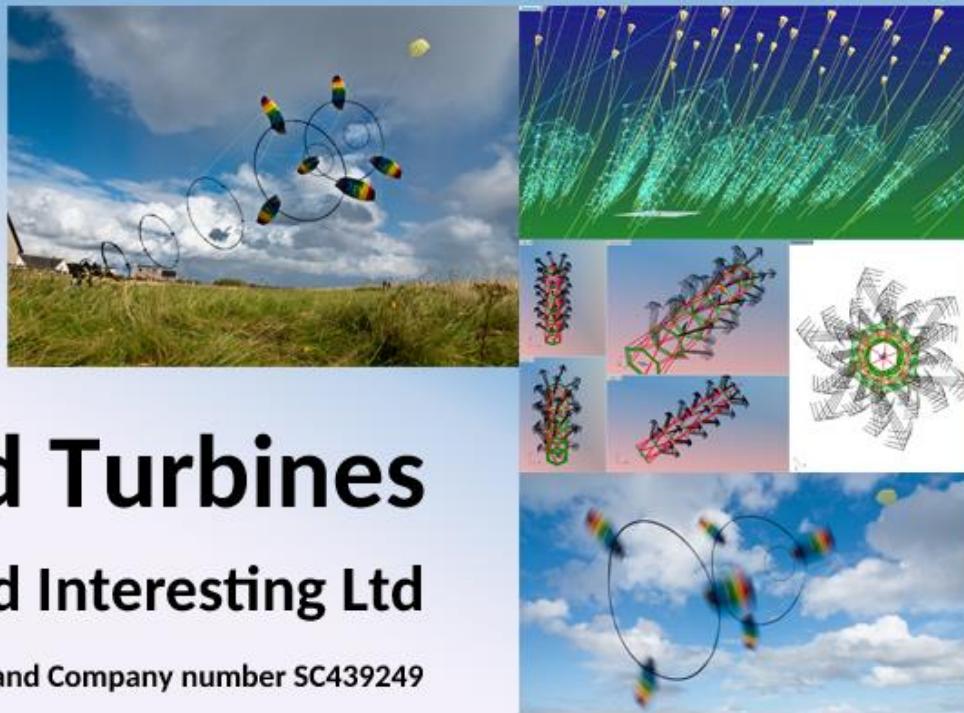


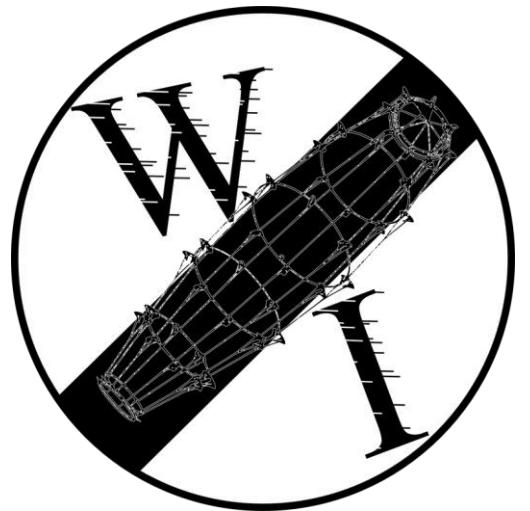


Airborne Wind Turbines

Windswept and Interesting Ltd

15a Aiginish Isle of Lewis Registered in Scotland Company number SC439249

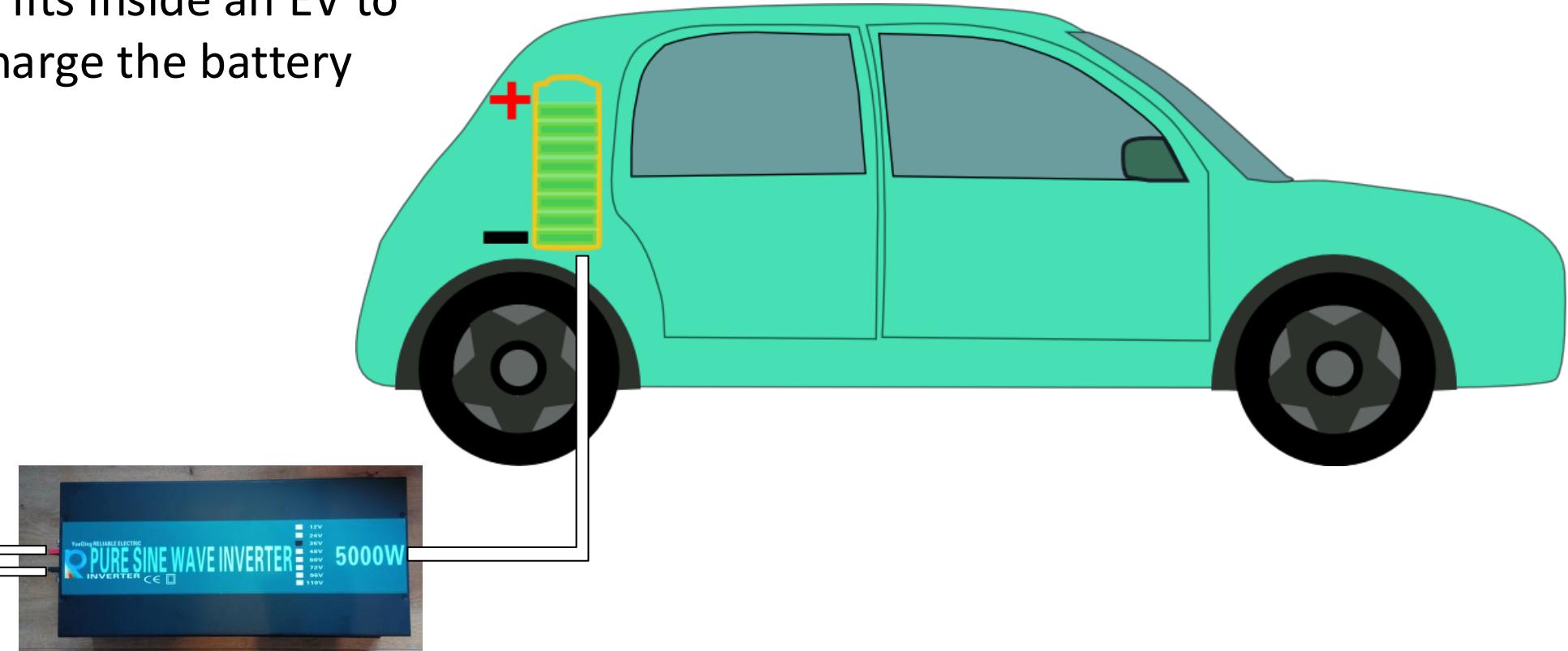




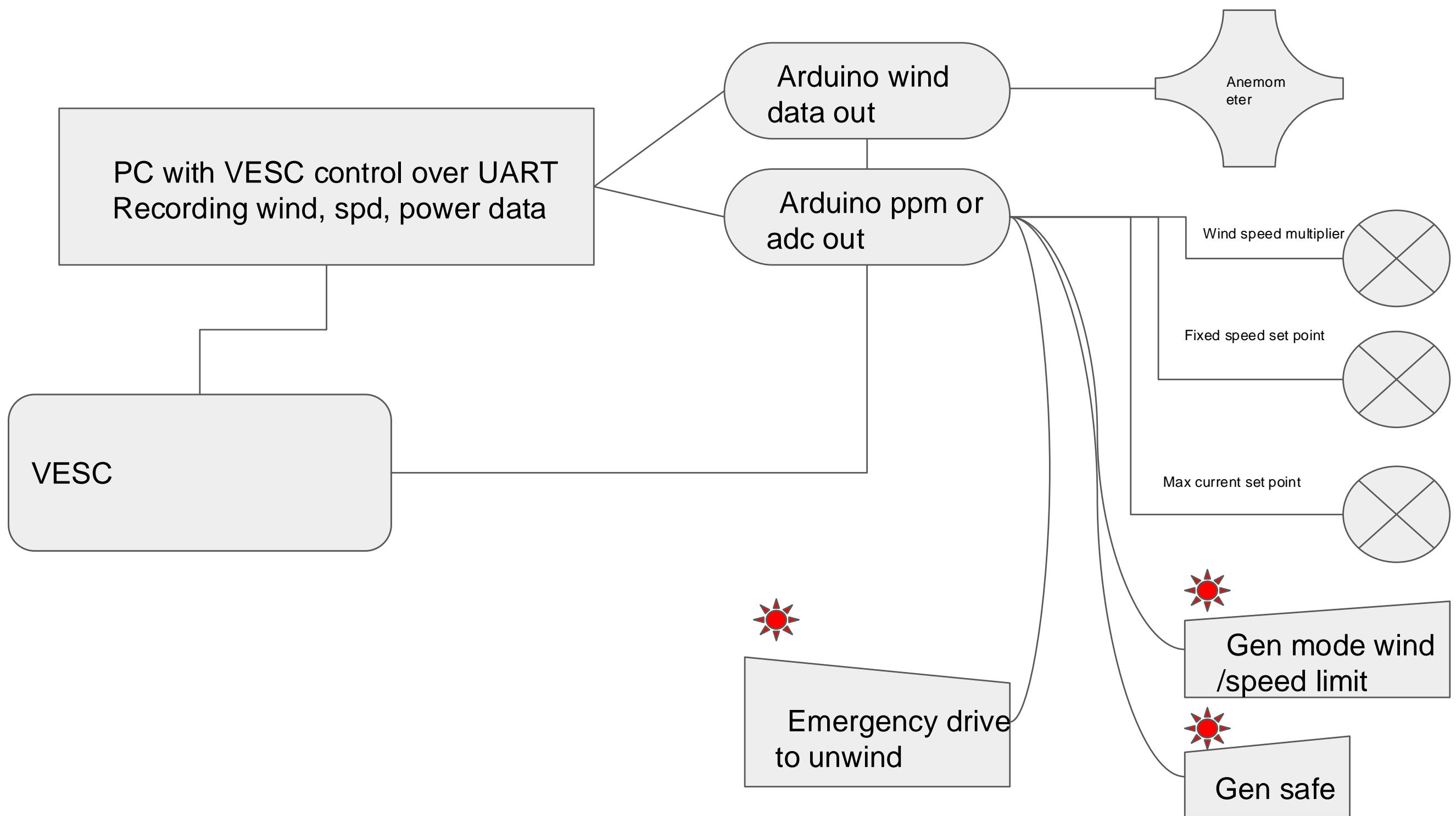
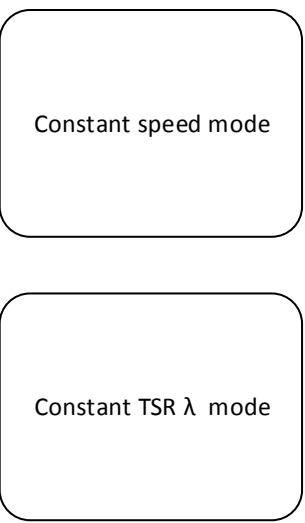
Wind-swept and Interesting Car Charge Challenge



Use a flying wind turbine
which fits inside an EV to
recharge the battery



Energy independent EV cars powered with renewable energy are possible with kite turbines.
The energy density and packing size of kite turbines make them ideal for the challenge.



Start up Routine

Library calls
 Establish VESC Communication
 Units defined
 (Establish comms with torsion sensor, and live computer
 parametric tuning units later version)

Lift Line
 Tension Sensing

VESC Speed Data
 (Assumes Rotor and
 VESC are connected)

Torsion Line
 Twist Angle
 Measure

Lift established?

