batteries. During the 'Un-Loaded' stages of rotation, the rotor blades rotate very freely. This allows the rotor to build up speed and allows aerodynamic lift to be generated by the blades.

#### Normal Operation

Once the rotor is spinning at 350 RPM, current will be delivered to the batteries. As the rotor speed increases, so too, will the current and voltage. Excessive wind speed may increase the battery voltage to a high level. Once this happens, the 'Airsynergy Hybrid Controller' will recognize that the battery voltage is too high, and switch part of the turbine output to the dump load.

### **Charge Regulation**

Once the charge controller has switched over to the dump load, the turbine will no longer be charging the batteries. Instead, the power from the turbine will be delivered to the dump load (The built in resistive heater element) and the turbine rotor may seem to rotate more slowly. The battery voltage will begin to drop to normal levels during the regulation period.

Once the battery voltage is back within acceptable limits, the charge controller will switch the turbine output back to charge the batteries. Refer to the charge controller user manual for specific operational instructions.

### **Emergency Shutdown & Safety**

In case of emergency the procedure is simple. Open the access panel and turn the 'On/Off/Short' switch to the 'Short' position, two clicks clockwise from the 'On' position and **securely close** the access panel as per chapter 10. By activating the 'Short' position the output from the wires of the turbine are 'shorted' together. This effectively puts an infinite load on the generator causing the turbine to stall. The rotor may rotate slowly in high winds, but speed will not build up significantly.

**WARNING:** It is not recommended that the 'Short' position be activated while the rotor is spinning at very high speed. This sudden braking action will stress the blades and other components. It is recommended to activate the 'Short' position before high winds occur or during a "lull" when the rotor is not spinning excessively fast (not following this warning, may violate your warranty). Failing to secure the access panel could result in unauthorised access.

### **High Winds**

Every effort has been taken to ensure that the RPU will withstand the forces exerted by strong winds. However, the raw power in high winds is immense, and the stresses placed upon the turbine are magnified by gusty and turbulent conditions. The rotor blades may rotate slowly during the shutdown period, but the forces exerted will be greatly reduced during strong winds. One should protect the turbine from extreme winds as you would protect other items of your property.

**WARNING:** Where possible, the turbine should be shutdown in advance of particularly strong winds and storm conditions. This will decrease the wear and tear, also helping to avoid a failure. Never allow the turbine to run un-loaded with no connection to a battery bank or dump load. Doing so will allow open circuit voltages to be generated by the turbine. These voltages may be dangerous and will damage the stator coils within the turbine.

### **Electrical Installation**

Please refer to the wiring diagram for the RPU, as there may be different ways of wiring other small Wind turbines, photovoltaic panels, charge controllers and batteries together. Do not make any modification to the RPU system. The electrical wiring of the RPU electrical systems must be done in accordance with national and local electrical codes and regulations.

**WARNING:** Follow carefully the instructions in this manual and do not connect the turbine or batteries during the installation until instructed to do so. Ensure that the turbine is not running or connected to the batteries during the installation or wiring process. Connect the output wires of the turbine together to prevent the rotor from starting.

### **Protect the Cables**

Also use the braided mesh cable supports to prevent mechanical strain on the transmission wires running down the tower from the turbine by hooking the braided mesh cable support to the inside of the tower. Failure to do this will result in excessive mechanical strain on the slip-ring assembly connections and may cause a failure.

**WARNING:** The power transmission wires must be protected from mechanical damage and fatigue.

### Required Maintenance

The operator can manually shutdown the wind turbine at any time if necessary for scheduled or unscheduled maintenance etc. There is no unscheduled automatic shutdowns in this system, however, the system can temporary stop the turbine by engaging the dump load during high winds. Manual stops for service, maintenance or repair should also be recorded in the 'Inspection & Maintenance Log Book'. Where the operator has stopped the turbine because of a suspected fault, the operator shall investigate and report the cause before the wind turbine is restarted.

Please use the 'Inspection & Maintenance Log Book' to record the findings of each of the following;

- Wind Turbine Identification (From Identification Plate),
- Total Energy Produced (From Controller),
- Total Operating Days (From Controller),,
- Current Shutdown Hours,
- Date and Time of Fault Reported,
- Date and Time of Service or Repair,
- Nature of Fault or Service,
- Action Taken,
- Parts Replaced.

**WARNING:** Always consult the 'Authorised Representative' as identified on Page 2, before replacing parts to ensure that you actually need to replace them, the correct parts are used and the warranty is maintained if applicable.

### 1.6 Tools & Safety Equipment Required

Item	Tool Description		
1	Spanners	16	ThreadLoc Glue
2	Torque Wrench	17	Bearing Grease
3	Screw Drivers – Flat Head and Philips	18	Grease Gun
4	Ratchet/Ratchet Sockets	19	Hard Hat
5	Allen Keys	20	Steel Toe Boots
6	Loctite Glue	21	Electrical tape
7	Multi-meter	22	Cable Wire/Fishing Tool
8	Wire Snips	23	Safety Glasses
9	Measuring Tape	24	Wire Strippers
10	Power Tools - Drills	25	Spirit Level
11	Cordless Impact Drill	26	Socket Extensions
12	Tube Silicon	27	Heat Shrink
13	12V Power Supply	28	Silicon Gun
14	Cable ties	29	BondLoc High Strength ThreadLoc 50ml
15	Triangular Socket Key	30	2x Clamping Roller Trolleys

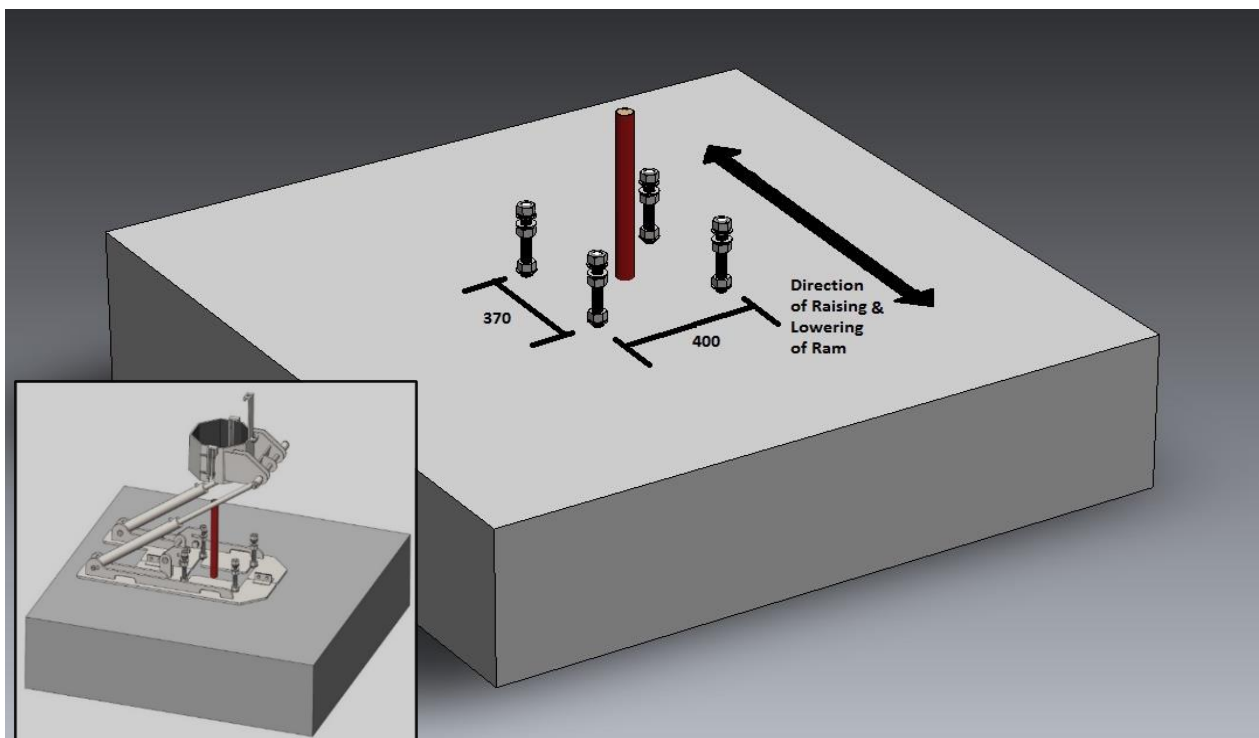
## 2 Illustration of Foundation, Raising System & Raising the RPU Streetlight.

### 2.1 Foundation

It shall be the responsibility of the customer's suitably qualified installer to provide a pad foundation that shall be designed and sized by a suitably qualified structural/civil engineer.

**WARNING:** Please consider obstacles to wind and solar generation at the install location.

The design shall enable the transfer of the loads to the ground through the 4 holding down bolts specified. The items that shall be considered for the pad foundation design **shall include but shall not be limited by** the design loads on the RPU, the Mass of the RPU, the load bearing capacity of the ground, a survey assessment by a civil engineer, whether the hydraulic raising system is suitable for use at the install location and for the particular pad foundation being used.



*Foundation with Raising System inset (For Illustration Purposes ONLY)*

### 2.2 Operation

***Please, when necessary, reference assembly 00382A exploded view & B.O.M. on page 15 for part description and part no referencing.***

Place the RPU Hydraulic Ram Base LHS & RHS (00370P & 00406P) in position as shown in the diagram opposite for the Foundation Anchor Plate Design Close-up and aligned as illustrated in the diagram above Foundation with Raising System inset. Bolt these together using the fixings provided. Use the holding down nuts and washers on the bolts to secure the RPU Hydraulic Ram Bases to the foundation. Install RPU Twin Ram Hinge Extension Pieces (Part Nos 00372P and 00373P) with RPU Ram Clevis Pin (00378P) and bolts for connection to lugs on the underside of base plate flange. Connect both Double Acting Hydraulic Rams (00376A) to the anchor plate as shown opposite ensuring that all hoses and hose connections are not obstructing the movement of the pole.

Place the RPU Collar Front & Rear (Part Nos 00380P & 00381P) around the pole using RPU Hydraulic RAM Collar Support (00411P) to support RPU Collar Front (00380P) initially if necessary and then rest

RPU Collar Rear (00381P) on to RPU Collar Front while fixing together using the bolts provide to clamp around the pole. Align the eyes of the rams (one at a time) with the holes in 00380P to receive 30.25mm diameter RPU Ram Clevis Pin (00378P).

**WARNING:** Ensure that all pins have been secured with their relevant R-Clips.

If raising the RPU,

- 1) Ensure the base, levelling nuts and washers are at the correct height as per drawing 00272A and level to receive the pole baseplate. Have the remaining nuts and washers ready for placing on the holding down bolts when the pole is raised into position.
- 2) Connect the hydraulic hoses between the rams and the hydraulic pump. Have a suitably qualified person check all the hydraulic connections and the bolt fixings. Check the vicinity that there are no tools or obstructions near any moving parts.

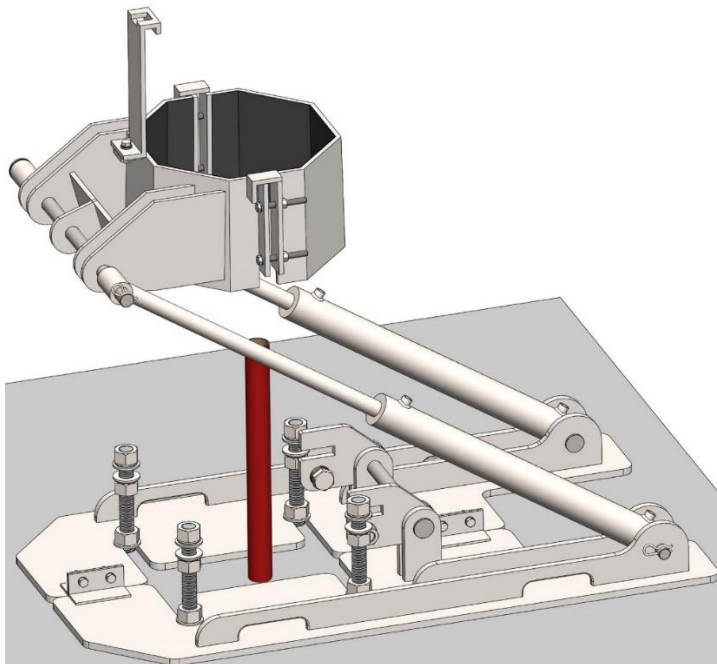
If lowering the RPU,

- 1) Ensure the base is at the correct height as per drawing 00272A and carry out point 2) above and gently take the strain of the RPU Pole without damaging the bolts.
- 2) Loosen and remove the top holding down nuts and washers.

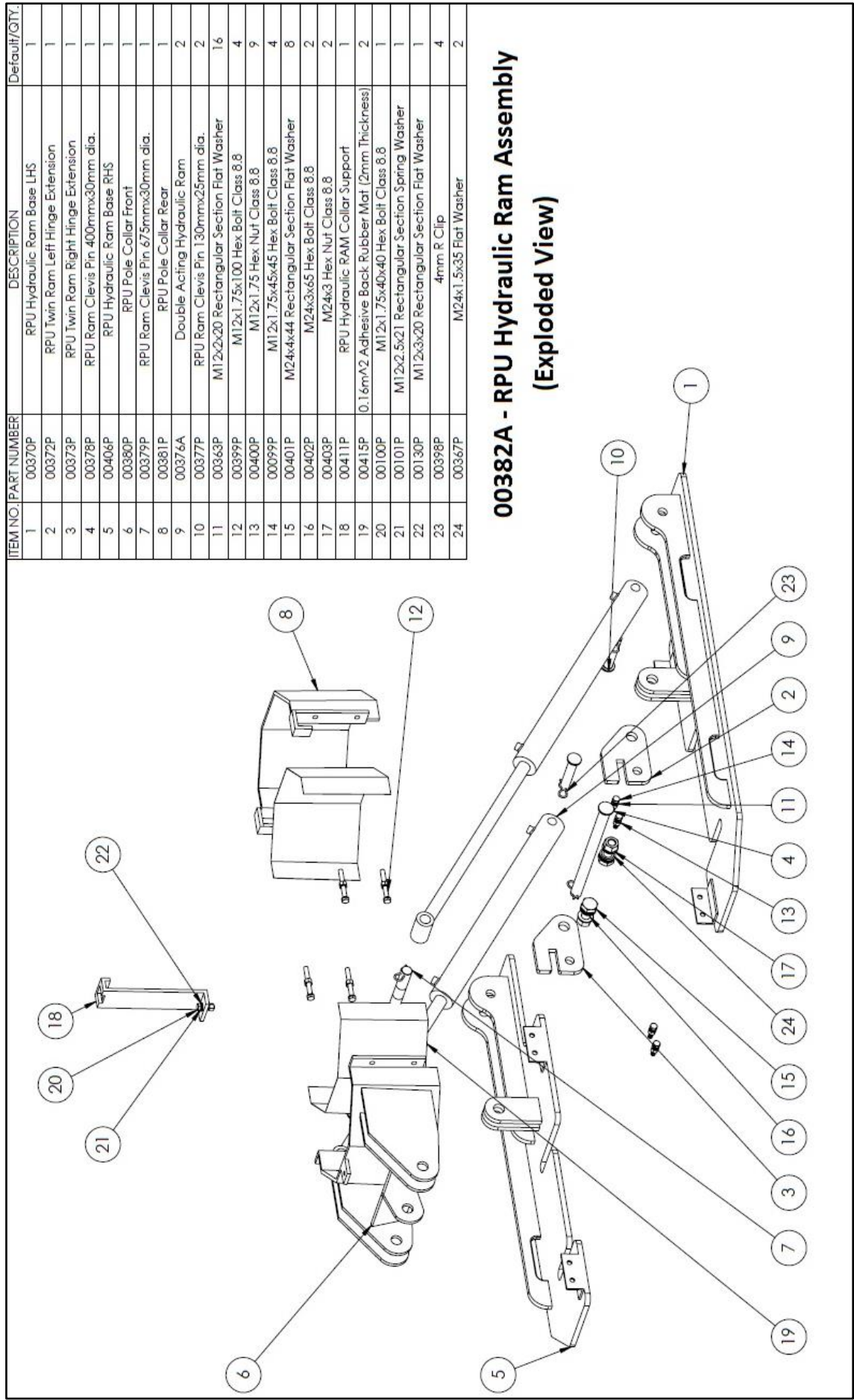
**WARNING:** Finally, before using the lever switch to raise or lower the tower, carry out these final checks of your environment ensuring that;

- no unnecessary persons are in the vicinity of the RPU when it is being raised or lowered.
- a wind speed assessment has been made by a suitably qualified engineer and that the winds are low enough not to interfere with the raising/lowering of the RPU.
- no person is standing in a position of danger relative to the RPU during this process.
- the RPU is ready for raising/lowering.

If all is clear, and the RPU is ready, raise/lower the RPU into position slowly. Once it is in position secure it with the washers and nuts on the holding down bolts. Check the levels afterwards and adjust and tighten the nuts to the required torque settings, in the table at the back of this manual, in order to level and secure the RPU.