yes

no

Rotor Speed >60rpm

yes

no

Line Twist Angle >5

yes

no

Line Twist Angle <15

yes

no

Line Twist Angle >20

yes

no

Routine When Line Angle sensing is proven working

No REGEN Braking

Higher REGEN Braking Level

Lower REGEN Braking

Same REGEN Braking

No REGEN Braking

DRIVE VESC FORWARD

Is Signal =
DRIVE VESC FORWARD

Communicate to VESC

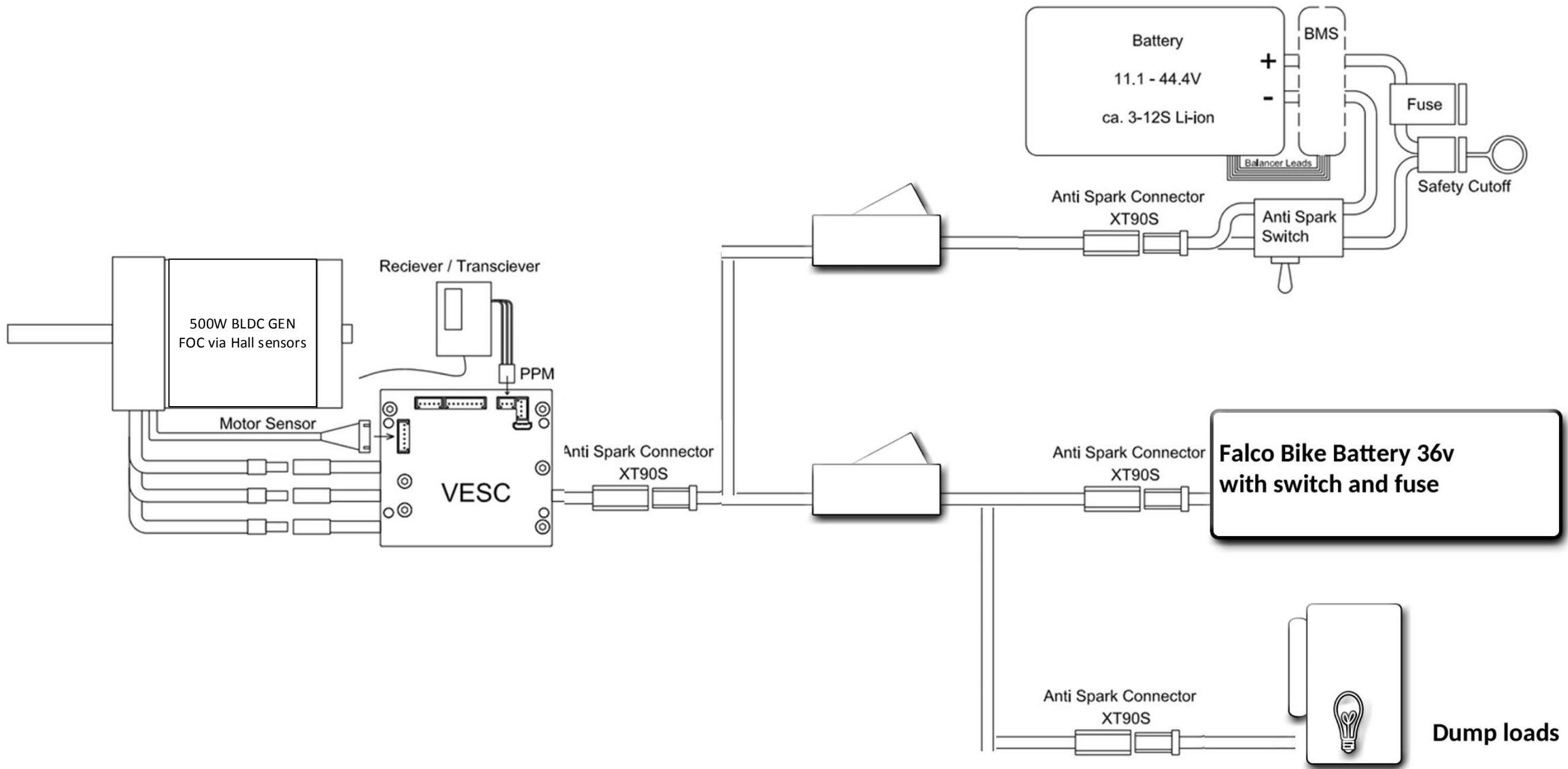
Delay 0.4 sec

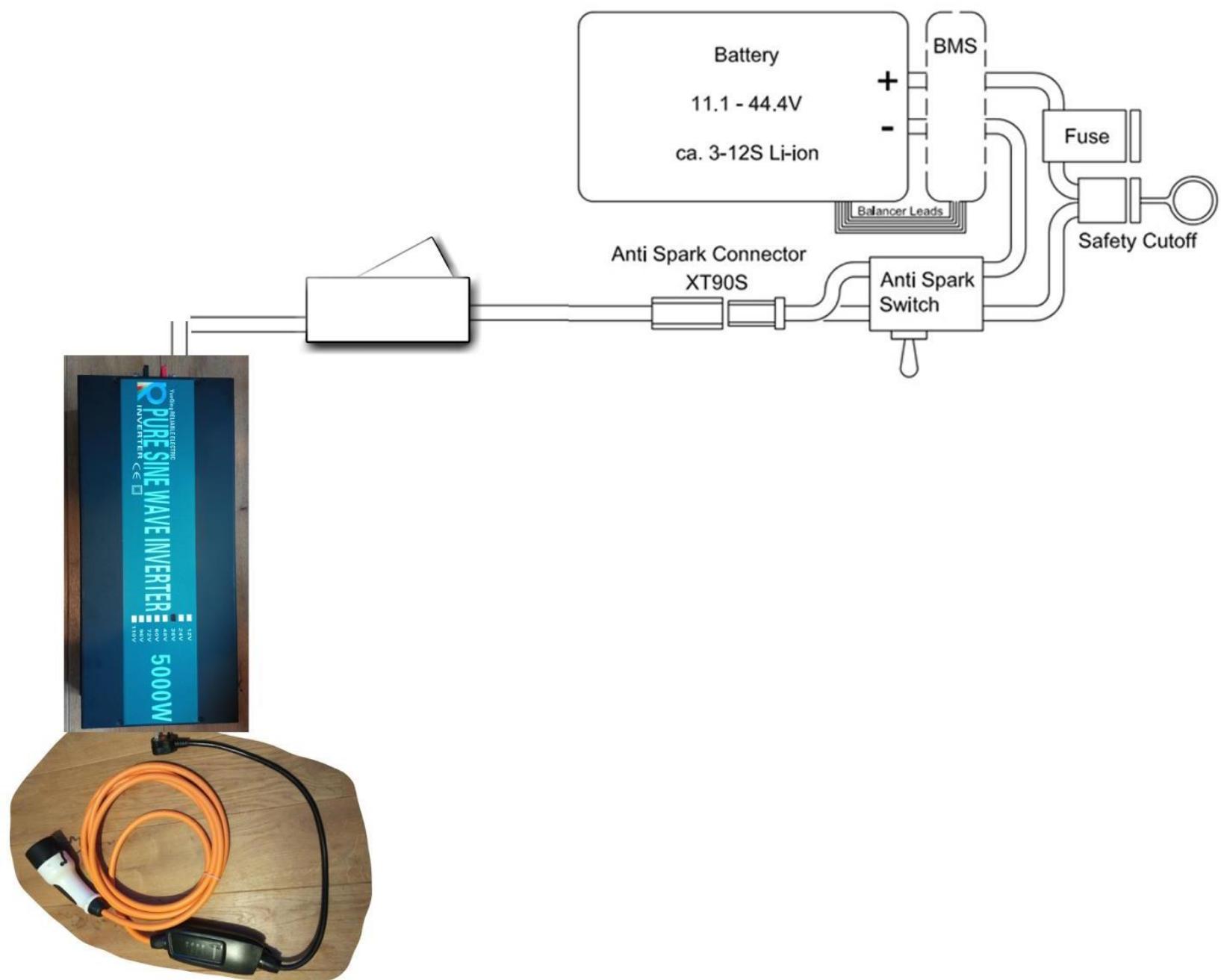
Manual
Override



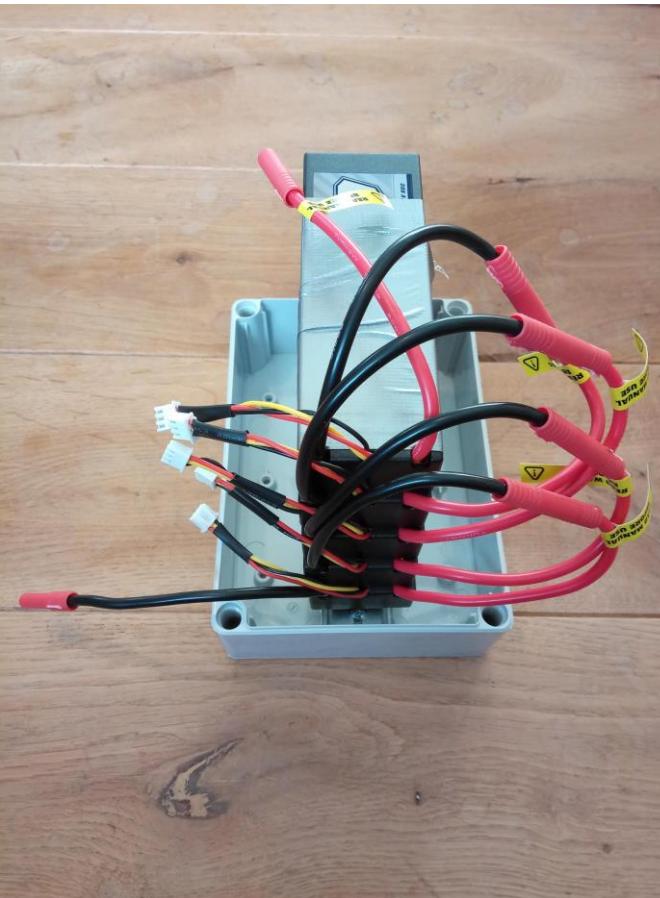
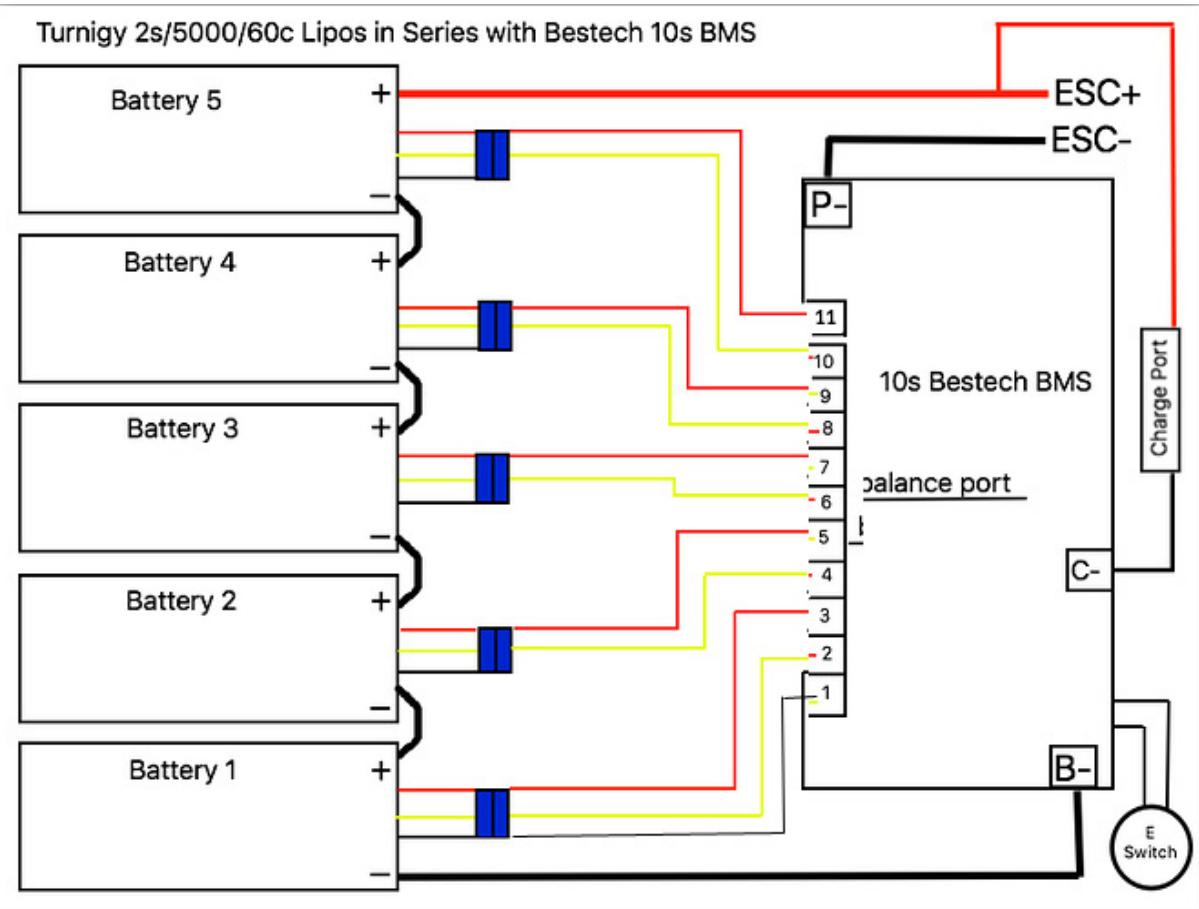
nominal kite system power W	Kite RPM	kite rad/s	Kite chainring teeth	driven gear teeth	ratio	driven rpm	driven rad/s	torque chain ring	torque small ring		speed required for input rpm	speed required for input rad/s	gearing needed
500	80	8.3775804	47	22	2.136364	170.9091	17.8975581	59.6831037	27.936772		984.8484848	103.133092	5.762411
500	80	8.3775804	61	17	3.588235	287.0588	30.0607297	59.6831037	16.6329961		984.8484848	103.133092	3.430825
500	80	8.3775804	47	17	2.764706	221.1765	23.1615458	59.6831037	21.5875056		984.8484848	103.133092	4.452772
500	80	8.3775804	61	22	2.772727	221.8182	23.2287457	59.6831037	21.5250538		984.8484848	103.133092	4.439891
Standard Trampa wheel inch diameter	circumference	into m	speed km/h	Speed m/s	rev/s	rpm	rad/s	wheel torque Nm					
8	25.132	0.6383528	40	11.11111	17.40591	1044.35458	109.364555	21.9449528					
motor output W	motor shaft rpm	Motor shaft rad/s	Motor Torque Nm	motor pulley	slave pulley		input ratio	input speed rpm	Input speed rad/s				
2400	5000	523.598775	4.583662	13	66	5.07692308	984.848485	103.133092					
2400	5000	523.598775	4.583662	14	66	4.71428571	1060.60606	111.066407					
2400	5000	523.598775	4.583662	15	66	4.4	1136.36364	118.999722					
2400	5000	523.598775	4.583662	13	66	5.07692308	984.848485	103.133092					
2400	5000	523.598775	4.583662	14	66	4.71428571	1060.60606	111.066407					
2400	5000	523.598775	4.583662	15	66	4.4	1136.36364	118.999722					

voltage 10S	capacity mAh	C#	Max current out	max power	power demanded from discharging	current @ discharge	time to discharge
37	20000	5	100	3700	3500	94.59	
37	20000	10	200	7400	3500	94.59	
37	20000	15	300	11100	3500	94.59	
37	20000	20	400	14800	3500	94.59	
37	20000	25	500	18500	3500	94.59	
37	20000	30	600	22200	3500	94.59	
37	20000	35	700	25900	3500	94.59	
37	20000	40	800	29600	3500	94.59	
37	20000	45	900	33300	3500	94.59	
37	15000	5	75	2775	3500	94.59	
37	15000	10	150	5550	3500	94.59	
37	15000	15	225	8325	3500	94.59	
37	15000	20	300	11100	3500	94.59	
37	15000	25	375	13875	3500	94.59	
37	15000	30	450	16650	3500	94.59	
37	15000	35	525	19425	3500	94.59	
37	15000	40	600	22200	3500	94.59	
37	15000	45	675	24975	3500	94.59	
37	10000	5	50	1850	3500	94.59	
37	10000	10	100	3700	3500	94.59	
37	10000	15	150	5550	3500	94.59	
37	10000	20	200	7400	3500	94.59	
37	10000	25	250	9250	3500	94.59	
37	10000	30	300	11100	3500	94.59	
37	10000	35	350	12950	3500	94.59	
37	10000	40	400	14800	3500	94.59	
37	10000	45	450	16650	3500	94.59	
37	5000	5	25	925	3500	94.59	
37	5000	10	50	1850	3500	94.59	
37	5000	15	75	2775	3500	94.59	
37	5000	20	100	3700	3500	94.59	
37	5000	25	125	4625	3500	94.59	
37	5000	30	150	5550	3500	94.59	
37	5000	35	175	6475	3500	94.59	
37	5000	40	200	7400	3500	94.59	
37	5000	45	225	8325	3500	94.59	



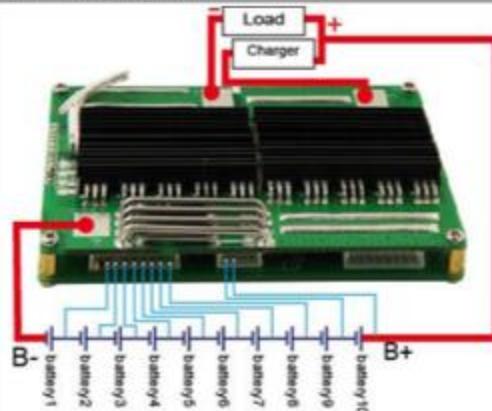


Turnigy 2s/5000/60c Lipos in Series with Bestech 10s BMS



Data Sheet

Item	Contents	Criteria(Adjustable)	
1	Model	HCX-D223V1	
2	Voltage	Charging voltage Maximal continuous charging current Maximal continuous discharging current Current consumption	42V 20A 80A $\leq 20\mu A$
3	Current	Over charge detection voltage Over charge detection delay time Over charge release voltage	$4.28V \pm 0.025V$ 0.5~2S $4.08V \pm 0.05V$
4	Overcharge Protection	Over discharge detection voltage Over discharge detection delay time Over discharge release voltage	$3.00V \pm 0.05V$ 50~200mS $3.00V \pm 0.1V$
5	Over Discharge Protection	Over current detection voltage Over current detection current Detection delay time Release condition	$0.1V \sim 0.2V$ $200A \pm 40A$ 5~20mS Cut load, automatically recover
6	Over Current Protection	Detection condition Detection delay time Release condition	Exterior short circuit 200~500μS Cut load, automatically recover
7	Short Circuit Protection	Balance voltage for single cell Balance current for single cell	$4.2V \pm 0.025V$ $126mA \pm 15mA$
8	Balance	Inner resistance	$\leq 20m\Omega$
9	Resistance	Operating temperature range Storage temperature range	-40 ~ +85°C -20 ~ +125°C
10	Temperature		
11	Size (L*W*T)	L120mm * W80mm * T25mm	