*Foundation Anchor Plate Design Close-up Pole Hidden (For Illustration Purposes ONLY)*

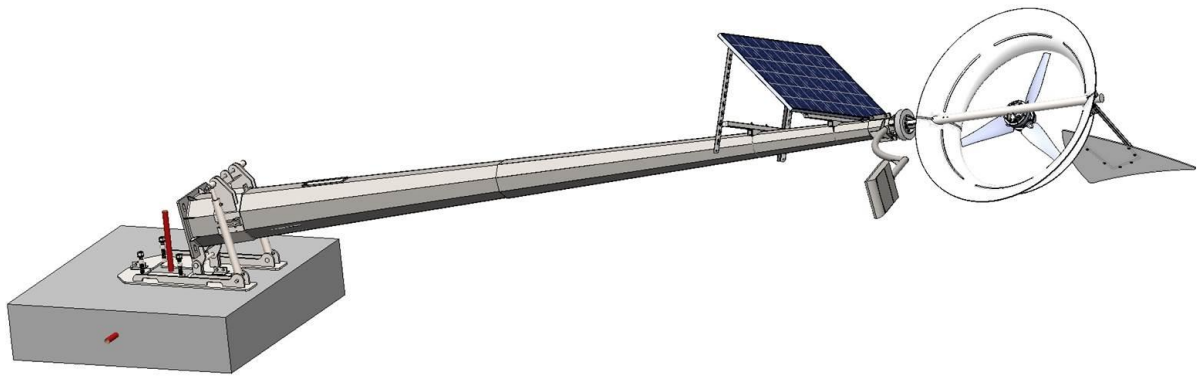


**00382A - RPU Hydraulic Ram Assembly  
(Exploded View)**

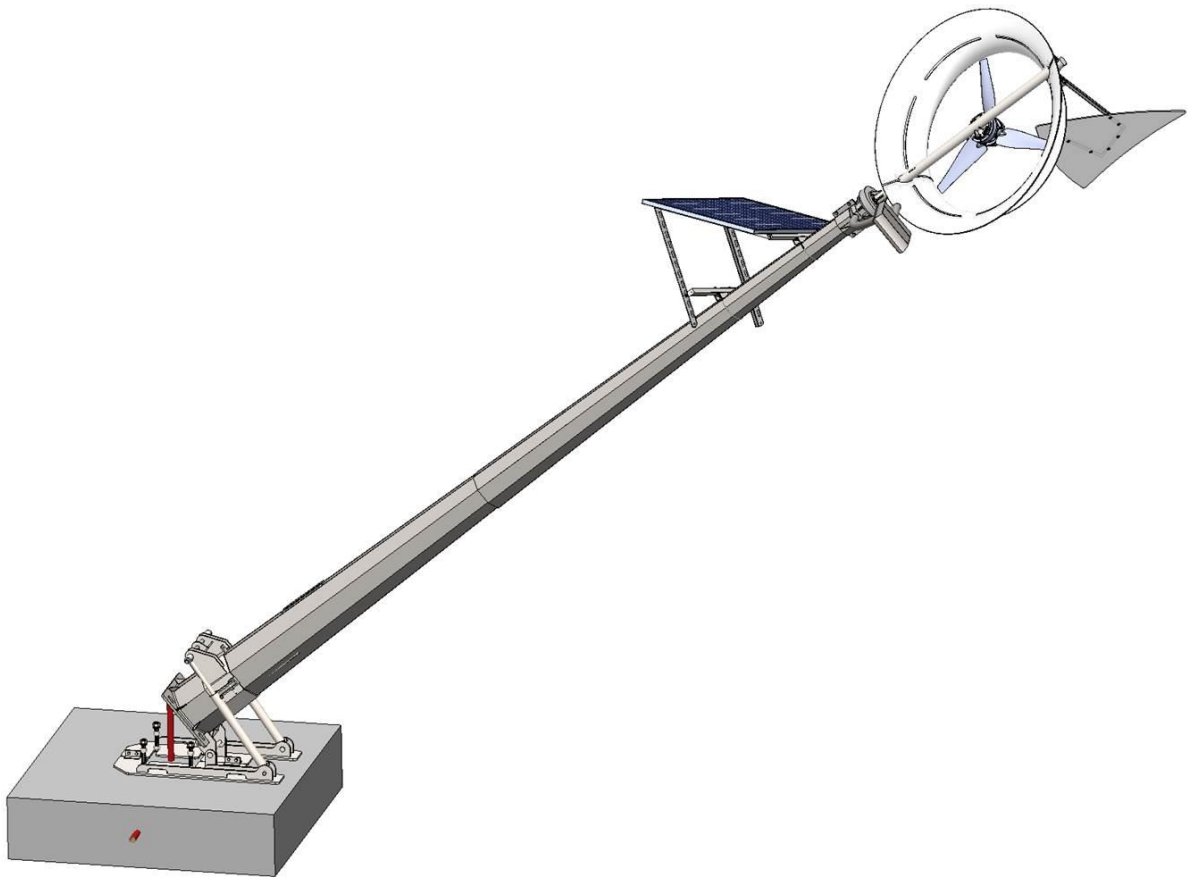
00382A – Hydraulic Ram Raising System (Exploded View & BOM)



## 2.3 Mechanical Installation Stages



*15 degrees for assembling RPU Parts (For Illustration Purposes ONLY)*



*45 Degrees Mid. Hoist (For Illustration Purposes ONLY)*





*Raised RPU (For Illustration Purposes ONLY)*

### 3 Mechanical Installation (Main Tower Assembly)

Use a compass to determine North-South and mark the direction of the Light and Solar on the ground for future reference. Use two roller clamping trolleys to line up bottom pole section with the top section aimed per light and solar correctly. Remember to ensure the lower tower section is lined up to match the rectangular holding down bolt arrangement. Mark on the lower section of the tower where the slip joint should end, this should give a **900mm overlap**. Align one full edge of the octagonal interface and bring together the tower carefully and in a line until fully locked.



Slip Joint on the Tower Showing 900mm Stop Dimension

Train through the wiring looms from the controller for the light, solar array and upper pole before slot together.



LED Supply & Control Tower Wiring Loom



Solar Panel Tower Wiring Loom



Feed 'Pull Wire' thru Tower



Connect Securely and Tape Cables to be Pulled thru Tower

Train the main wiring loom through the braided mesh cable support/cable connection strain relief.



Braided Mesh Cable Support

Hook the braided mesh support over support hook welded inside the top of the pole. Do this via the hole in the main tower upper bearing flange.



Use the Cable Connection Strain Relief Ties to Hook to the Tower

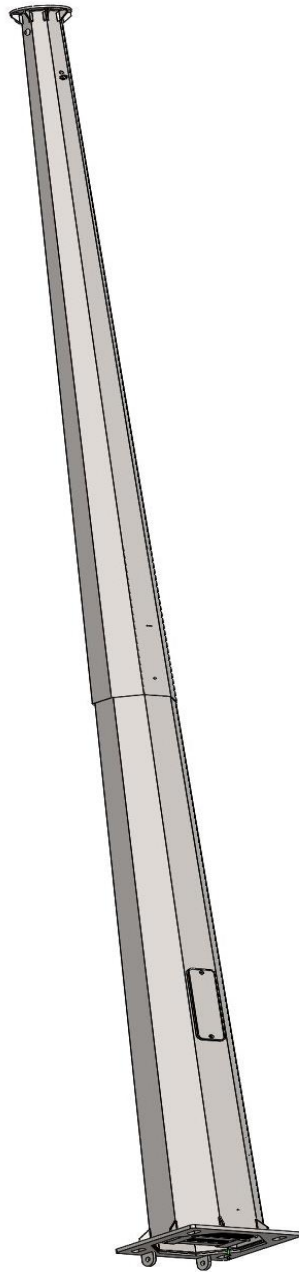


Detail using the Cable Connection Strain Relief Ties to Hook to the Tower

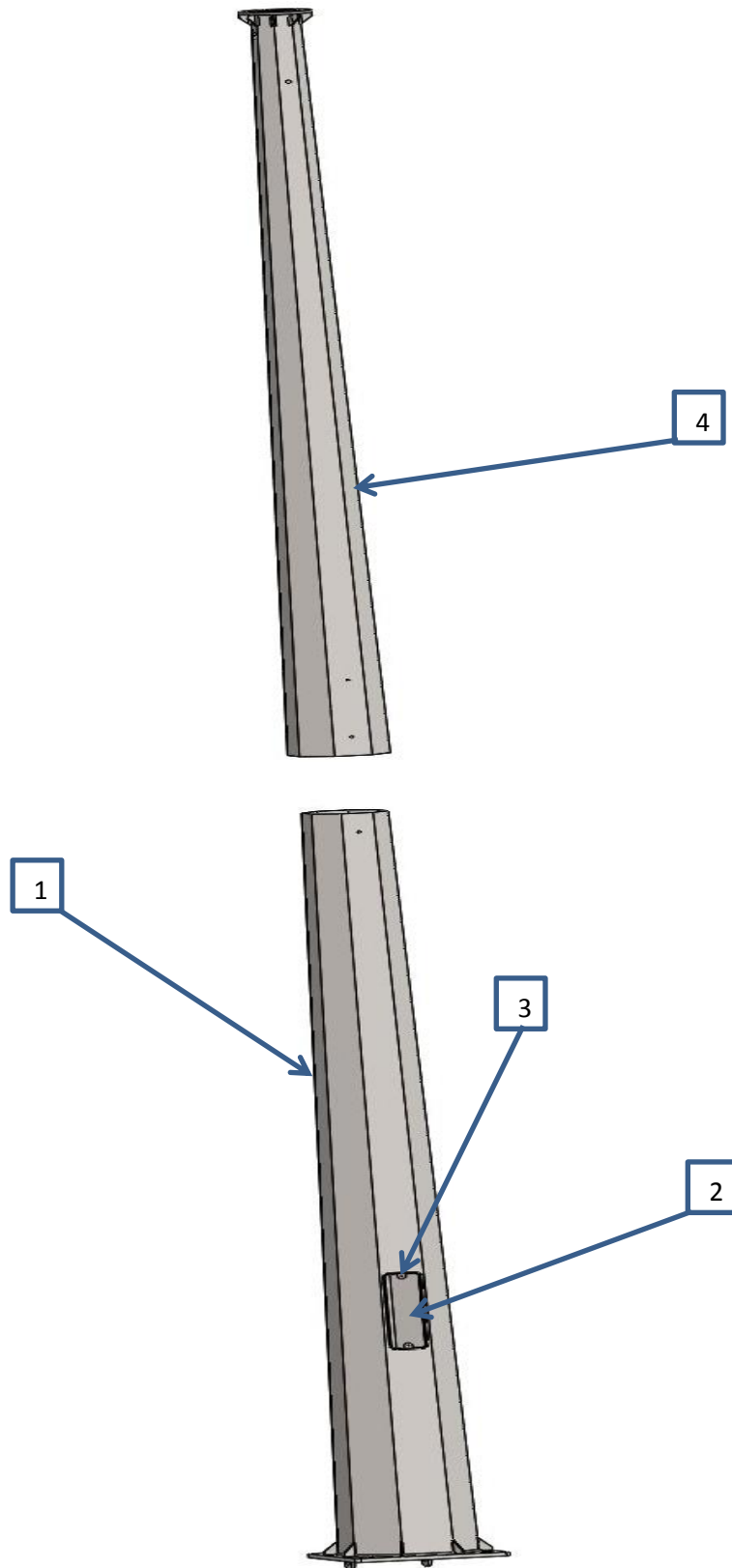
Continue to prepare for raising mechanism.

End of life, recycle/disposition parts per Parts Manifest in section 1.2

Item No	Part Number	Description	Quantity
1	00067P	RPU Bottom Pole Design	1
2	00068P	RPU Access Panel Cover	1
3	00167P	M8x1.25x35x35 Triangular Head Bolt	2
4	00207L	Upper Tower	1
5	00187A	Lower Tower Fixing Pack	1

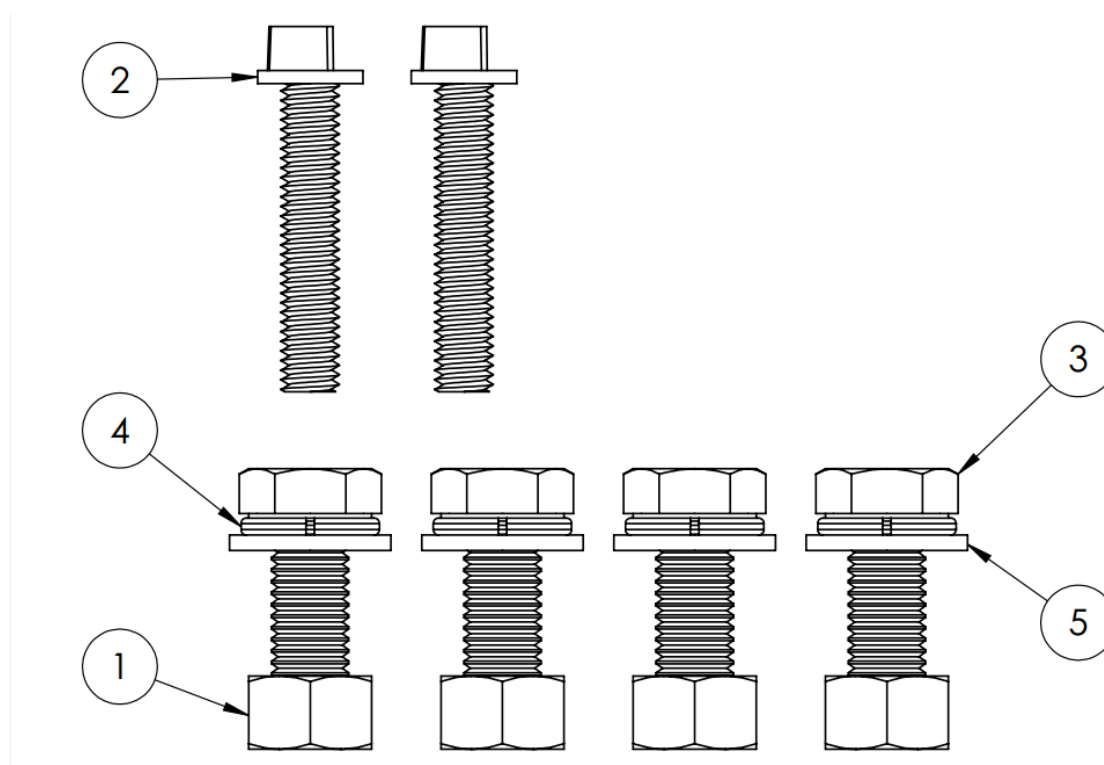


*Main Tower Assembly (Assembled)*



*Main Tower Assembly (Exploded)*

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	00151P	M10x1.5 Hex Nut Class 8.8	4
2	00167P	M8x1.25x35x35 Triangluar Head Bolt	2
3	00186P	M10x1.5x30x30 Hex Bolt Class 8.8	4
4	00090P	M10x2.2x18 Rectangular Section Spring Washer	4
5	00126P	M10x2x21 Rectangular Section Flat Washer	4



*Main Tower Assembly Fixing Pack*

## 4 Mechanical Installation (Battery & Controller Cradle)

Make all the necessary wiring loom connections to the controller through pole to. Solar, Light, and upper generator pole (via slip ring) connections. All connections are colour coded and can only connect in one way.

**WARNING:** Do NOT power up the system until all the connections are made.

**WARNING:** Any loose wires could create short circuit which could result in damage of the controller.



Carefully Insert the Cradle without Batteries Part Way in to the Bottom of the Tower



Fully Insert First Battery and Slide Cradle in another Third Way



Insert Second Battery



Connect Battery Cables as Shown



Battery Cables Connected

**WARNING:** Everything, especially the LED must be connected to the controller before battery power supply is connected last or else a dimming failure is caused and the controller could be damaged.



Insert the battery restraining rod (That replaces the strap in the images below) through the battery handles in order, to leave them available for use. Slide the loaded battery & controller cradle into the base of the tower as shown below and secure as shown or with bars as provided.



Secure Batteries in Place with Strap (To be Replaced with Bracket)



Use Suitable Lifting apparatus As Necessary to Lift Part or Fully Loaded Cradle



Use Extra Straps if Necessary to Secure Batteries in Place (Straps To be Replaced with Bracket).



Locate Wiring Looms in Tower & From Cradle to Connect



Connect Cables from the Cradle to the Wiring Looms in the Tower



Affix the cradle to Tower using the bolts provided in the designated labelled polythene zip bag. Make necessary earth terminal connection to Tower.



Ensure that the Cradle is Bolted into Position



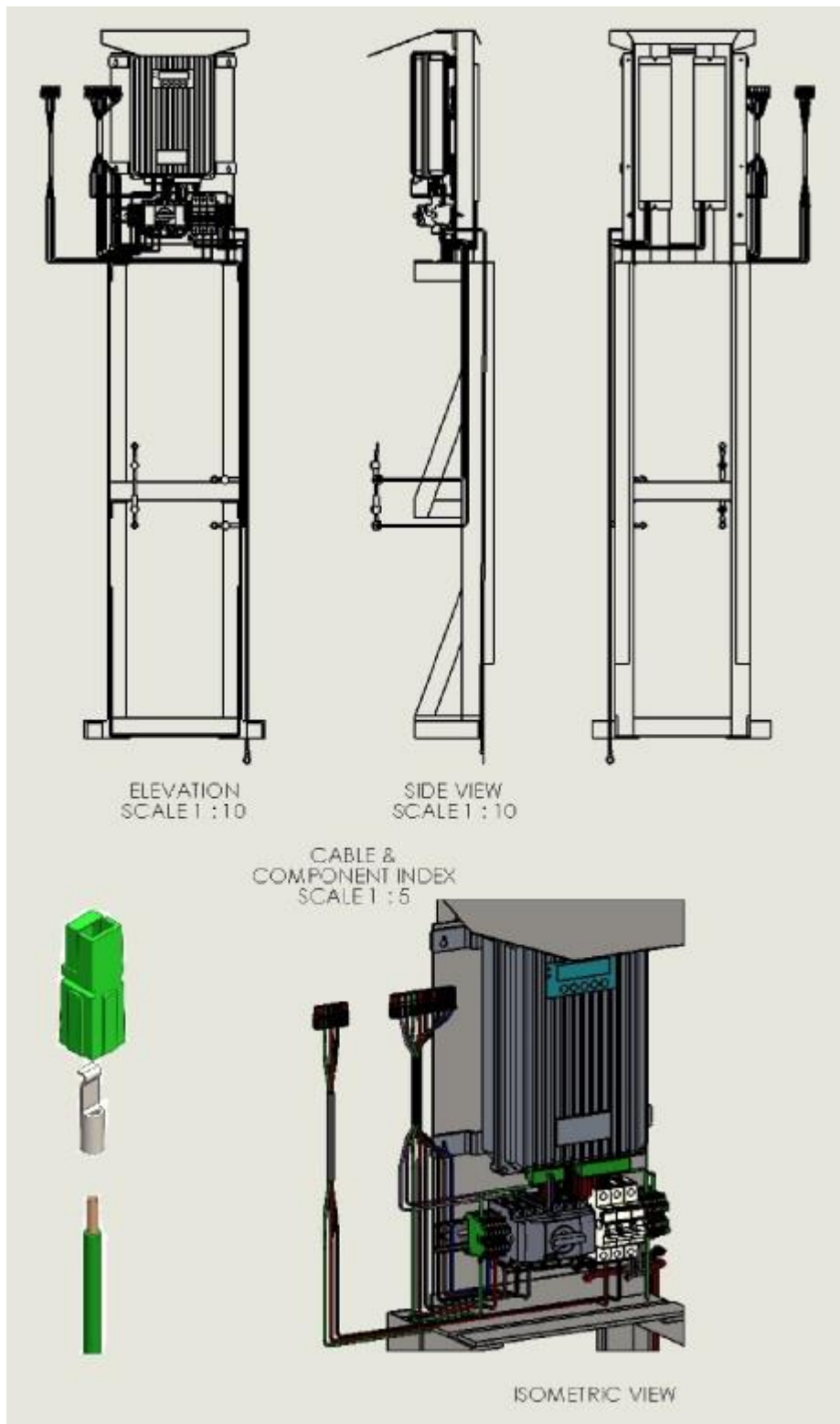
Fix Earthing Wire to Earthing Point at the Base of the Tower

All Bolt/Nut Torques settings per Torque Table in the Appendix D

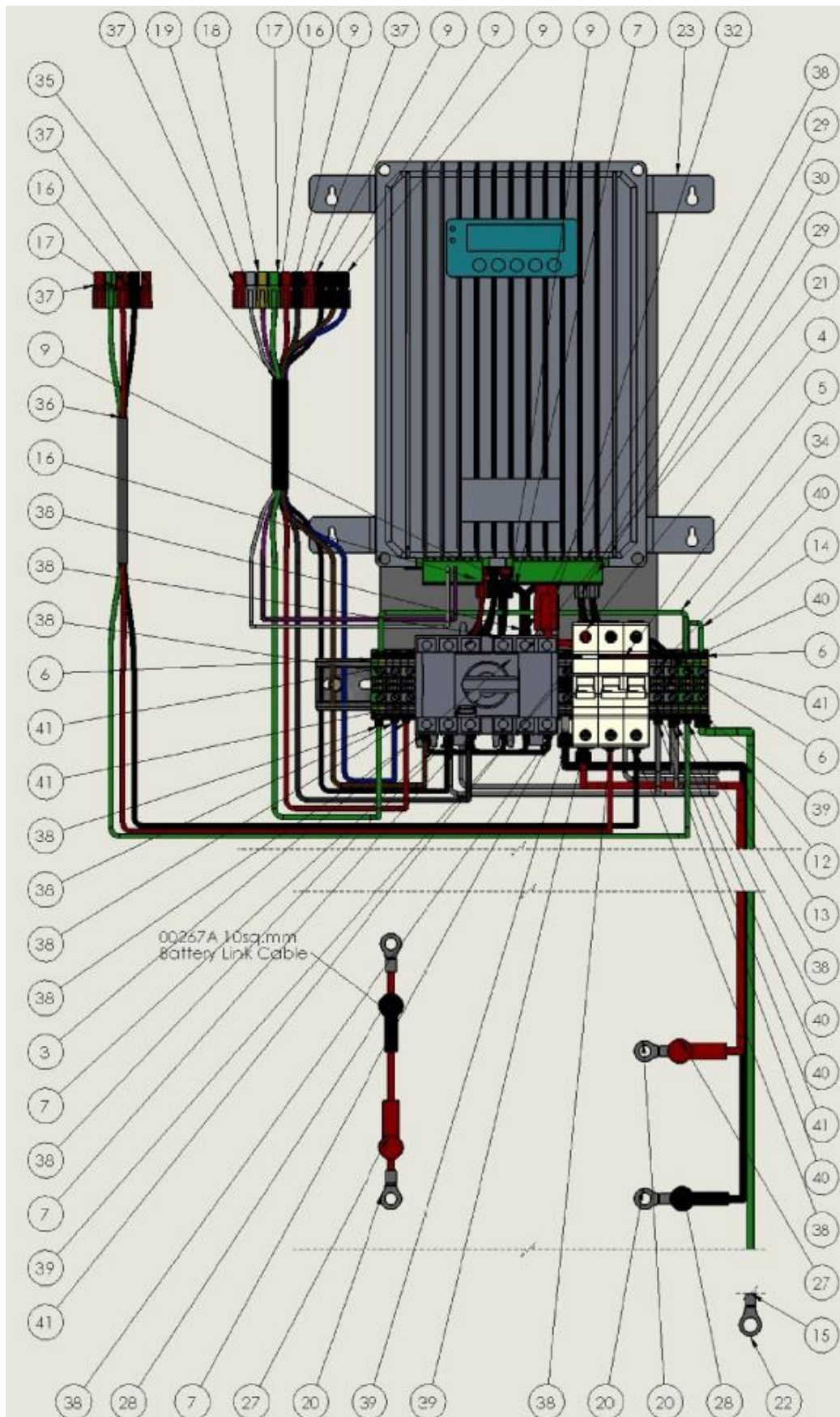
End of life, recycle/disposition parts per Parts Manifest in section 1.2

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	00266P	RPU-Battery & Controller Cradle for EverExceed VRLA ST-12230	1
2	00040P	RPU-Zenithsun Resistor ASZ7045 1000kW	2
3	00202P	DIN 35 - 7.5mm Slotted 225mm Long	1
4	00047P	ABB Single Pole MCB 40A-50VDC Din Rail Mount (S201MC40)	1
5	00048P	ABB Double Pole MCB 16A-50VDC Din Rail Mount (S202MC16)	1
6	00121P	10mm Earth Terminal Din Rail Mount	3
7	00242P	2.5sq.mm Flex Black 90mm long	10
8	00194P	Multicomp BMC2AG 30 AMP Insert	20
9	00188P	Anen PA45B0-H Black	10
10	00238P	2.5sq.mm Flex Red 90mm long	2
11	00239P	10sq.mm Flex Red 120mm long	2
12	00117P	10sq.mm Flex Black 1300mm	1
13	00116P	10sq.mm Flex Red 1300mm	1
14	00237P	2.5sq.mm Flex Green & Yellow 80mm long	1
15	00111P	10sq.mm Flex Green 1500mm	1
16	00189P	Anen PA45B2-H Red	4
17	00190P	Anen PA45B5-H Green	2
18	00336P	Anen PA45B4-H Yellow	1
19	00193P	Anen PA45B9-H White	1
20	00118P	M8x10 sq mm Ring Terminal	4
21	00113P	Socomec Sirco Double Throw Switch	1
22	00268P	M10x10 sq mm Insulated Ring Terminal	1
23	00322P	RPU Susie 3 Controller	1
24	00132P	M5X1.0X10 Rectangular Section Std. Flat Washer	2
25	00106P	M5x0.8x20x20 Hex Bolt	2
26	00282P	M5x0.8 Hex Nut	2
27	00185P	RPU-Battery Terminal Caps Red	2
28	00198P	RPU-Battery Terminal Caps Black	2
29	00321P	Anen PA45B8-H Grey	2
30	00326P	2.5sq.mm Flex Black 110mm long	2
31	00316P	Anen PA75B0-HL Black	1
32	00317P	Anen PA75B2-HL Red	1
33	00239P	10sq.mm Flex Red 100mm long	1
34	00328P	2.5sq.mm Flex Green & Yellow 290mm long	1
35	00329P	8x2.5sq mm Flex Cable	1
36	00331P	3x2.5sqmm Flex Cable	1
37	00332P	Anen PA1399G2-H Blank Red	4
38	00333P	2.5 sq mm Ferrule	30
39	00335P	10 sq mm Ferrule	5
40	00334P	4 sq mm Ferrule	6
41	00324P	10mm Grey Terminal Din Rail Mount	5
42	00318P	Multicomp BMC14AG 75 AMP Insert	2

*Battery and Controller Cradle Assembly Material List*



*Cradle and Controller Assembly Drawing*



Controller Part Detail Indexed



## 5 Mechanical Installation (Generator Upper Pole Assembly)

Insert a 'Pull Wire' into the Pole to use for pulling the generator cable through.



Feed appropriate 'Pull Wire' for Generator Cables

Affix the bearing to the bottom flange using the designated bag of bolts and thread lock adhesive.



Connect Bearing Using the Bolts Provided



Use tool with Correct Torque Setting as Per Table



Bearing Fitted

Insert the generator wire through the Gland provided and use the 'Pull Wire' to pull the cable through the pole. Affix the generator to the generator plate using the designated bag of bolts and utilise acoustic washers (not shown). Connect via the gland beneath.



Sanho 300W Generator



Put Cable Gland on Wire from Generator and use 'Pull Wire' to pull it thru Pole to Bearing



Prep Surface of Generator & Mounting Plate with Silicon, Then Place Anti-Resonance Rubber



Generator Cable Gland Connected



Connect Cable with Generator to Hole in Generator Pole

Once you have retrieved the terminal connections of the generator wire through the hole in the bottom of the pole connect the 'Slip Ring' rotary-side terminal connections to them.



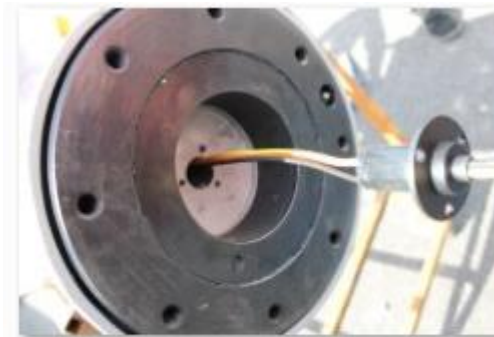
Extract Connection Terminals for connection to the Slip Ring



Connect to Rotary Side of Slip Ring



Re-insert Connection Terminals into Pole



Insert Slip Ring Rotary Wire into Pole

Secure the slip ring to the underside of the pole using either the glue or fixings provided. For the IP68 slip ring also install the aid to assist with the extra torque required. The aid also requires you to use the 6 x 2mm thick washers on the bolts between the bearing and the flange. The IP68 slip ring Aid and washer not shown.



Slip Ring Inserted(Being Replaced)



Use Fixings Provided to Secure Slip Ring

End of life, recycle/disposition parts per Parts Manifest in section 1.2

Item No	Part Number	Description	Quantity
1	00024P	RPU Upper Pole	1
2	00161P	RPU-7-inch Bearing	1
3	00027P	RPU Tail fin	1
4	00133P	RPU-300W Generator	1
5	00130P	M12x3x20 Rectangular Section Flat Washer	18
6	00101P	M12x2.5x21 Rectangular Section Spring Washer	18
7	00099P	M12x1.75x45x45 Hex Bolt Class 8.8	8
8	00095P	M8x2x24 Rectangular Section Flat Washer	6
9	00152P	M8x1.25 Locking Hex Nut Class 8.8	10
10	00096P	M8x1.25x50x50 Serrated Flange Hex Bolt Class 8.8	8
11	00129P	M8x1.6x17 Rectangular Section Flat Washer	14
12	00159P	M8x1.25x50x50 Hex Bolt Class 8.8	6
13	00106P	M5x0.8x20x20 Hex Bolt	3
14	00100P	M12x1.75x40x40 Hex Bolt Class 8.8	10
15	00137P	M8x1.25x45x45 Hex Bolt Class 8.8	4
16	00157P	M8x1.25 Serrated Flange Hex Locking Nut	8
17	00132P	M5x1.0x10 Rectangular Section Std. Flat Washer	3
18	00107P	M5x1.2x9.15 Rectangular Section Spring Washer	3
19	00106P	M5x0.8x20x20 Hex Bolt	3
20	00188P	Multicomp BMC1S Black	9
21	00190P	Multicomp BMC1S Green	2
22	00194P	Multicomp BMC2AG Inserts	9
23	00162A	RPU Tail Fin Fixing Pack	1
24	00163A	RPU EU Fixing Pack	1
25	00164A	RPU Bearing Fixing Pack	1
26	00207L	RPU Upper Tower Packing List	1
27	00269A	Upper Pole Wiring Instructions	1

*Generator Upper Pole Assembly Material List*

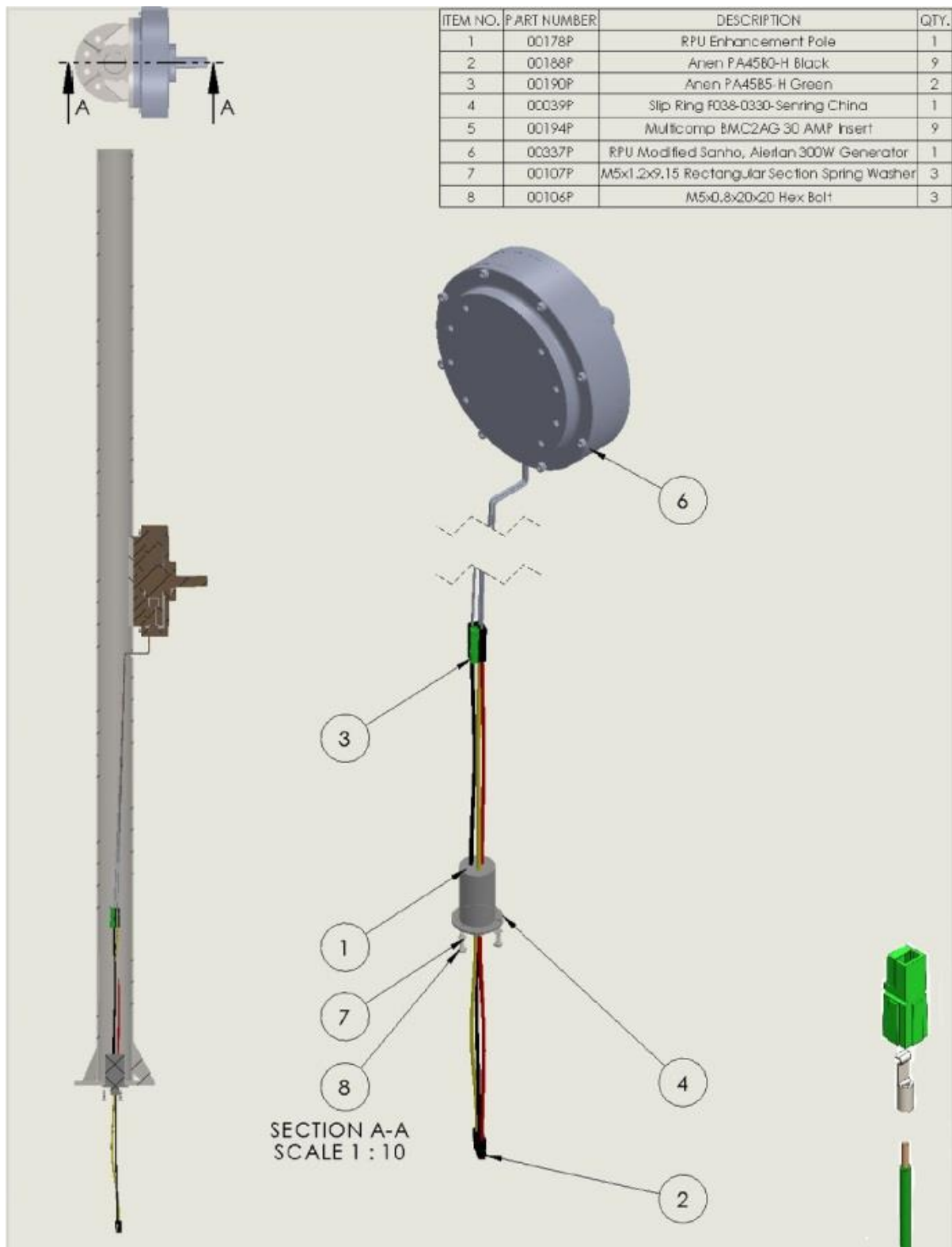


*Generator Upper Pole Assembly*









Generator Upper Pole Assembly Slip Ring Assembly Details

## 6 Mechanical Installation (Slip Ring Cable Support Assembly)

Ensure all the necessary wiring loom connections that come from the controller through the pole to the Solar, Light, and upper generator pole (from slip ring) connections, are ready for plug and play.



LED Light Lead for LED Armature.JPG



Solar Panel Connection Loom.JPG



Ensure Looms are Connected before Connecting Poles



Braided Mesh Cable Support

Train the connection through the associated gland in the tower as required, to the Solar Array, to the light, and to the slip ring, for plug and play.



Screw Gland into Hole to Protect LED Wire



LED Armature Wired

Orientate LED Armature as the light is required over uppermost top pole gland **to align with mark on concrete that determines where light should be positioned.**

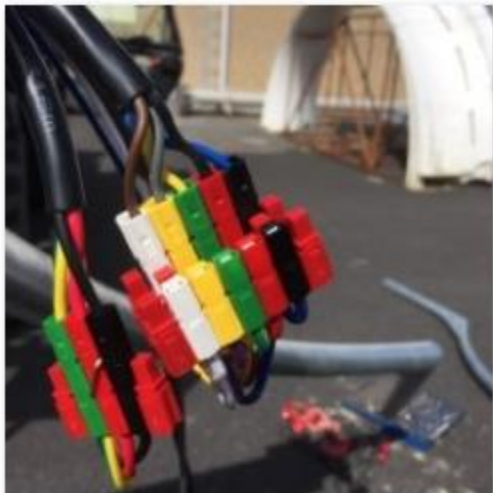
Assemble the light bracket and the light bracket clamp on the top pole over the upper most gland, below the bearing, while threading through the cable to connect to the light.



Offer up the LED Armature and LED Wire to the Tower and Connections to Loom



Offer Up LED Armature Clamping Bracket and Tighten Equally All 4 Nuts



Ensure Looms are Connected before Connecting Poles



Pull Wire thru LED Light Armature

Once all the cables are in place ensure the braided mesh support is on the hook welded inside the top of the pole. Do this via the hole in the main tower upper bearing flange. **Ensure that cable ties are used to hold the braided mesh support on the hook.**

**WARNING:** Do NOT power up the system until all the connections are made.

**WARNING:** Any loose wires could create short circuit which could result in damage of the controller.

All Bolt/Nut Torques settings per Torque Table in the Appendix D

End of life, recycle/disposition parts per Parts Manifest in section 1.2



## 7 Mechanical Installation (Hub, Turbine Blades, Generator Shaft Adaptor, Nose Cone, Tail Fin Assembly & Enhancement Unit Halves)

Connect the generator terminal to the generator wiring loom in the main tower and secure with staples like fasteners made from copper wire as shown below.

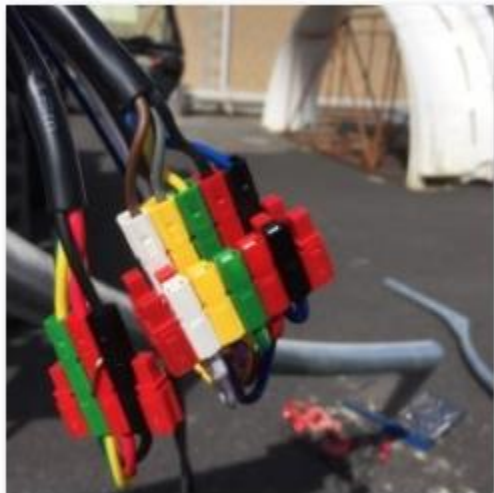


Connect Terminals of Slip Ring to Generator Wiring Loom from Tower



Secure with Staple Shaped Copper Wire Fasteners as Shown

Ensure that the cables are connected and after tucking safely into the poles, offer up and affix the upper pole assembly to the main tower upper bearing flange plate using the designated bag of bolts.



Ensure Looms are Connected before Connecting Poles



Use Bolts and Spring Washers to Fix Bearing to the Top of Flange on Tower

To stop the bearing spinning during assembly, hold the upper pole assembly in place by clamping the tail fin bracket down to one of the roller clamping trolleys.

Affix the tail fin bracket to the upper shroud stiffener plate, in position on the four holes, using the designated bag of bolts. To aid fixing, slot through two of the screws first, to steady the tail fin bracket for bolt torquing. All Bolt/Nut Torques settings per Torque Table in the appendix X.X



Clamp Stiffner Bracket To Prevent Generator Pole from Rotating



Tail Fin Secured(Being Replaced with Lock Nuts)



Tighten with Tool with Correct Torque Settings as per Table



Tail Fin Secured(Being Replaced with Lock Nuts)

Prep the generator shaft and get the pre-assembled and balanced blades and hub assembly.

**WARNING:** Ensure that the blades are set for downwind operation. This may involve opening the bolts connecting the boss to the hub, separating them and replacing the boss from the other side.



Ready Sanho 300W Generator for Receiving Rotor



Ready Rotor for Sanho 300W Generator.JPG

Slot the turbine blades & hub assembly over the generator shaft. Affix using the supplied shaft locking nut to the specified torque setting. Special tool required.



Align Shaft Key with Key Way and Mount Rotor Boss and Hub and Hand Tighten



After Mounting Rotor Boss and Hub tighten Holding on Nuts

**WARNING:** Alternatively use suitable locking nut or 'ThreadLoc' glue to prevent nut loosening.

Drop the nose cone over the front and affix using the designated bag of bolts.



Nacel Cap Securely Fitted(Editing Required)



Align the Nacel Cap to fit about the Blades and secure with Long Threaded Bolt Provided



Affix the plastic tail fin to the tail fin bracket using the designated bag of bolts.