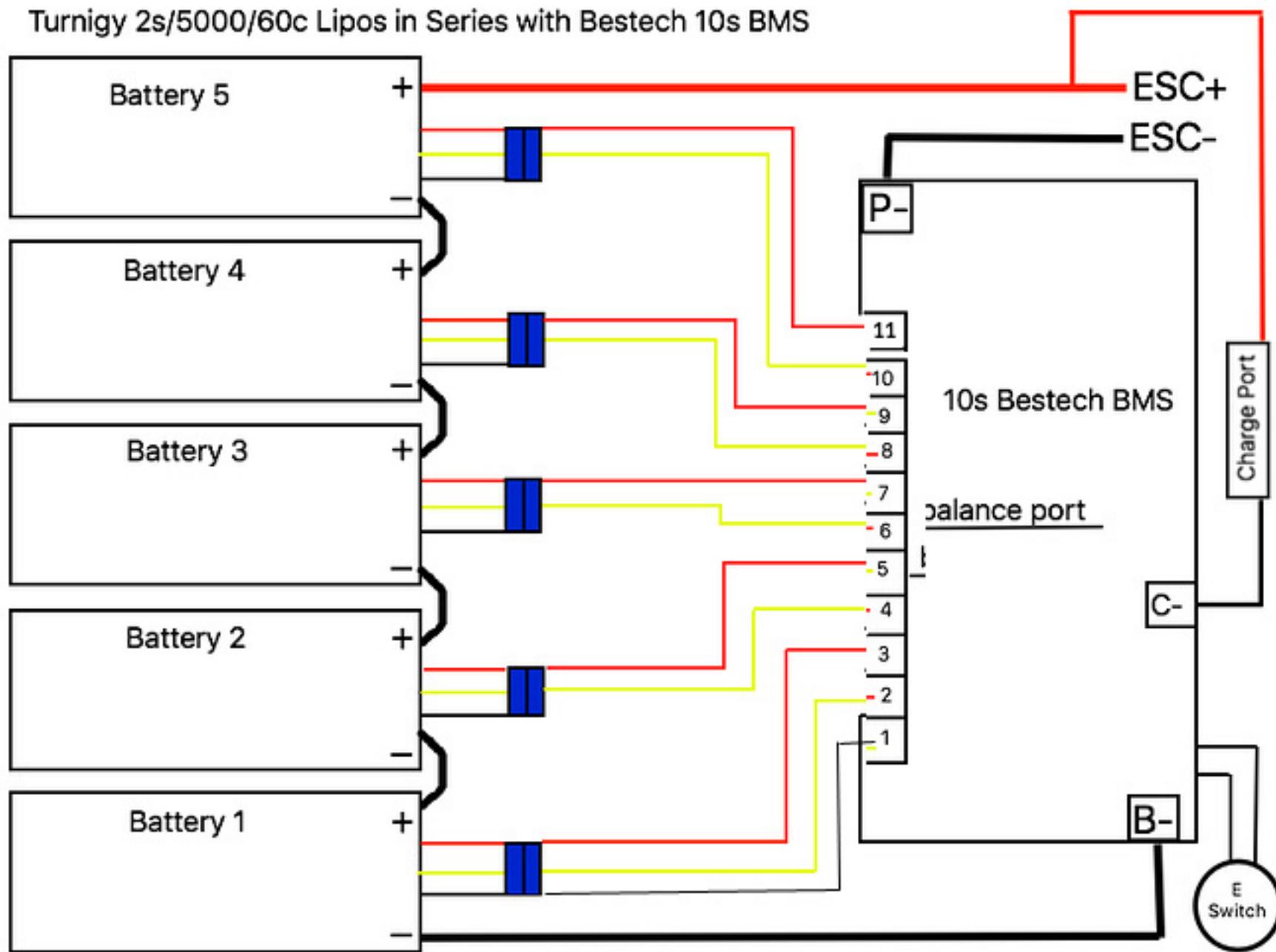


*Note: Characteristics subject to change without notice.

ITEMS ORDERED

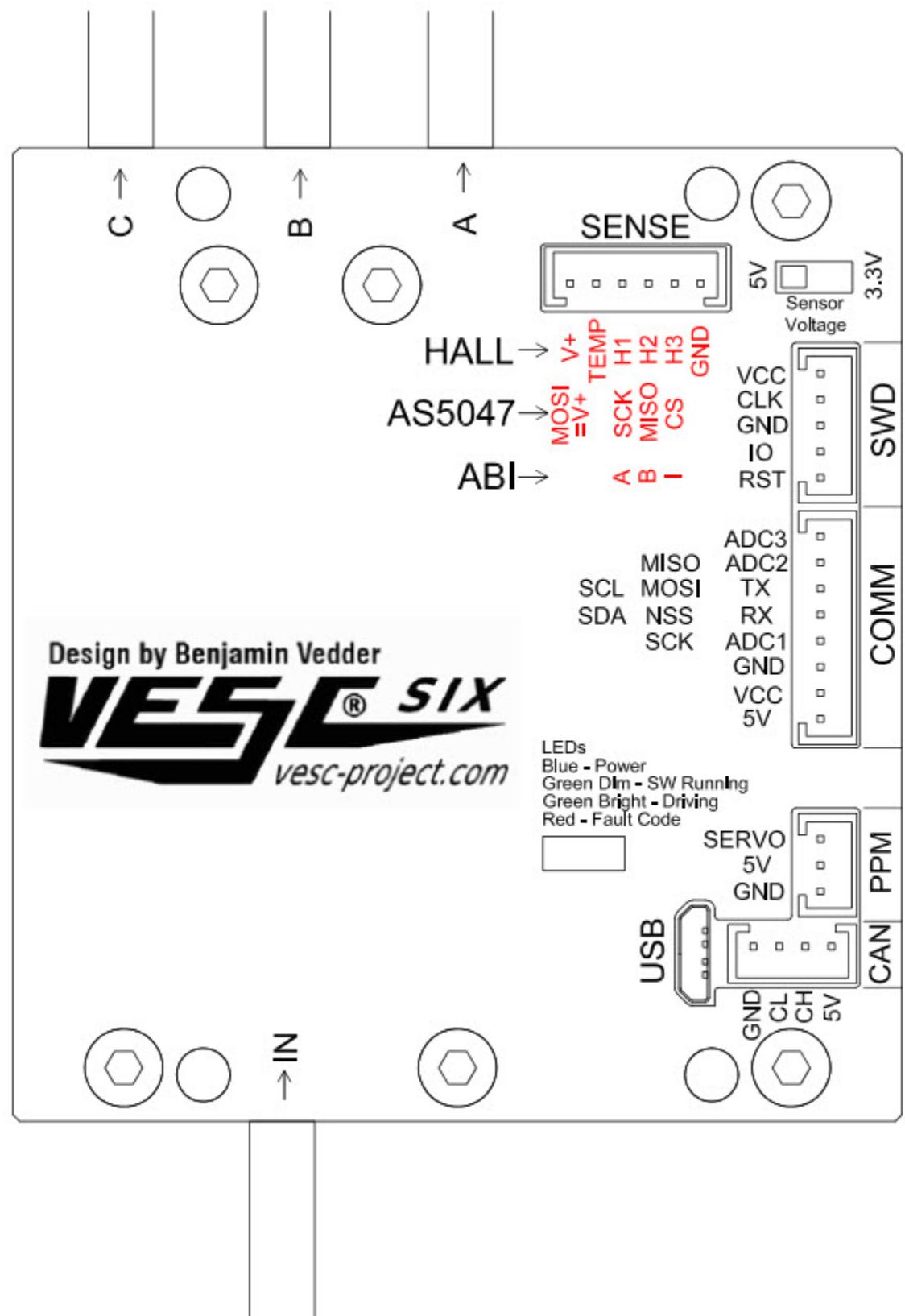
Product	SKU	Price	Qty	Warehouse
Turnigy 5000mAh 2S 7.4V 60C Hardcase Pack	T5000.2s.60HC	£21.77	5	United Kingdom (UK)
XT90-S Anti-Spark Connector (2pairs/Bag)	015000177-0	£4.56	2	United Kingdom (UK)

Turnigy 2s/5000/60c Lipos in Series with Bestech 10s BMS



Connectors and Switches:

The VESC is equipped with USB, Can-Bus, PPM, COMM, SWD and a Sensor ports. The following List will give you an idea how to interconnect the VESC to other devices.