Fit Tail Fin to Tail Fin Bracket and Hand Tighten



Tighten Fixings with Tool with Suitable Torque Setting Available



Tail Fin & Bracket Completed

Offer up each half of the enhancement unit to either side of the upper pole assembly. Hold in place using two of the bolts provided at top and bottom. Complete affixing by torqueing up all of the 8 bolts provided in designated set. All Bolt/Nut Torques settings per Torque Table in the Appendix D

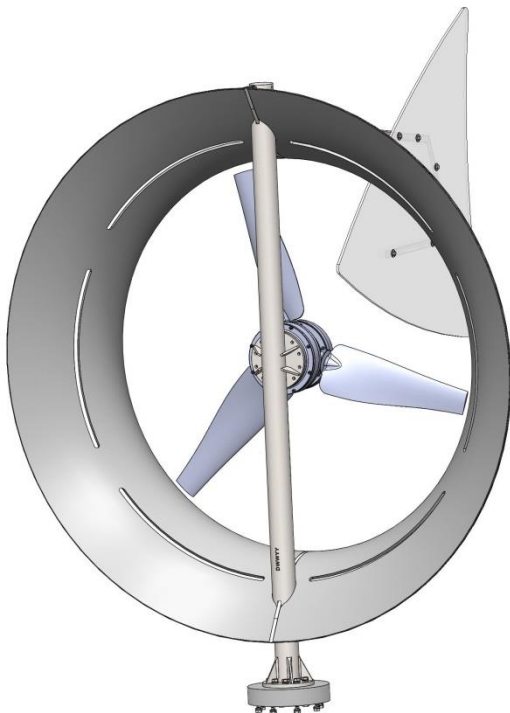
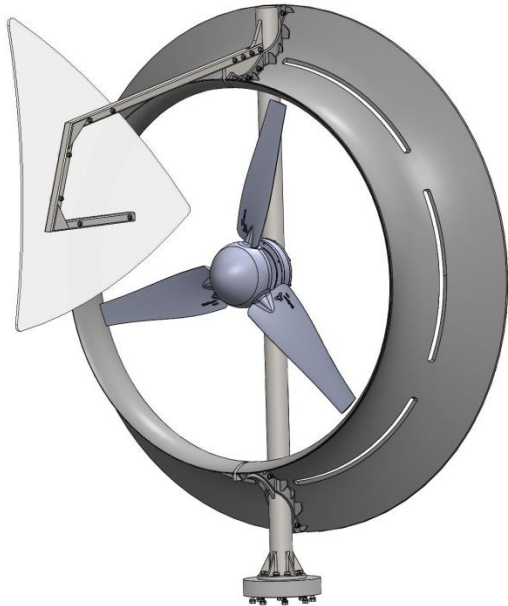


*Rotor Assembly, Tail Fin Assembly & Enhancement Unit Halves Exploded Assembly*

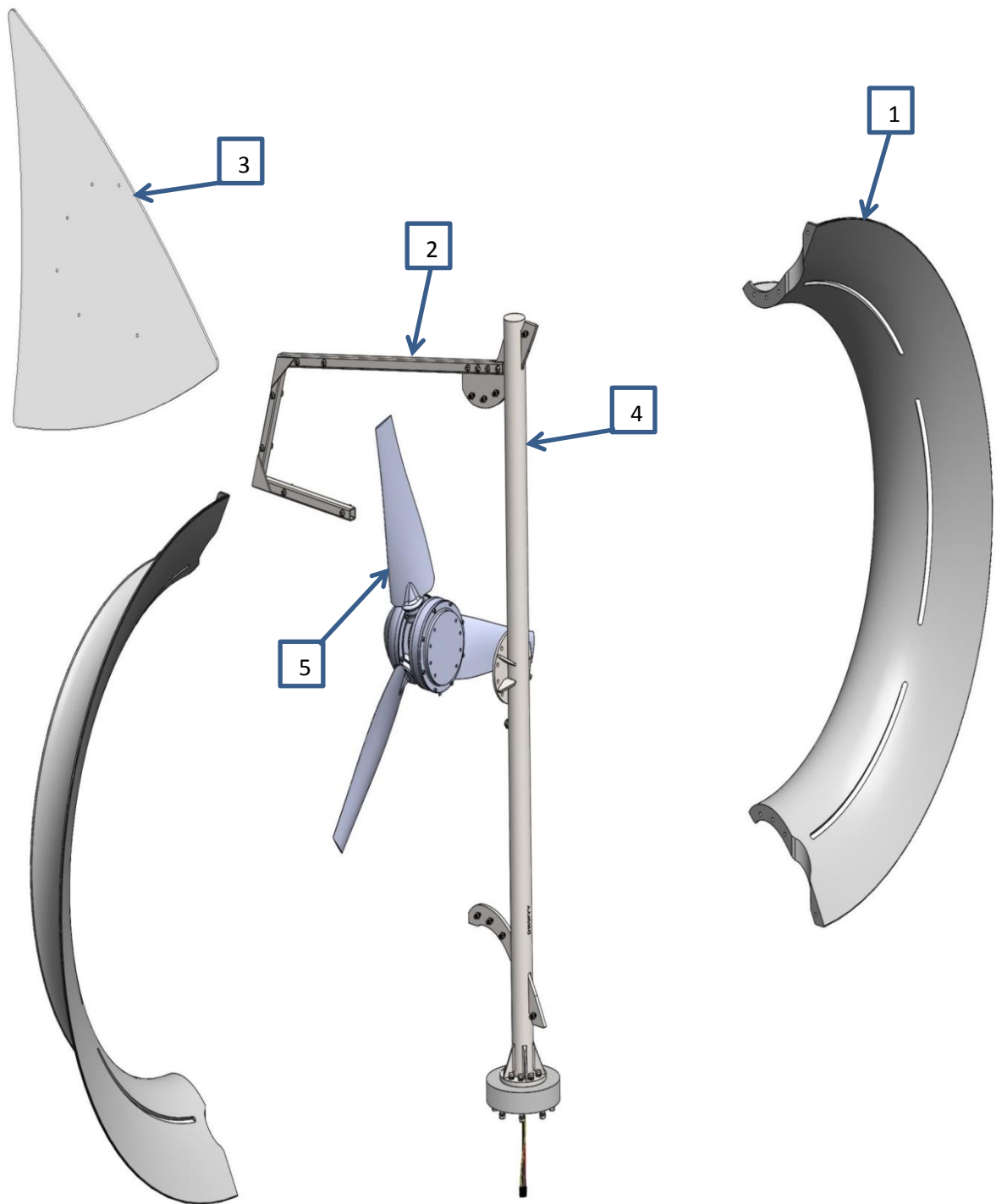
End of life, recycle/disposition parts per Parts Manifest in section 1.2

Item No	Part Number	Description	Quantity
1	00350P	RPU Enhancement Unit Half 9mm Flat	1
2	00027P	RPU Tail Fin	1
3	00031P	RPU Plastic Tail Fin	1
4	00155A	RPU Upper Tower	1
5	00174A	Blades & Cover Assembly	1
6	00134P	Hub Plate	1
7	00135P	Nose Cone	1
8	00160A	RPU Blade Fixing Pack	1

*Rotor Assembly, Tail Fin Assembly & Enhancement Unit Halves Material List*



*Rotor Assembly, Tail Fin Assembly & Enhancement Unit Halves Assembled*



*Rotor Assembly, Tail Fin Assembly & Enhancement Unit Halves Assembly Exploded & Indexed*

**NOTE:-** Ensure that ALL polycarbonate pieces are cleaned with water ONLY. Do not use detergents.

## 8 Mechanical Installation (Solar)

Find South with a compass or previously marked on the concrete base. Find the relative position on an octagonal face/edge which when raised will be closest to south facing and mark with 'S' as shown below do this also on the upper side of flange plate. Configure the angle packers so to facilitate the top and bottom solar brackets facing south. If a face of the octagonal tower is required, match the flat side of the angle packer to the determined tower face. If an edge of the octagonal tower is required, match the angled side of the angle packer to the determined tower edge.



Connect Gland To Solar Panel Connection Loom and Fix it to Tower

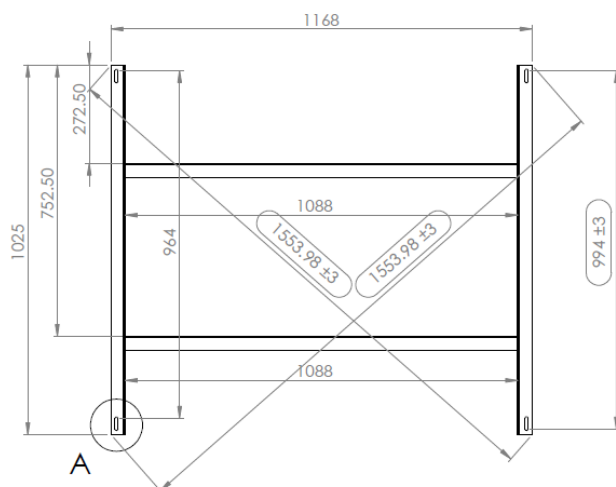


How both the Angle Packers are Used

Per location latitude, determine the closest suitable slot on the solar adjustable bars to match and mark the selected slot on the bars.

Per fig. 8.1, assemble the top and bottom solar brackets to the solar packers against determined top pole edge/face using the upper and lower U-bolts.

Drill the solar panel frame as per dimensions below for European Panels.



Solar Panel Frame Drilling Dimensions



Mark Out and Drill Solar Panel Frame Carefully to Fit Bracketing

Assemble the solar vertical uprights to the back of the solar panel as in figure below using the bolts, nuts and washers provided.



Fix Bracketing to Solar Panel as per Drawings



You may use Spanner to secure Nuts But Tighten Later to Correct Torque Settings. Don't Over Tighten



Solar Panel and Solar Bracketing

Assemble one end the solar adjustable bars x2 to the bottom of the solar vertical uprights.



Attach Solar Bracketing to Solar Armature as Per Drawing

Assemble the top of the solar vertical uprights to the top solar bracket per Solar Panel Assembly Exploded View. Assemble the determined slot in the solar adjustable bars x2 to the bottom solar bracket.



Be Careful not to Snag Wires



Tighten using Tool with Correct Torque Setting

Connect the solar panel to the solar cable trained through the gland from tower. With attached cable in solar wiring loom, earth the solar panel frame.



Connect Male and Female of Solar Connections



Fix Earthwire to Solar Panel Frame and Use Cable Ties to Tidy Away Cabeling at the Back of Solar Panel

All Bolt/Nut Torques settings per Torque Table in the Appendix D

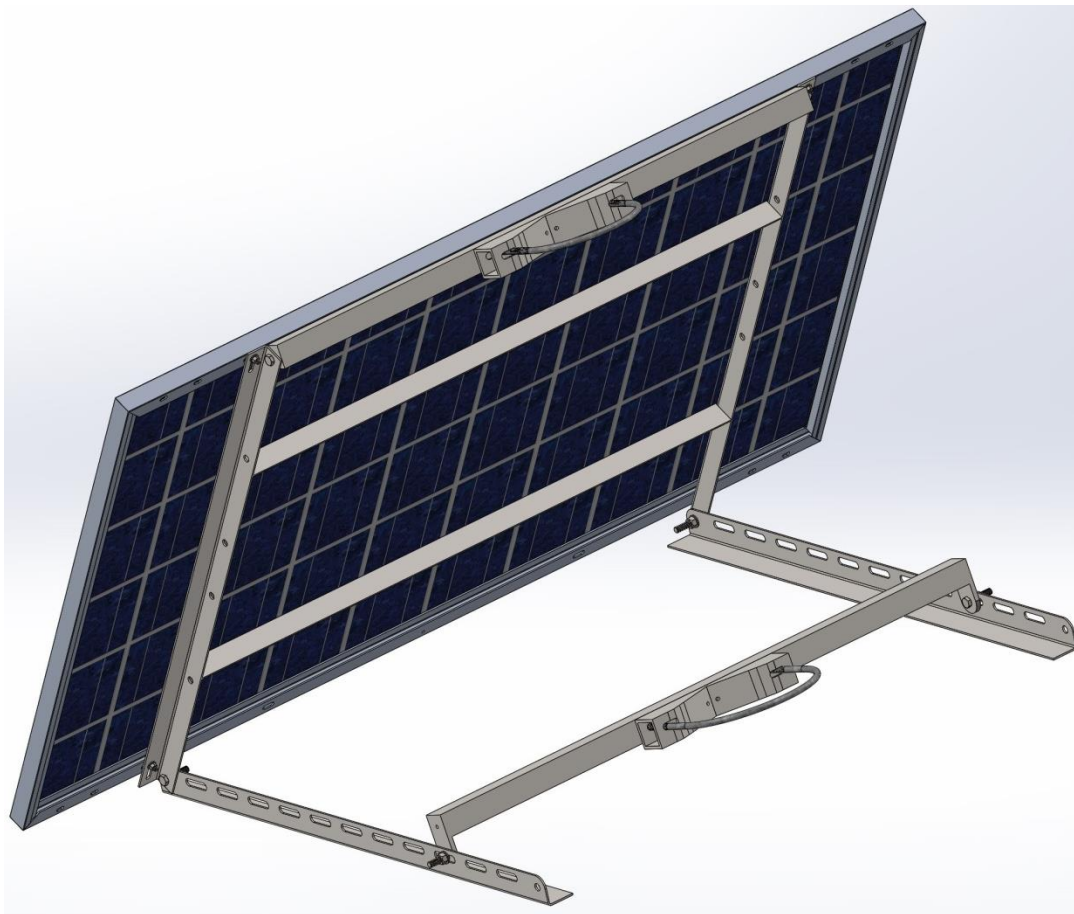
End of life, recycle/disposition parts per Parts Manifest in section 1.2



Item No	Part Number	Description	Quantity
1	00072P	RPU Top Solar Bracket For Fixing Pole	1
2	00074P	RPU Bottom Solar Connection Bracket To Pole	1
3	00071P	RPU Solar Panel Vertical Uprights	1
4	00073P	RPU Adjustable Solar Angle Bar	2
5	00075P	RPU Solar Angle Packer	2
6	00078P	RPU M10 Upper U-Bolt I.D 190mm Thread 120mm	1
7	00077P	RPU M10 Lower U-Bolt I.D 230mm Thread 120mm	1
8	00126P	M10x2x21 Rectangular Section Flat Washer	10
9	00151P	8M10x1.5 Locking Hex Nut Class 8.8	10
10	00125P	M10x1.5x45 Hex Bolt Class 8.	6
11	00085P	M6x1.6x15 Rectangular Section Flat Washer	8
12	00084P	M6x1.0x20x20 Hex Bolt Class 8.8	4
13	00086P	M6x1.0Hex Nut Class 8.8	4
14	00017P	Selected UL Solar Panel 260W*	1
15	00166A	PV Fixing Pack	1
16	00215L	RPU PV Brackets US Packing List	1

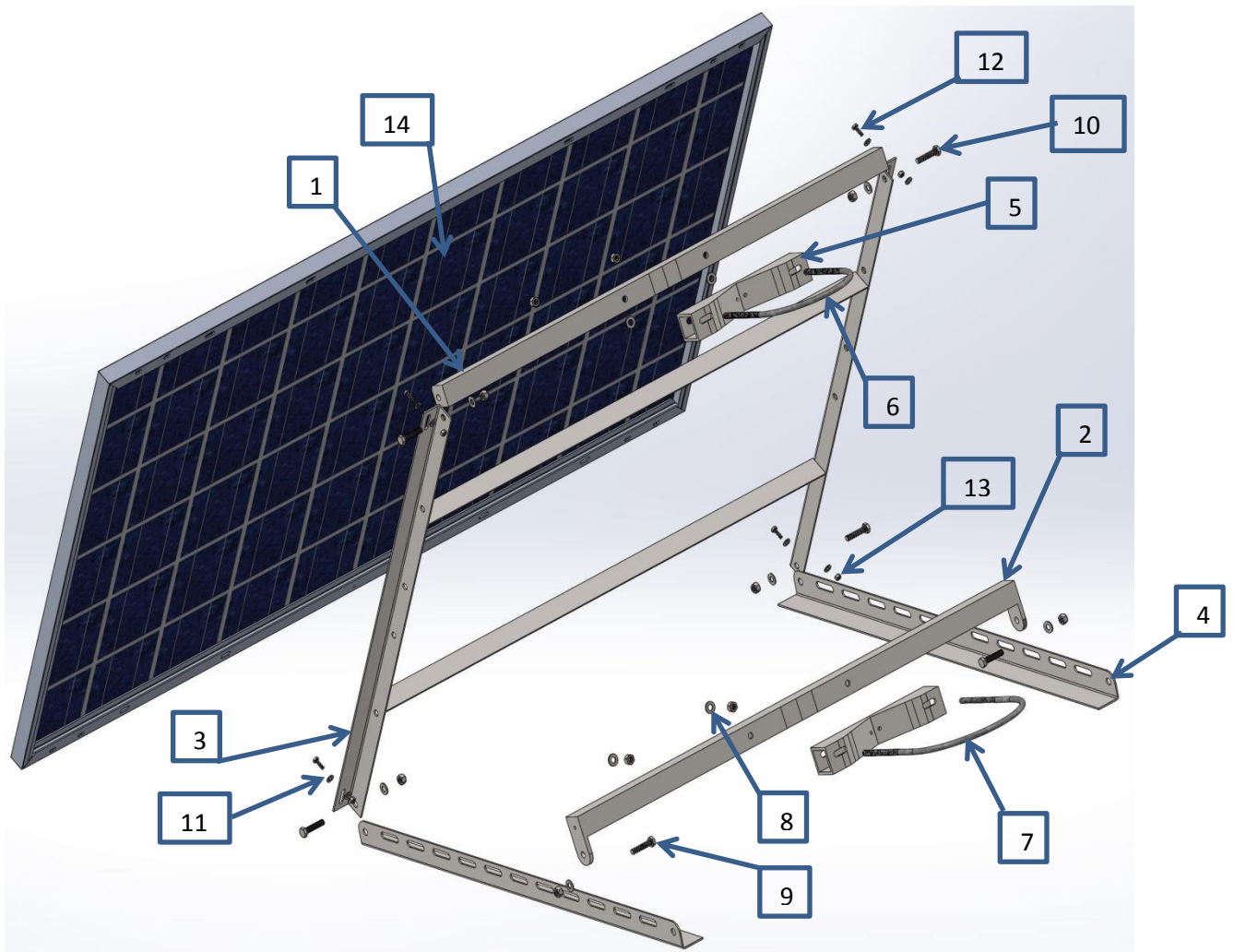
*Solar Panel Assembly Material List*

**\*Can be replaced in EU with specified CE Certified Solar Panel**



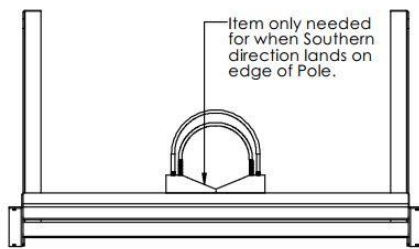
*Solar Panel Assembled*



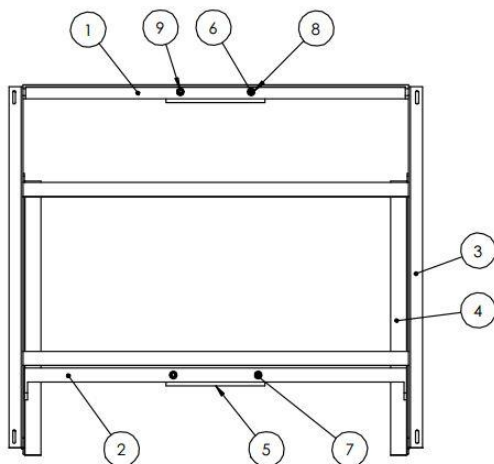


*Solar Panel Assembly Exploded View*

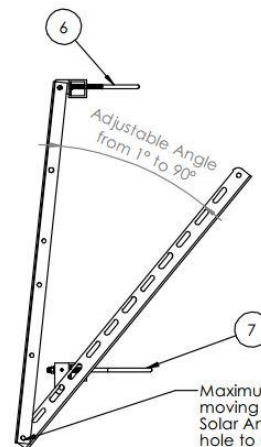
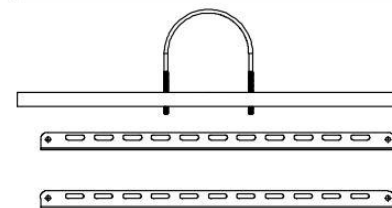
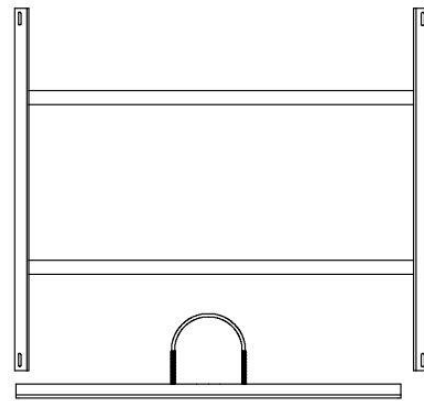
ITEM NO.	PART NUMBER	DESCRIPTION	AS0005a/QTY.
1	00072P	RPV TOP SOLAR BRACKET FOR FIXING TO POLE	1
2	00074P	RPV BOTTOM SOLAR CONNECTION BRACKET TO POLE	1
3	00071P	RPV SOLAR PANEL VERTICAL UPRIGHTS	1
4	00073P	RPV ADJUSTABLE SOLAR ANGLE BAR	2
5	00075P	RPV SOLAR ANGLE PACKER	2
6	00078P	RPV M10 Upper U-Bolt I.D. 190mm Thread 120mm	1
7	00077P	RPV M10 Lower U-Bolt I.D. 230mm Thread 120mm	1
8	00126P	M10x2x21 Rectangular Section Flat Washer	4
9	00151P	M10x1.5 Locking Hex Nut Class 8.8	4



TOP ELEVATION



FRONT ELEVATION



SIDE ELEVATION

Maximum Tilt Angle got by moving M10 fixing with Adjustable Solar Angle bar from bottom hole to upper two (2) holes.

Solar Panel Assembly Drawing

## 9 Mechanical Installation (Light)

Slide the light mounting down the light bracket.



Unscrew and Remove Back Cover of Light, Loosen Fixings and Slide LED Light on to Armature



Be Careful not to Snag LED Wires

Level the light and tighten all the light bolts until fixed on end of light bracket and connect the light cable connections to the light.



Align LED so it will Face Down when Tower is Erected and Tighten with Allen Key



Connect Earth to LED Grounding Point



Prep LED Light Cables for Connection via Terminal Block



LED Light Connections Made

Replace the light cover. All Bolt/Nut Torques settings per Torque Table in the Appendix D



Replace Back Cover of LED Light

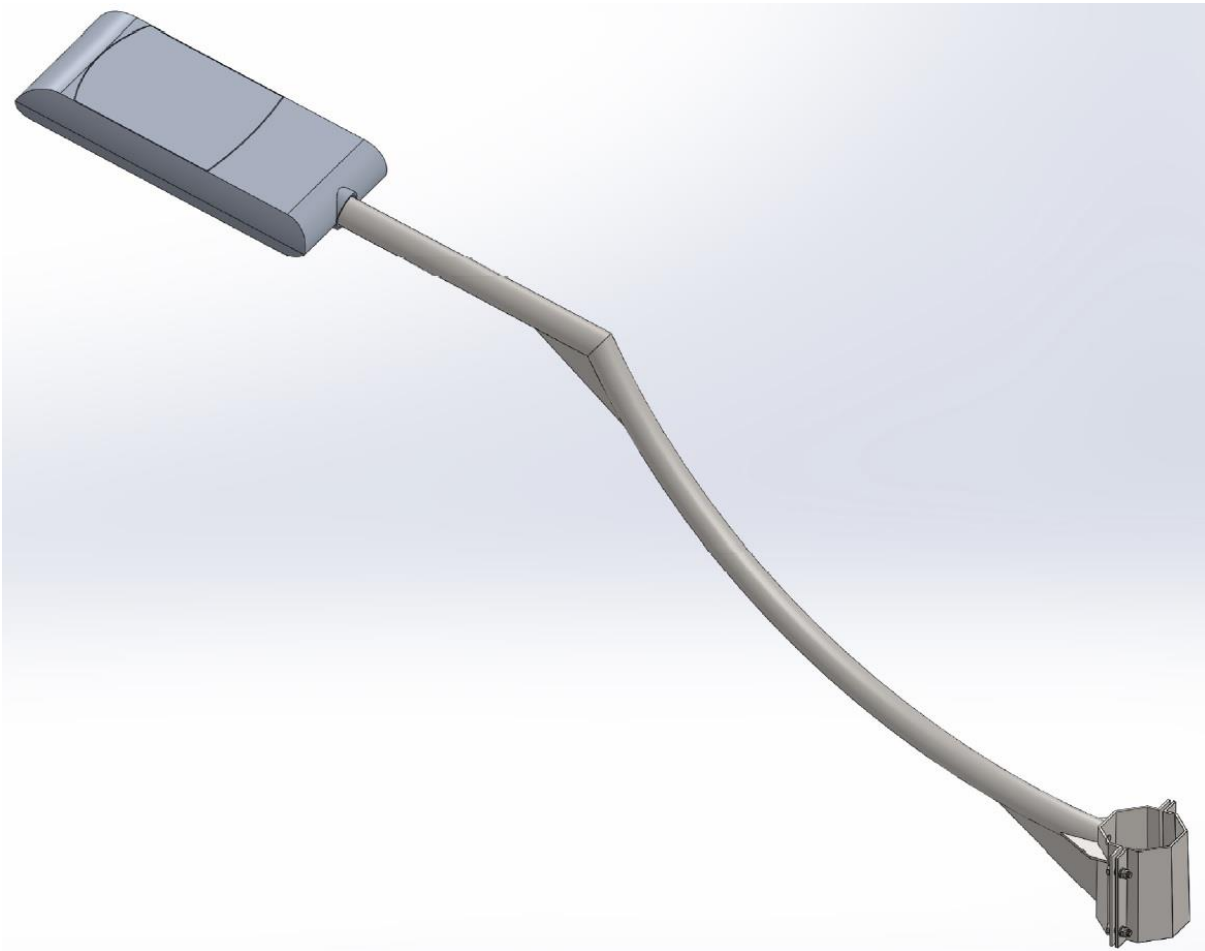


Securely Screw Fixings to Secure Back Cover with Hand and Tighten with Flat Head Screwdriver

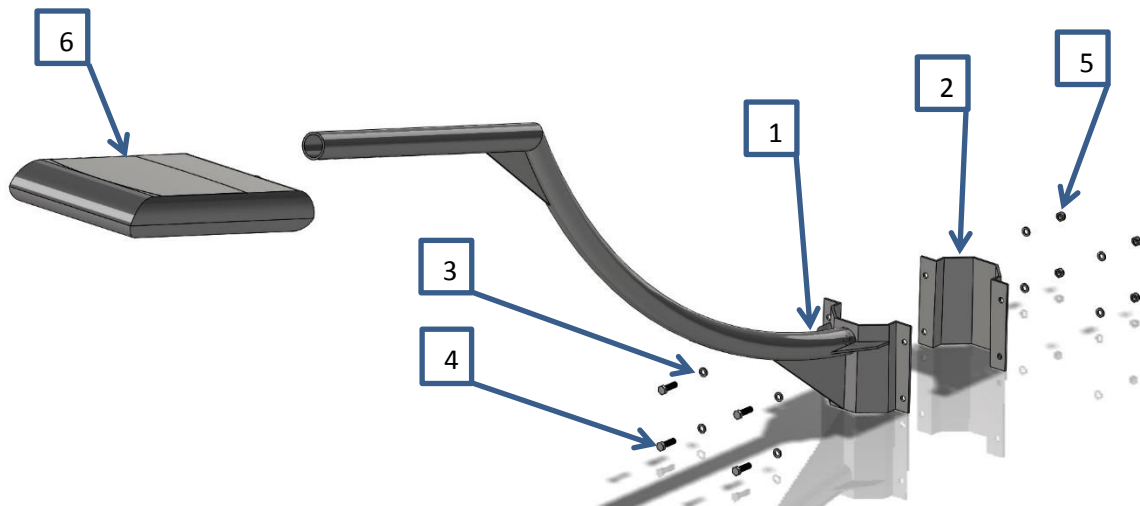
End of life, recycle/disposition parts per Parts Manifest in section 1.2

Item No	Part Number	Description	Quantity
1	00020P	RPU HP Winner T11 A-2 Light (50,000 Hrs)	1
2	00021P	RPU Light Bracket	1
3	00022P	RPU Light Bracket Clamp	1
4	00130P	M12x3x20 Rectangular Section Flat Washer	8
5	00100P	M12x1.75x40x40 Hex Bolt Class 8.8	4
6	00153P	M12x1.75 Locking Hex Nut Class 8.8	4
7	00170A	Single Light Fixing Pack	1
8	00165P	Plastic Zip Bag	1
9	00169P	IP66 M20x1.5 Cable Gland	1

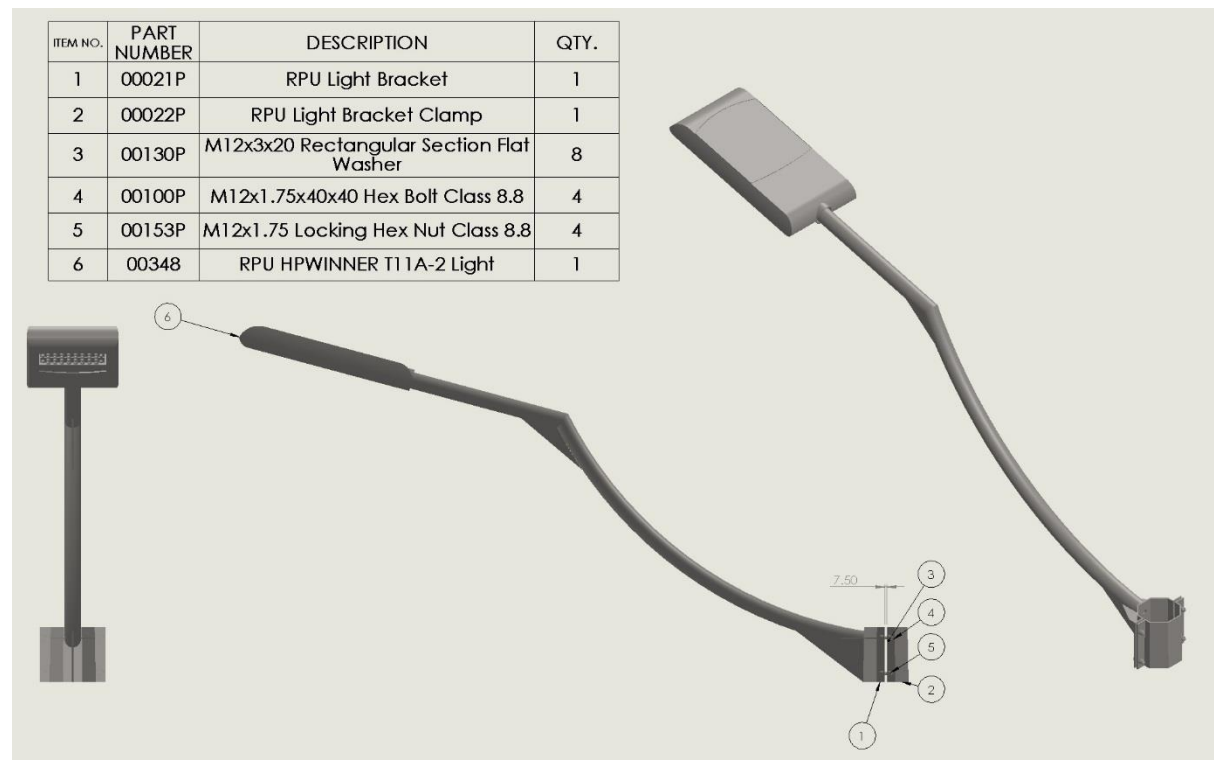
*Single Light Assembly Material List*



*Single Light Assembly*



*Single Light Assembly Exploded & Indexed*



*Single Light Assembled, Detailed & Indexed*



## 10 Mechanical Installation (Access Panel)

Before you close up, test the system works and check the system settings.



Test All Connection Before Raising the RPU System



Check Charge Controller Settings and Operational Status

Place the panel over the access hatch to tower base and affix the tri-lobular bolts supplied in the top and bottom holes to panel. Use the special tool to tighten them. All Bolt/Nut Torques settings per Torque Table in the Appendix D



Replace Access Panel Cover Plate and Hand Tighten Fixings



Use Tool to Tighten Appropriately

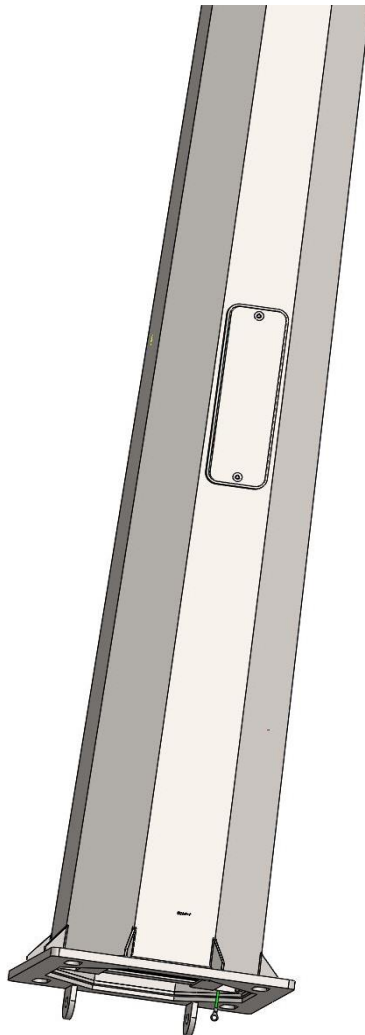
End of life, recycle/disposition parts per Parts Manifest in section 1.2



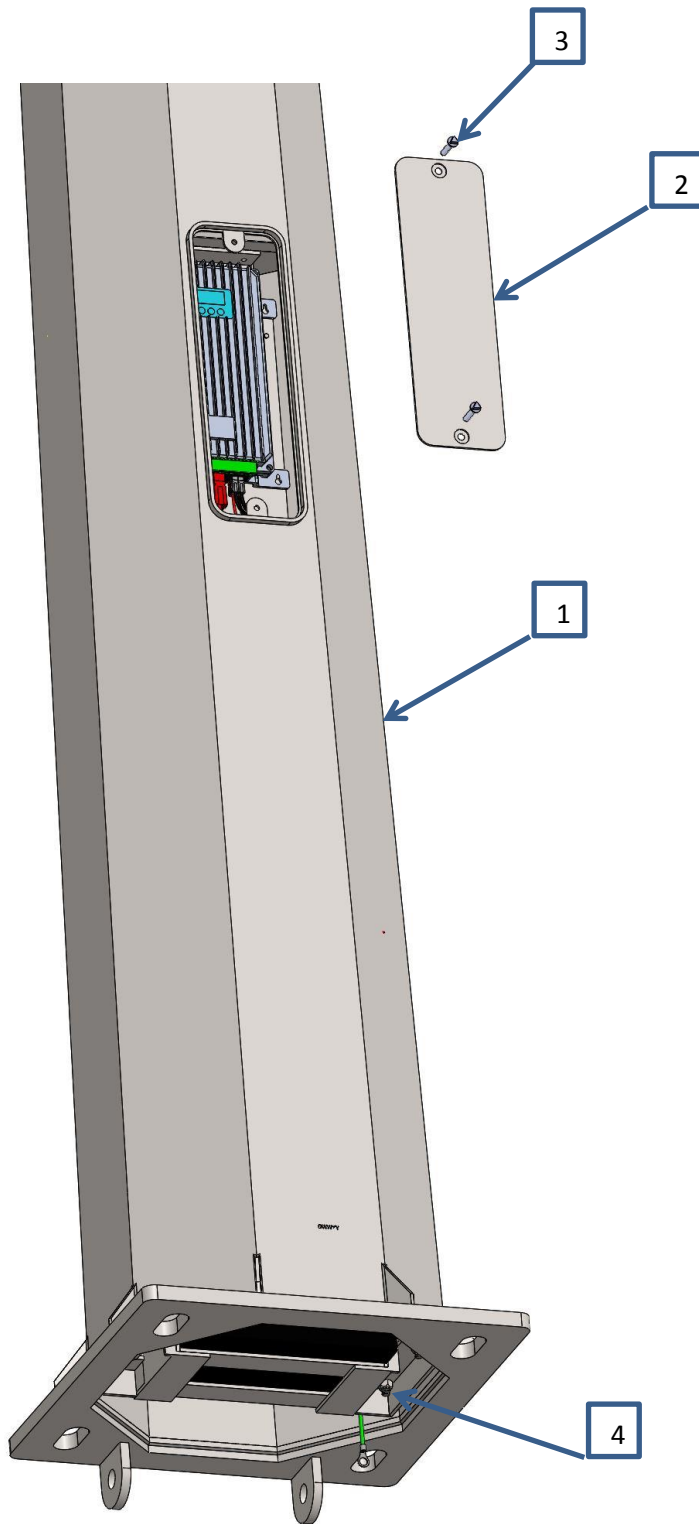
Table 10.1

Item No	Part Number	Description	Quantity
1	00067P	RPU Bottom Pole Design	1
2	00068P	RPU Access Panel Cover	1
3	00167P	M8x1.25x35x35 Triangular Head Bolt	2
4	00187A	Lower Tower Fixing Pack	1
5	00179P	M4x0.7x25x25 Hex Bolt	3
6	00181P	M4x1x9 Rectangular Section Flat Washer	3
7	00180P	M4x0.7 Hex Nut	3