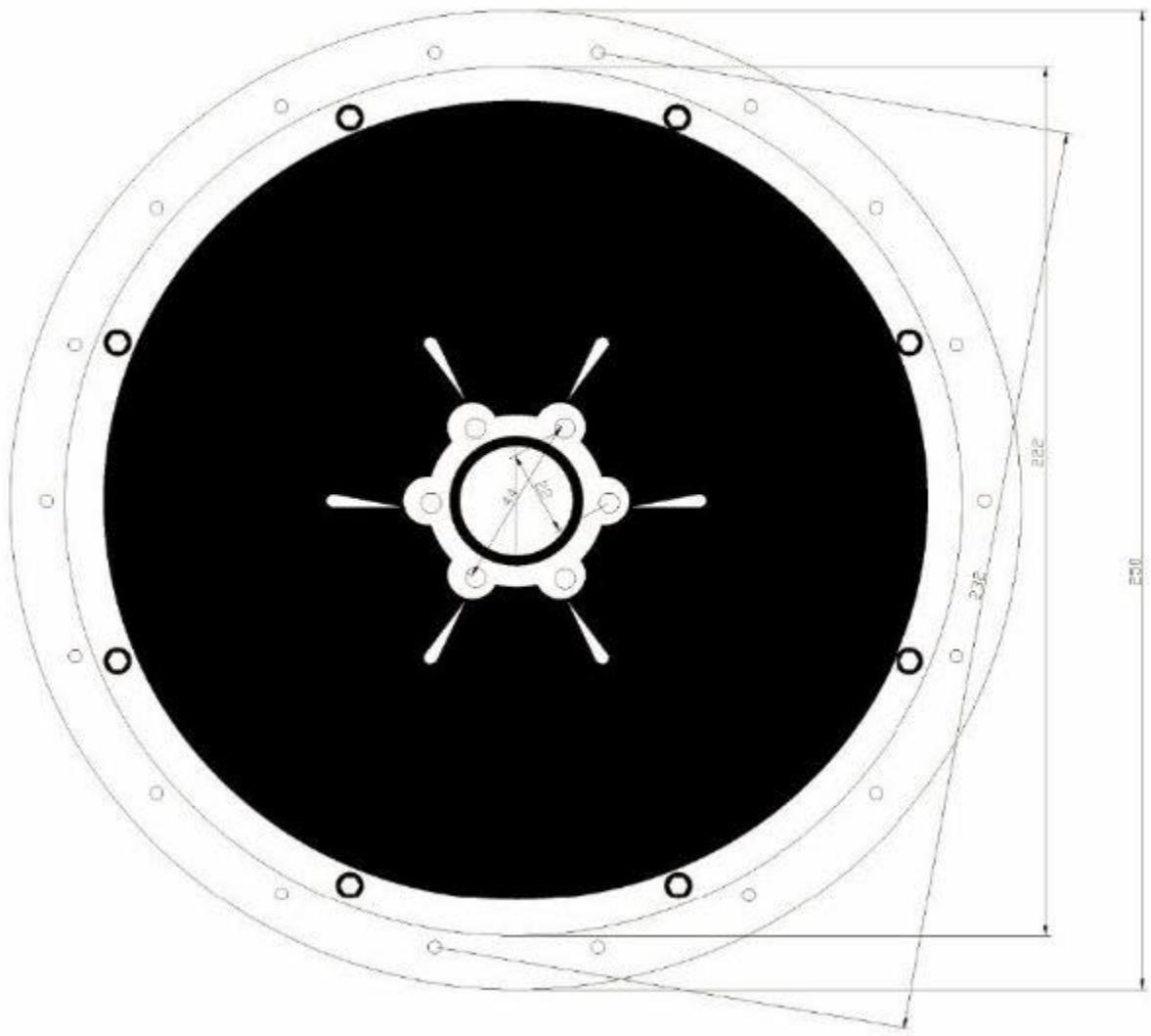
- Sensors:** Sensor Port for **ABI, HALL or AS5047P motor position sensors**. Motor sensors allow precise and powerful rotation of the motors rotor from a random (standstill) position or from a defined position A to a defined position B.
BETA VESCs have a wrong text printed on the PCB! The correct connector description can be seen in the image to the left.
- Did you check and adjust the sensor voltage (3.3 / 5V)?
Did you check the wiring scheme of your sensor cable?
- SWD:** Serial Wire Debug allows to access the STM32 Chip while running your VESC: Diagnostics, debugging and real time data.
- COMM :** I2C, UART and ADC Interface to allow communication with other devices, such as Microcontrollers (e.g. Arduino, Raspberry Pi) or using analog input devices (e.g. analog throttle)
- PPM:** Connect input devices using Pulse-Position Modulation e.g. a 2.4GHz transceiver for controlling the motors output power and speed (Radio control).
Never connect one receiver to separate VESC devices (Y-PPM).
- CAN:** CAN BUS for interconnection of VESC in an array. E.g. when implementing traction control in a multi drive setup or when powering up multiple motors, using multiple VESCs (master + slave 1, 2, 3,...). CAN-bus is also a universal bus to link the VESC to other devices also featuring CAN-Bus. **Linked VESC need to share the same common ground to prevent hardware damages!**
Only connect CAN L to CAN L and CAN H to CAN H.
GND and 5V should never be connected in a VESC array!
- Motor A,B,C:** Connectors for three phase wired BLDC Motors (Coil A, B, C). In most cases the motor wires can be plugged in randomly. If you know your motor phases plug in the phases accordingly (Yellow = A, Blue=B, Red=C) to be displayed correctly in the VESC-Tool real time data analysis.
DC-Motors use only connections **A** and **C**, **B** will be left unplugged!
- USB:** Micro USB-Port to connect to a computer for the purpose of configuration, firmware updates and real time data analysis.