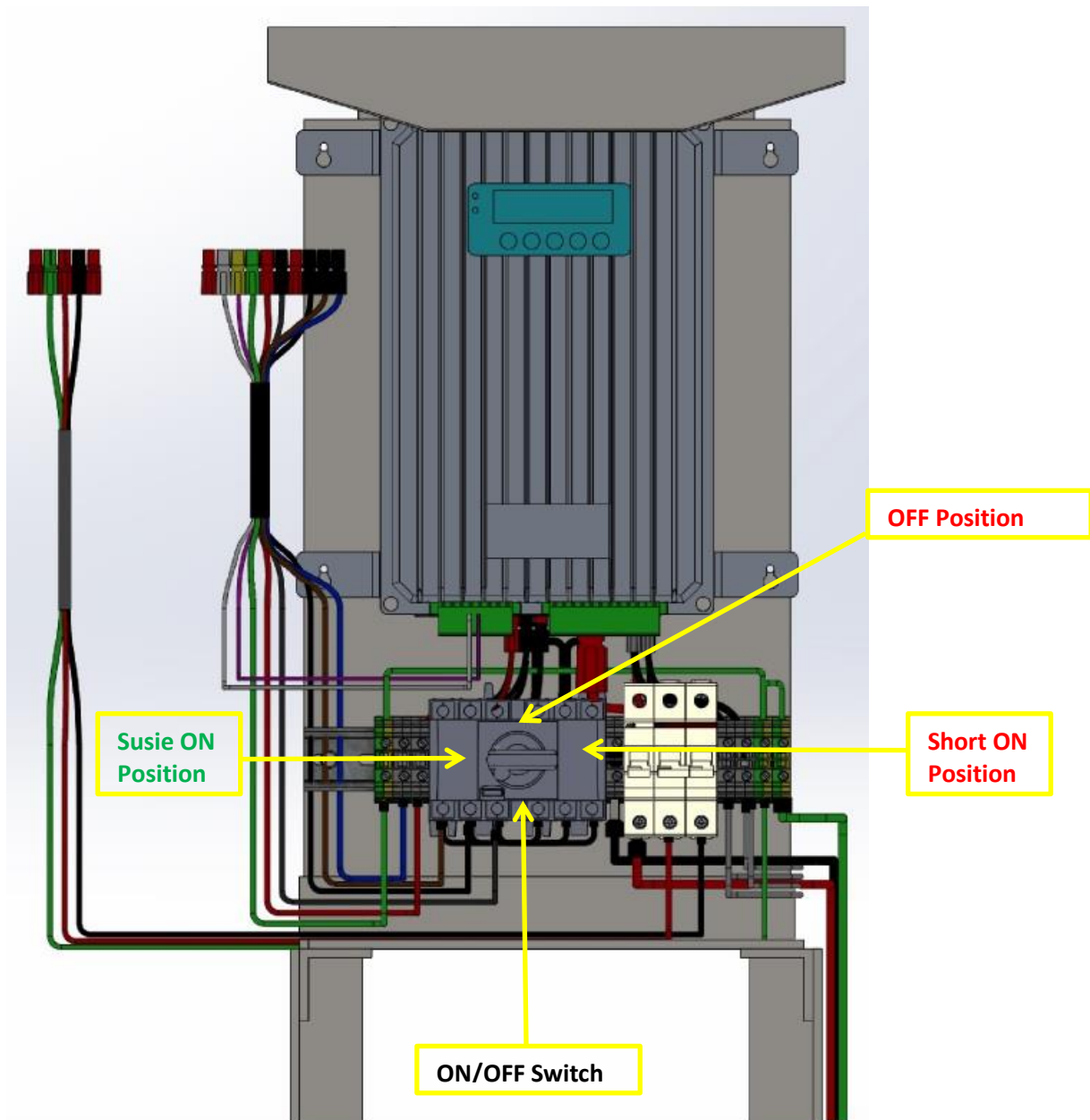
*Lower Tower Detailing the Access Panel*



*Lower Tower and Access Panel Assembled*



*Lower Tower and Access Panel Exploded and Indexed*



*Components to Reach Through Access Panel*

## **11 Testing/Troubleshooting Schedule**

### **11.1 System Initialisation via Controller**

See Hybrid Street Light Controller Manual.

### **11.2 Controller Reset**

See Hybrid Street Light Controller Manual.

### **11.3 How to Resolve Common Controller Error Issues**

See Hybrid Street Light Controller Manual.

### **11.4 Poor PV performance**

Ensure it is installed in a location free from obstruction from the solar direction.

Periodically hose down panels, then check connections/continuity to controller via access panel.

### **11.5 Poor direction holding in low wind of the Turbine**

Periodically grease the bearing via the grease nipple to underside of flange, assess tail fin presence – replace tail fin. This can also reduce power performance of the wind generator.

Possible external causes of poor holding in the wind and resulting reduction in predicted power performance is installation in areas with significant wind obstructions or obstacles that result in turbulence.

### **11.6 Poor lighting time experienced during periods of good wind and sunshine**

Load testing of batteries to monitor rate of discharge will indicate if batteries need to be replaced.

### **11.7 No Light**

Check and if necessary:-

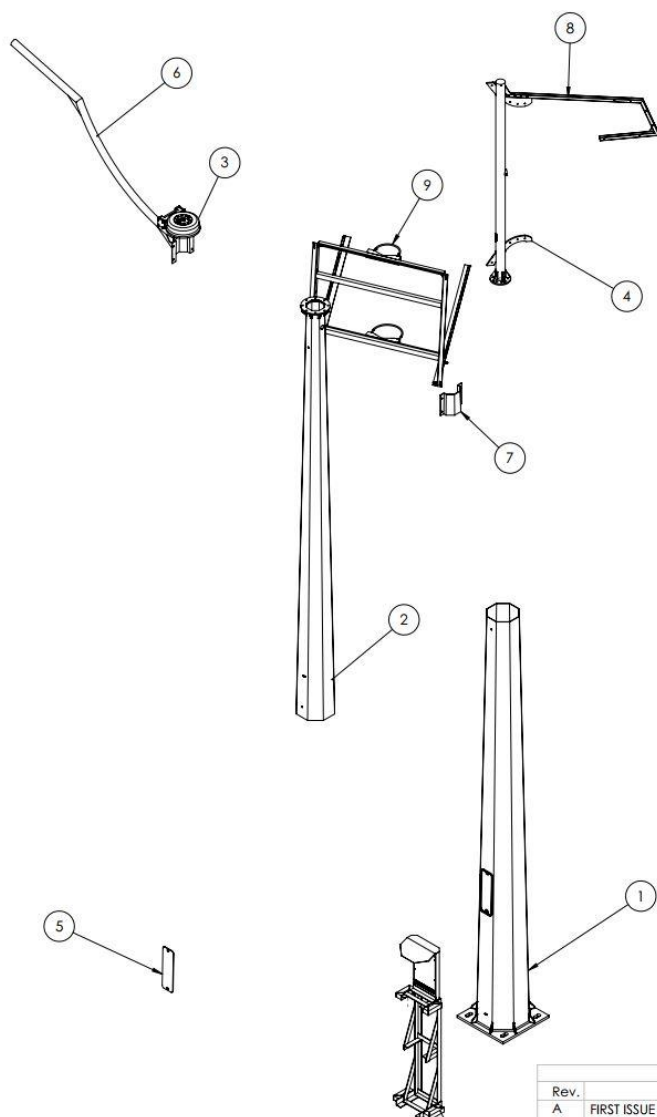
- Hose down panels,
- Continuity check all lines back to controller
- Replace controller
- Assess presence of all 3 turbine blades
- Tighten blade bolts
- Replace blade(s),
- Replace generator,
- Replace batteries,
- Replace light(s),
- Replace PV panel(s),
- Replace solar panel.

## **12 Manufacturer, Supplier and Installer Warranty Terms & Conditions**

**[To be inserted by licensee.]**

## A. General Overview Drawings

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	00067P	RPV Bottom Pole Design	1
2	00011P	RPV Top Pole Design	1
3	00023P	Bearing 7 inch IP65 Free-Turning Sealed Maintenance Free	1
4	00024P	RPV Upper Pole	1
5	00068P	RPV Access Panel Cover	1
6	00021P	RPV Light Bracket	1
7	00022P	RPV Light Bracket Clamp	1
8	00027P	RPV Tail Fin	1
9	00076A	RPV Solar Bracket Assembly	1
10	00005P	RPV Battery & Controller Cradle	1



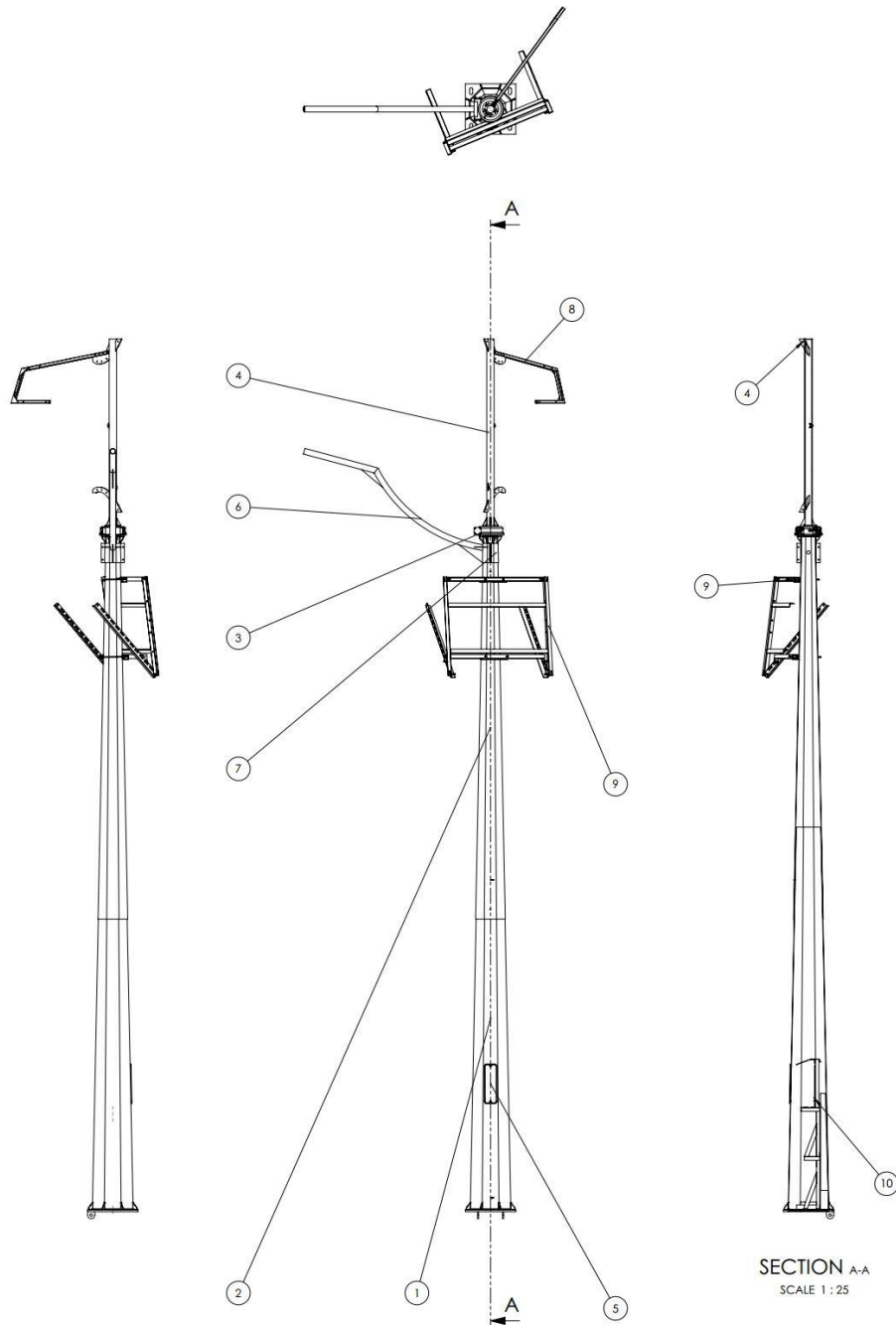
Revisions			
Rev.	Description	Rev. Date	Appv'd
A	FIRST ISSUE	16/01/15	T.W.

*Lower Tower and Access Panel Assembly Exploded & Detailed*



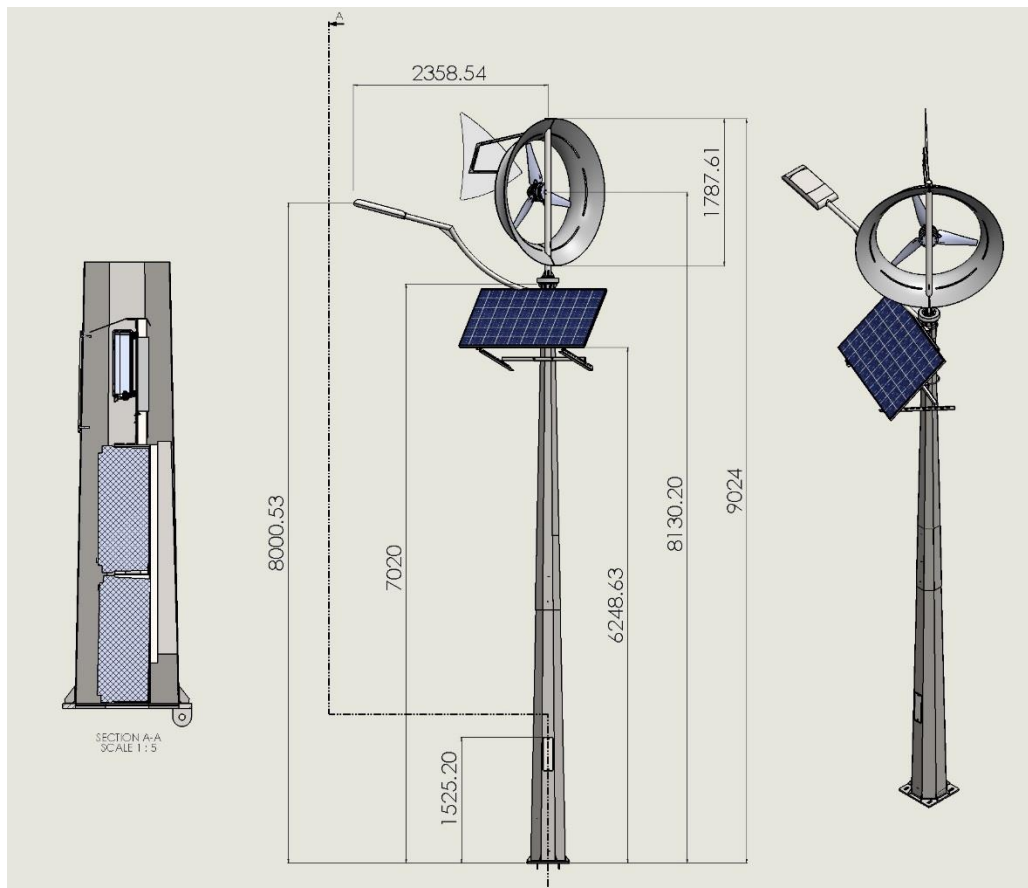


*Complete RPU Assembly Exploded*

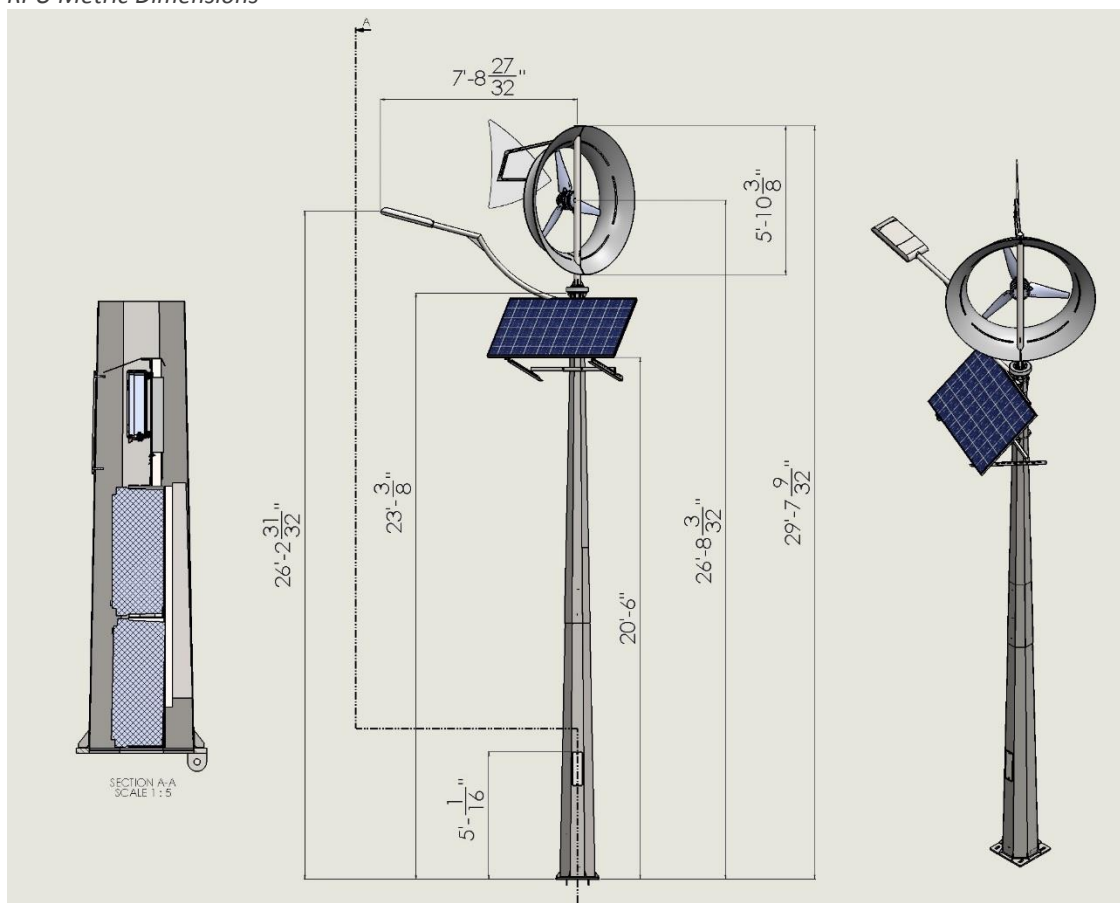


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8	00027P	RPU Tail Fin	1
9	00076A	RPU Solar Bracket Assembly	1
10	00005P	RPU Battery & Controller Cradle	1

*Lower Tower and Access Panel Assembled*

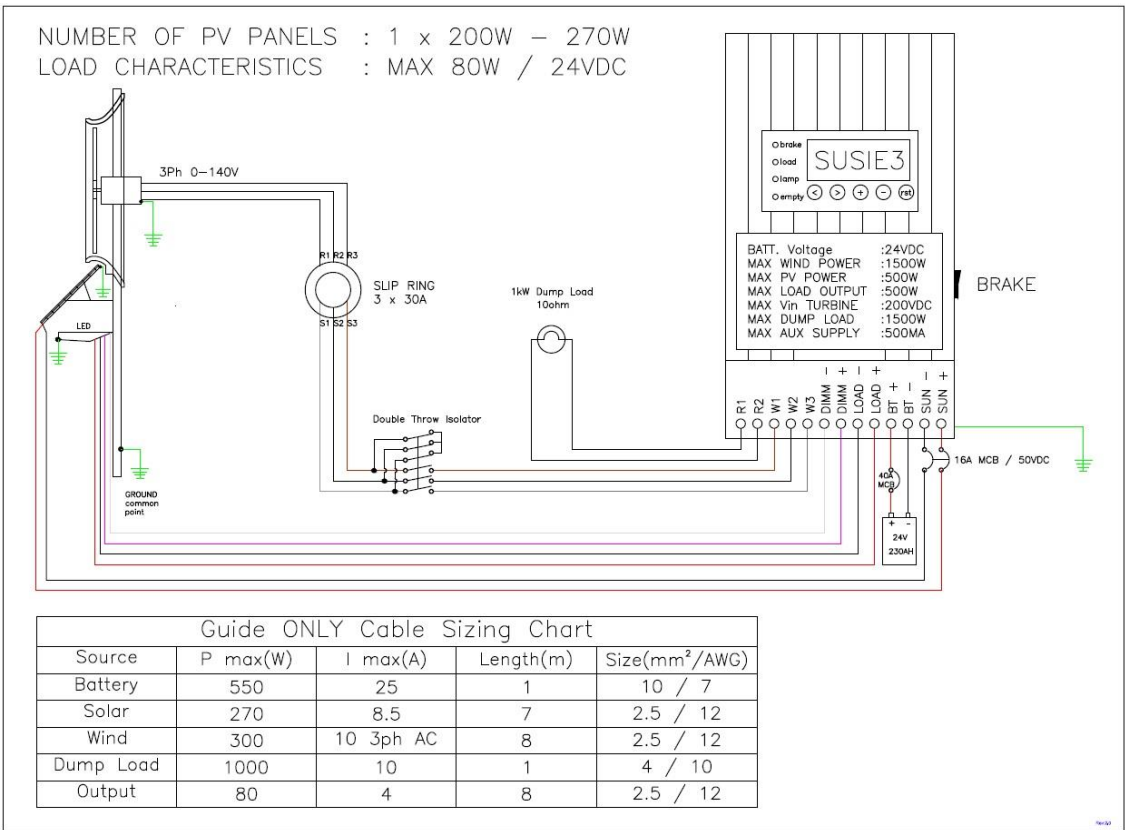


*RPU Metric Dimensions*

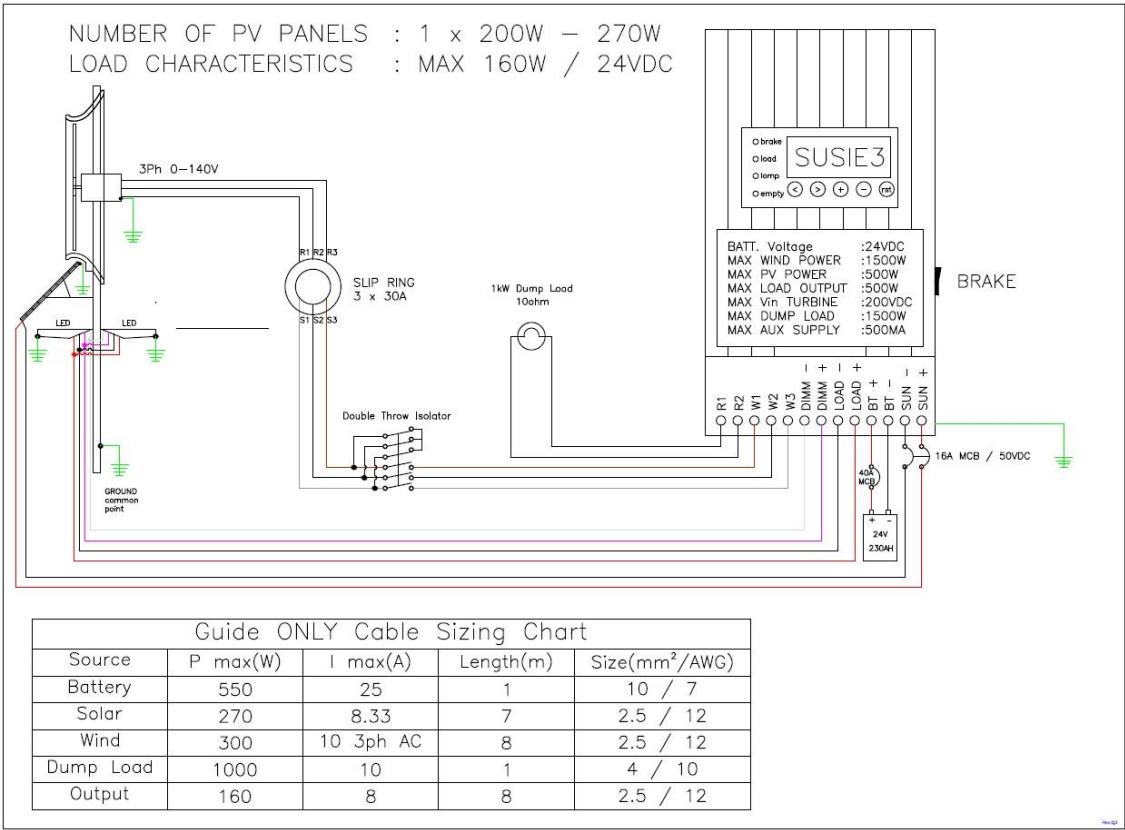


*RPU Imperial Dimensions*

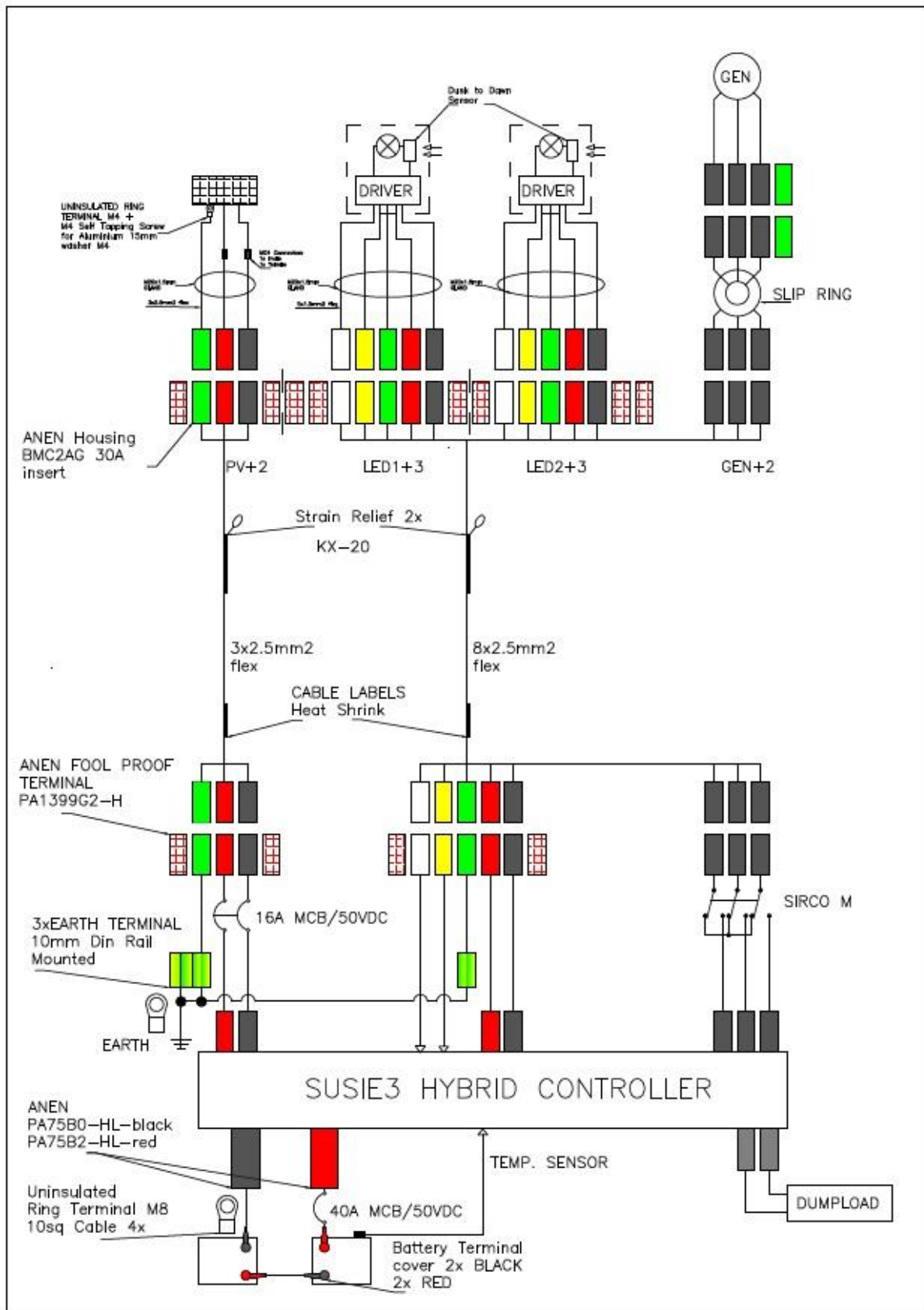
B. Electrical Schematic



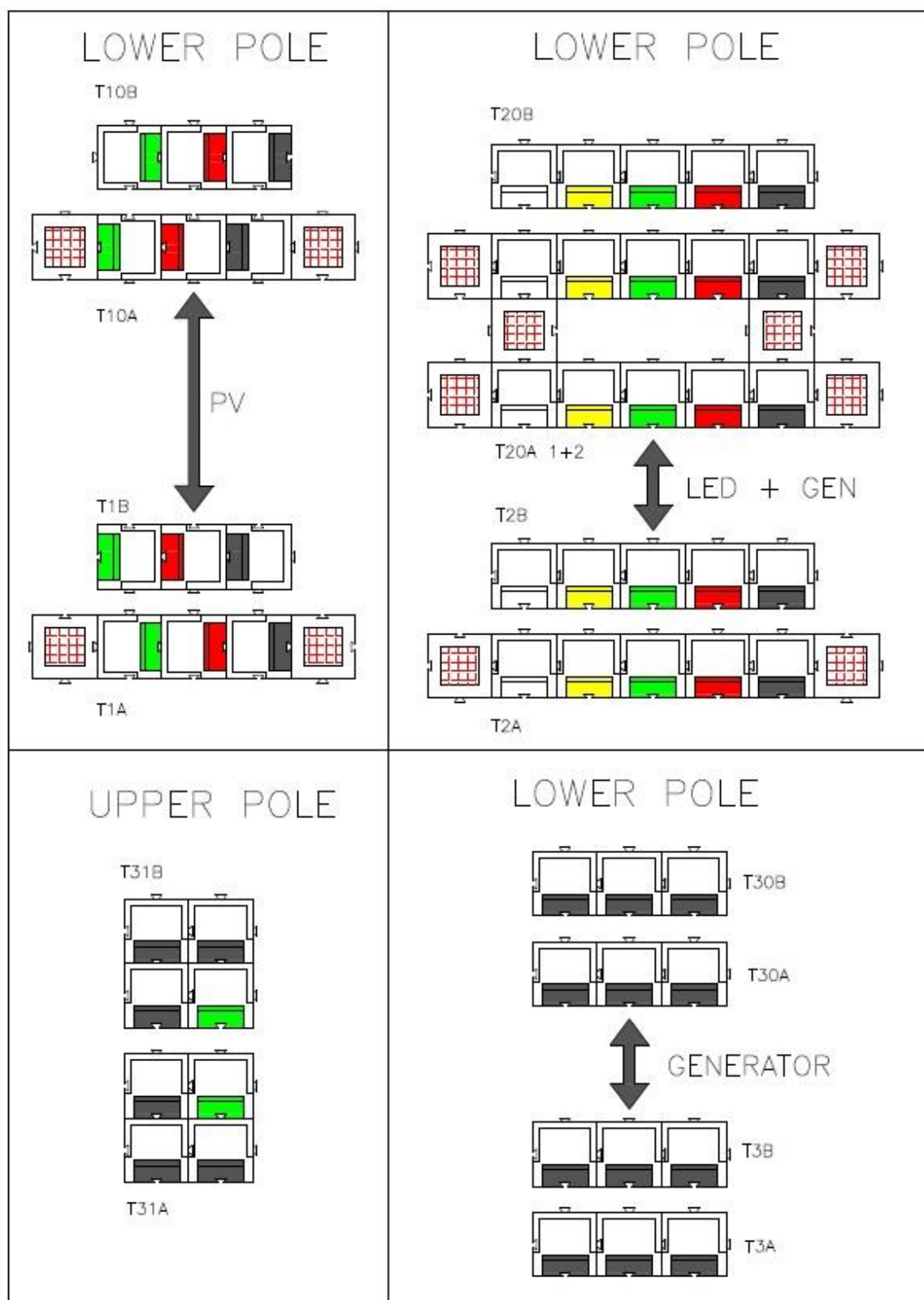
80W LED RPU Schematic Overview



160W LED RPU Schematic Overview



RPU Loom Schematic Overview

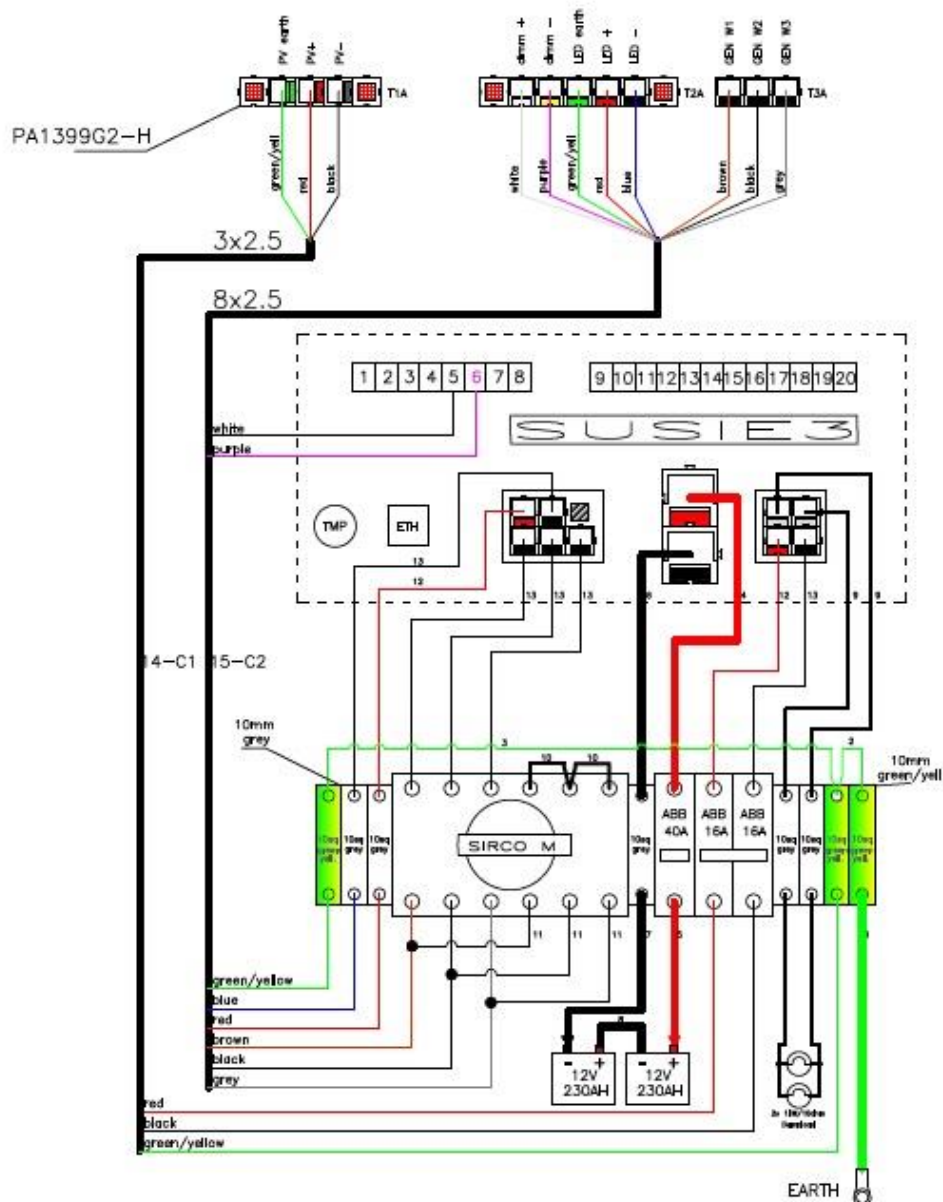


RPU Loom Connectors Overview



# CRADLE

- ABB40A — S201MC40
- ABB16A — S202MC16
- SIRCO M — 22096009 SOCOMEC COUPLING ACCESSORY  
22003001 SOCOMEC SIRCO M1 3X20A SWITCH—2PCS
- DUMLOAD — ASZ7045 1000W 10R J
- 10sq Ter. — Din Rail Mounted screw Terminals
- ANEN terminals — PA45B0-H — black PA75B0-H — black } BATTERY  
PA45B2-H — red PA75B2-H — red }  
PA45B4-H — yellow  
PA45B5-H — green  
PA45B8-H — grey  
PA45B9-H — white PA1399G2-H — foolproof connector



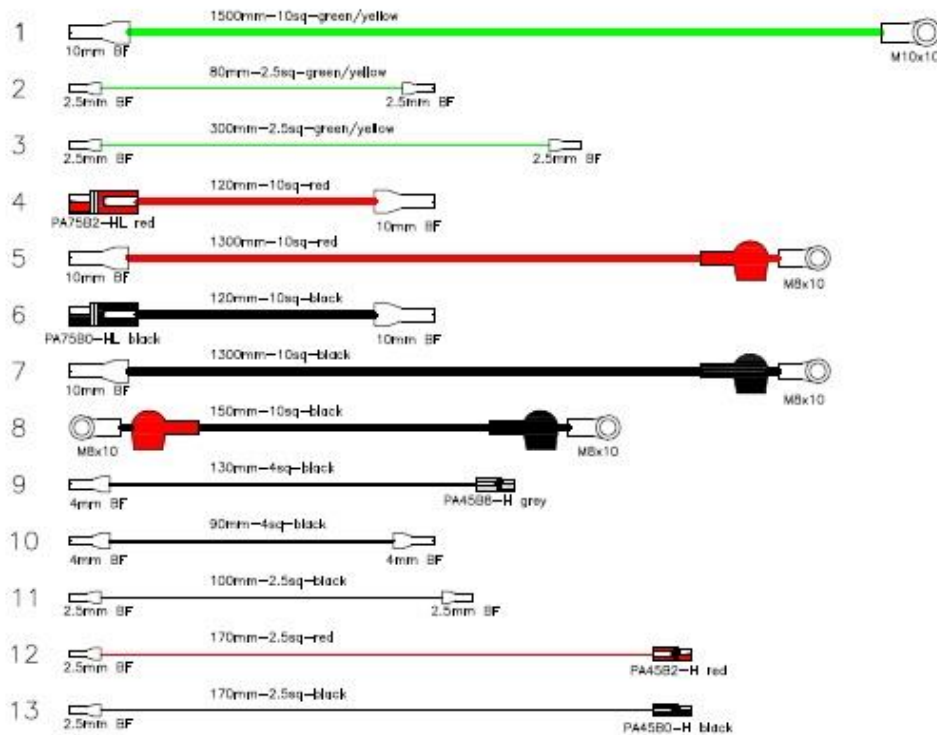
RPU Cradle Wiring Schematic

All Lengths are measured from tip to tip

PAXx-H connectors are ANEN make with MULTICOMP contacts  
PN: BMC2AG – 30A

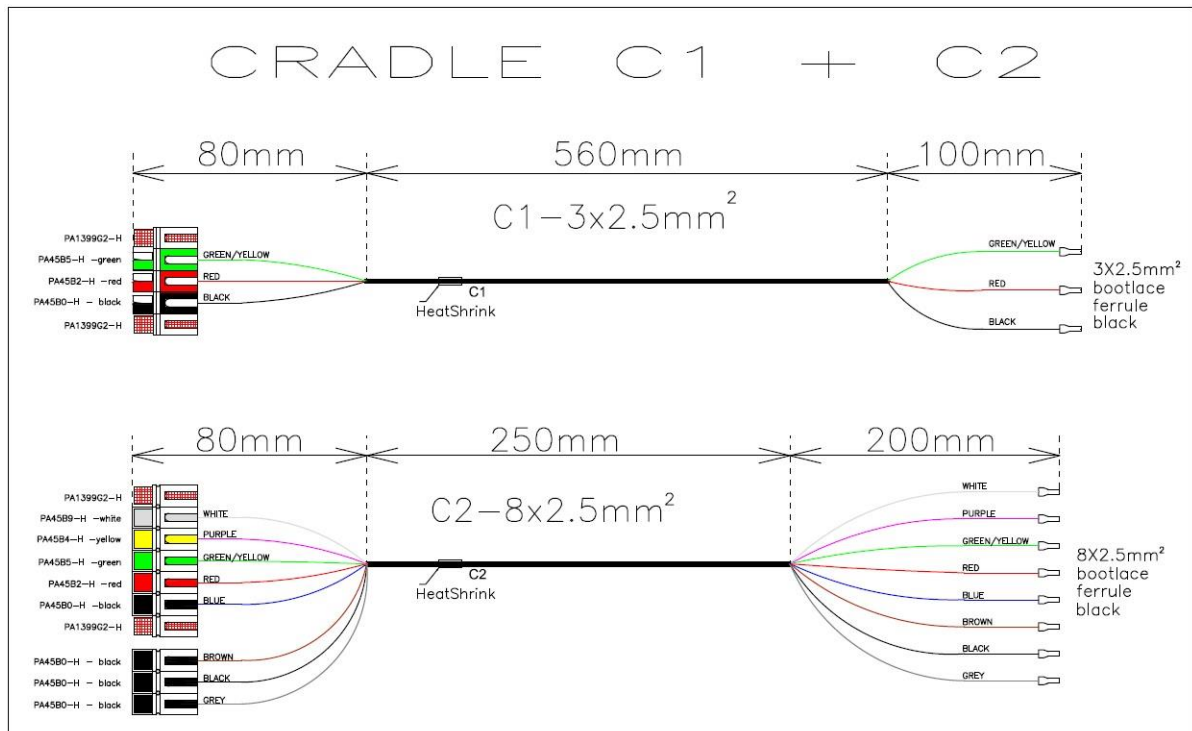
PAXx-HL connectors are ANEN make with ANEN contacts  
PN: PA5952 – 75A

All bootlace ferrule (BF) are single entry normal length  
Black colour

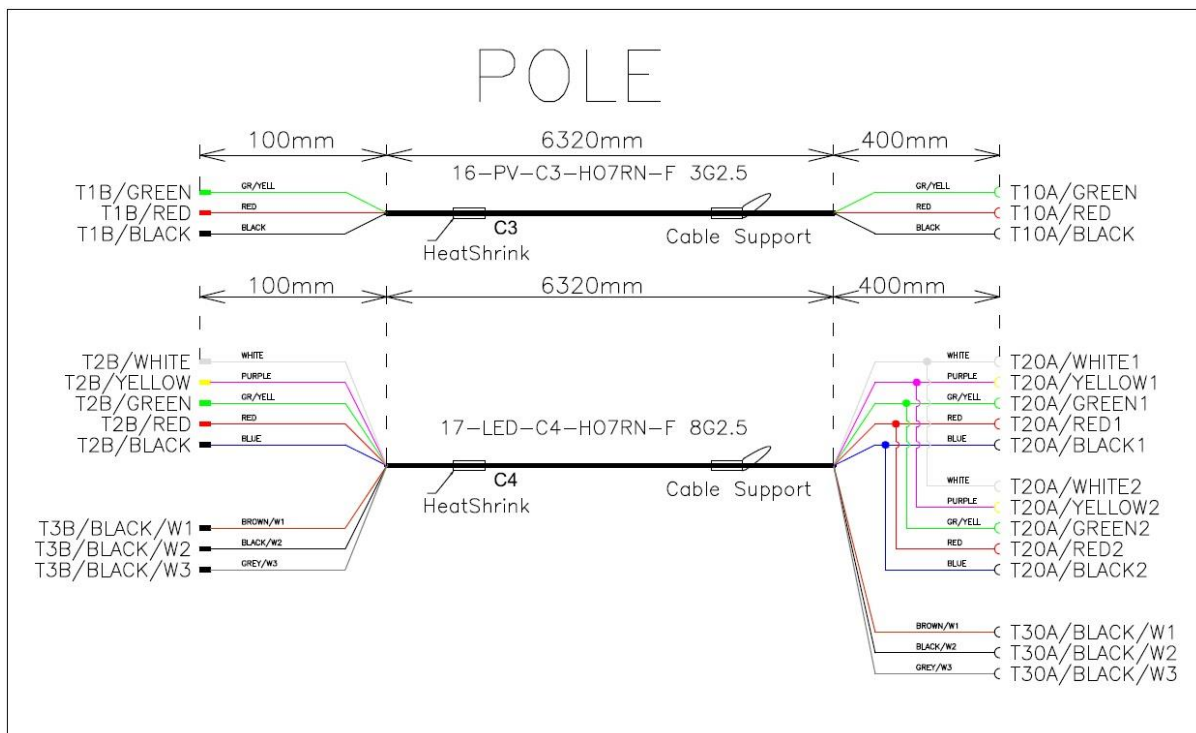


NUMBER	LENGTH (MM)	WIRE TYPE	WIRE COLOUR	PCS.	PN:
1	1500	10mm2 / FLEX	GREEN/YELLOW	1	
2	80	2,5mm2 / FLEX	GREEN/YELLOW	1	
3	300	2,5mm2 / FLEX	GREEN/YELLOW	1	
4	120	10mm2 / FLEX	RED	1	
5	1300	10mm2 / FLEX	RED	1	
6	120	10mm2 / FLEX	BLACK	1	
7	1300	10mm2 / FLEX	BLACK	1	
8	150	10mm2 / FLEX	BLACK	1	
9	130	4mm2 / FLEX	BLACK	2	
10	90	4mm2 / FLEX	BLACK	2	
11	100	2,5mm2 / FLEX	BLACK	3	
12	170	2,5mm2 / FLEX	RED	2	
13	170	2,5mm2 / FLEX	BLACK	5	
14	SEE C1 FOR DETAIL	3X2,5mm2 / HO7RN	BLACK	1	
15	SEE C2 FOR DETAIL	8X2,5mm2 / HO7RN	BLACK	1	
16	SEE C3 FOR DETAIL	3X2,5mm2 / HO7RN	BLACK	1	
17	SEE C4 FOR DETAIL	8X2,5mm2 / HO7RN	BLACK	1	
18	SEE C5 FOR DETAIL	3X2,5mm2 / HO7RN	BLACK	1	
19	SEE C6 FOR DETAIL	5X1,5mm2 / HO7RN	BLACK	2	

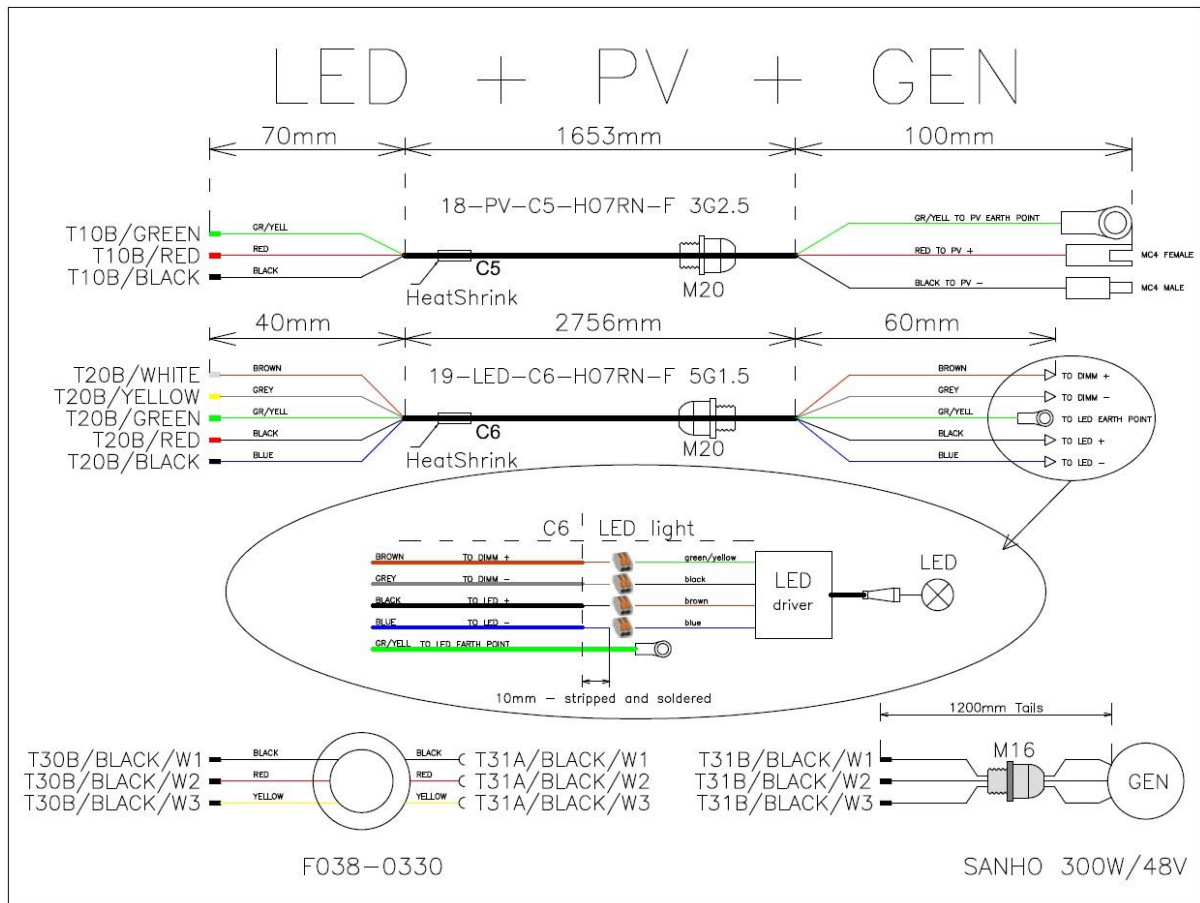
RPU Cradle Cable Index



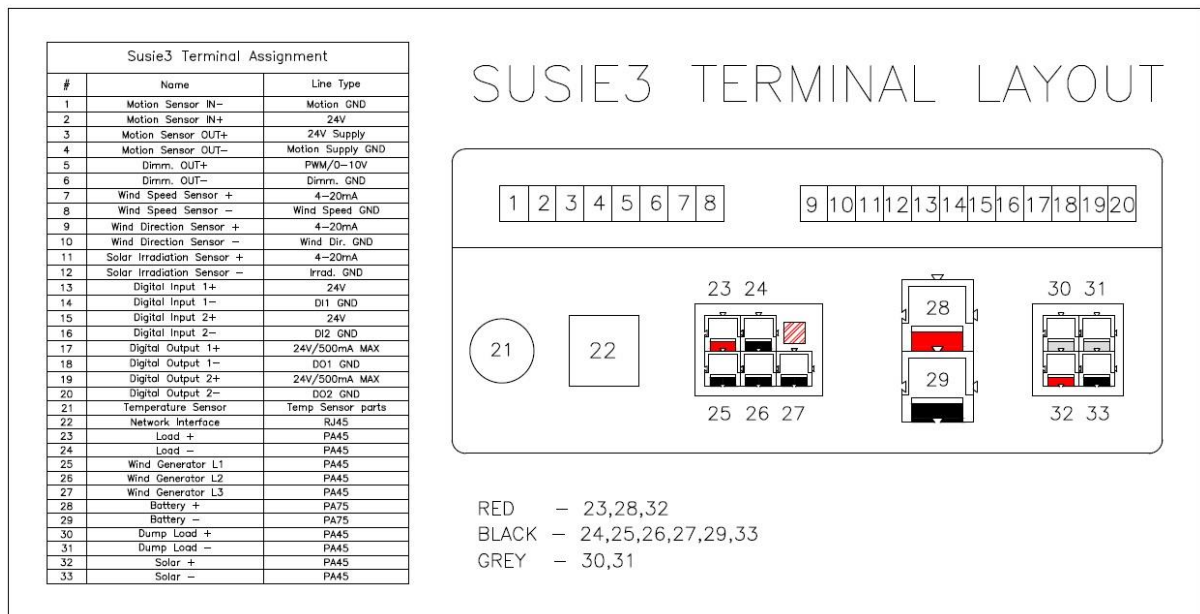
RPU Cradle Looms C1 + C2



RPU Pole Looms C3 + C4



RPU Connection Cables for LED PV & GEN



RPU Hybrid Street Light Controller Terminal Layout

## **C. Controller Manual**

Ref. Hybrid Street Light Controller2 manual draft.doc

## D. Nut & Bolt Torque Settings

Bolt Size (ISO)	Bolt Type	Torque (Nm) for Bolt Preloading
M30	10.9	2000
M24	8.8	725
M22	8.8	570
M20	8.8	420
M18	8.8	295
M16	8.8	215
M14	8.8	141
M12	8.8	89
M10	8.8	51
M8	8.8	26
M6	8.8	10.5
M5	8.8	6



## E. Noise Analysis

We investigated the noise from the RPU, firstly by looking at the one that is in operation. We investigated this (with the help of a cherry-picker) using hearing and a vibration stethoscope. This indicated that the tonal noise was originating with the generator. It appeared that the vibration was originating with the generator and then being transmitted into the structure, using the pole, cowl etc. as acoustic radiating elements.

We had previously used rubber type resilient mounts and had mounted the generator on these. This was helping to reduce the transmission of vibration from the generator into the pole and the effect could be heard using the stethoscope. We also looked at the electrical test rig. This used an electric motor to drive one of the generator units and the speed of the generator could be controlled in a range of about 0-460 rpm. Using this and a combination of the stethoscope we identified two resonant frequencies in this rpm range at 222 and 333 Hz, correlating with 280 and 380 rpm respectively. 222 Hz is a much stronger resonance.

Given the correlation between the two resonant frequencies, It was understood that these were the second and third harmonic of a fundamental resonance at 111 Hz, however the fundamental was not being excited as the turbine was not spinning fast enough to have enough energy to excite this, so the second harmonic at 222 Hz was the strongest resonance presented. More details analysis may also show peaks at 444 Hz, 555 Hz etc, getting weaker as the frequency rises. 333 Hz was already much weaker than 222 Hz.

Recommendations: Two approaches were proposed;

### Proposal 1

Source custom vibration isolation mounts for the generator. These should be designed (or sourced if available) to have the correct resilient properties to isolate the generator from the pole mounting with specific emphasis on the frequency at 222 Hz and 333 Hz.

### Proposal 2

Investigated tuning the generator controller to limit the power take off at 280 rpm and 380 rpm, since the generator seems to only generate vibration under load.

This analysis was presented to New World Energy Enterprises Limited, wholly owned by Airsynergy by;

Dr. Peter Hill  
Acoustic Designs

## F. CE Marking - Declaration of Conformity Information



**New World Energy Enterprises Ltd**

(Part of the Airsynergy Group)

Unit 2, Harp Business Park

Church Quarters

Granard

Co. Longford

Ireland

N39 XK13

T: 00353 43 6660855

F: 00353 43 6660740

M15102

# EC Declaration of Conformity

IN ACCORDANCE WITH BS EN ISO/IEC 17050-1:2010

We **New World Energy Enterprises Ltd**  
of **Ro Unit 2, Harp Business Park, Church Quarters, Granard, Co. Longford.**

### Declare that:

Manufacturer	<b>Airsynergy</b>
Equipment	<b>RPU Wind Turbine</b>
Type	<b>Wind generator with solar, battery, lamp</b>
Serial number	<b>range</b>

### in accordance with the following Directives:

<b>2006/42/EC</b>	<b>Machinery Directive</b>
<b>2006/95/EC</b>	<b>Low Voltage Directive</b> and its amending directives
<b>2004/108/EC</b>	<b>Electromagnetic Compatibility Directive</b> and its amending directives

### has been designed and manufactured to the following specifications:

Machinery Directive 2006/42/EC	Assessment of compliance with Annex 1: Essential Health and Safety Requirements, part 1
Machinery Directive 2006/42/EC	Assessment of compliance with Essential Health and Safety Requirements for electrical equipment of machines
BS EN 60204-1:2006+A1:2009	Safety of machinery. Electrical equipment of machines. General requirements
EN 61400-1:2005+A1:2010	Assessment of requirements of wind turbines
EN 50308:2004	Wind turbines —Protective measures —Requirements for design, operation and maintenance
Directive 2004/108/EC	Assessment of electromagnetic compatibility performance
EN 61000-6-3:2007	Generic emissions standard for residential, commercial and light industrial environments.

**I hereby declare that the equipment named above has been designed to comply with the relevant sections of the above referenced specifications. The unit complies with all applicable essential requirements of the Directives.**

Signed by: 

Name: **Jim Smyth**  
Position: **Managing Director**

At: **New World Energy Enterprises Ltd**  
On: **February 2016**

**CE<sub>16</sub>**

# EC Declaration of Conformity

IN ACCORDANCE WITH BS EN ISO/IEC 17050-1:2010

We **MO TEAM LTD**  
of **11E Chapel Road, Crumlin, Co. Antrim, BT29 4LY U.K.**

**Recommend that:**

Manufacturer	<b>Airsynergy</b>
Equipment	<b>RPU Wind Turbine</b>
Type	<b>Wind generator with solar, battery, lamp</b>
Serial number	<b>M15102Test</b>

**in accordance with the following Directives:**

<b>2006/42/EC</b>	<b>Machinery Directive</b>
<b>2006/95/EC</b>	<b>Low Voltage Directive</b> and its amending directives
<b>2004/108/EC</b>	<b>Electromagnetic Compatibility Directive</b> and its amending directives

**has been designed and manufactured to the following specifications:**

Machinery Directive 2006/42/EC	Assessment of compliance with Annex 1: Essential Health and Safety Requirements, part 1
Machinery Directive 2006/42/EC	Assessment of compliance with Essential Health and Safety Requirements for electrical equipment of machines
BS EN 60204-1:2006+A1:2009	Safety of machinery. Electrical equipment of machines. General requirements
EN 61400-1:2005+A1:2010	Assessment of requirements of wind turbines
EN 50308:2004	Wind turbines —Protective measures —Requirements for design, operation and maintenance
Directive 2004/108/EC	Assessment of electromagnetic compatibility performance
EN 61000-6-3:2007	Generic emissions standard for residential, commercial and light industrial environments.

**I hereby declare that the equipment named above has been designed to comply with the relevant sections of the above referenced specifications. The unit complies with all applicable essential requirements of the Directives.**

Notes not included on manufacturer DoC:

Manufacturer to use this recommendation/template supplied to create signed\* DoC for public release.

V3 Charge controller EMC test, all other parts as per design documents

Manufacturing QC, Spare parts and CE mark with Serial numbers to be recorded by manufacturer

\*The "responsible person" mentioned in the regulations which implement the MD is not necessarily the person signing the certificate. The actual person signing the DOC represents the company. The DOC must include a printed version of name and the job title of the person signing, also the date and place of signature.

Signed by: 

Name: **John Robert Moran**  
Position: **Managing Director**

At: **MO TEAM LTD**  
On: **18<sup>th</sup> February 2016**

**CE<sub>16</sub>**

## G. RPU Installation Inspection & Maintenance Log Book

# RPU Installation Inspection & Maintenance Log Book

**(Sheet)**

[illegible]