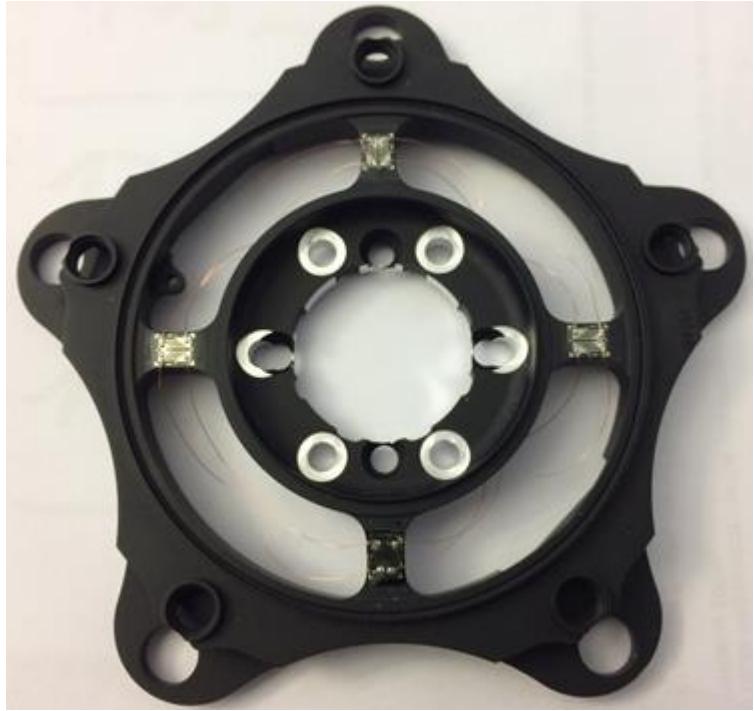
JST PH Series Crimp Contact, Female, 0.05mm ² to 0.22mm ² , 30AWG to 24AWG, Tin Plating	Stock no.:820-1456
	Qty:100
JST PHR, 2mm Pitch, 8 Way, 1 Row Female Straight Connector Housing	Stock no.:820-1488
	Qty:10
JST PHR, 2mm Pitch, 6 Way, 1 Row Female Straight Connector Housing	Stock no.:820-1481
	Qty:10
JST PHR, 2mm Pitch, 3 Way, 1 Row Female Straight Connector Housing	Stock no.:820-1475
	Qty:10
JST PHR, 2mm Pitch, 4 Way, 1 Row Female Straight Connector Housing	Stock no.:820-1478
	Qty:10
JST PHR, 2mm Pitch, 5 Way, 1 Row Female Straight Connector Housing	Stock no.:820-1472
	Qty:10

36V 500W Electric Bicycle Wheel Brushless Gearless DC Hub Motor for Front wheel eBike E-bike



Voltage: 36V Power: 500W Motor Type: Brushless Gearless Hub Motor Motor Net Weight: 5.5kgs Motor Diameter: 24.5cm Hall Sensor Quantity: 3pcs Max. Speed: 350RPM Max. Torque: 24.5N.M Magnet Body Size: 300*136*30mm Axle Diameter: 1.5cm Bushing Size: Diameter: 1.5cm, Height: 3.5cm Min. Fork Width Requirement: Min.10cm Corresponding Controller: 36V 500W Controller Disc Brake Available: 6-hole type



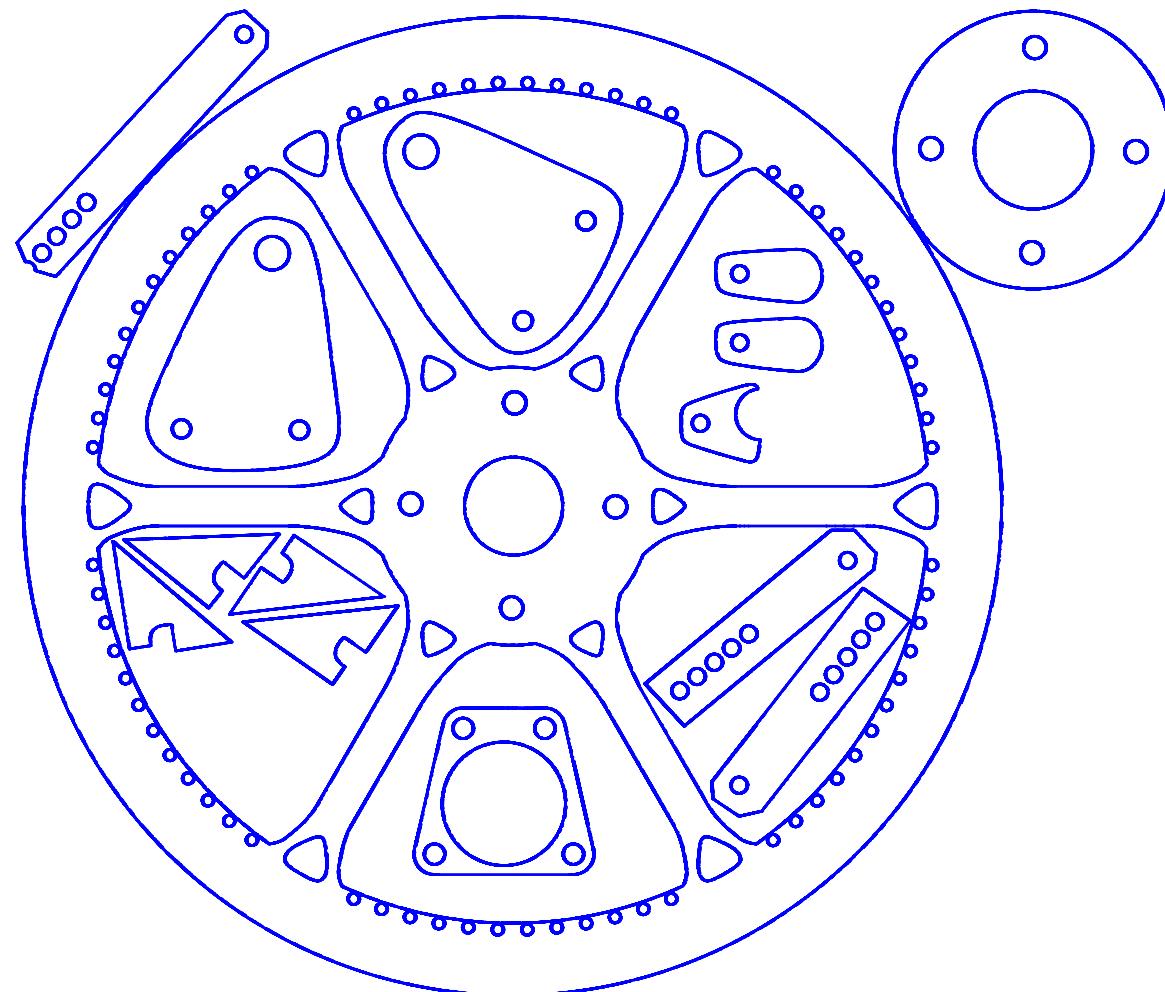
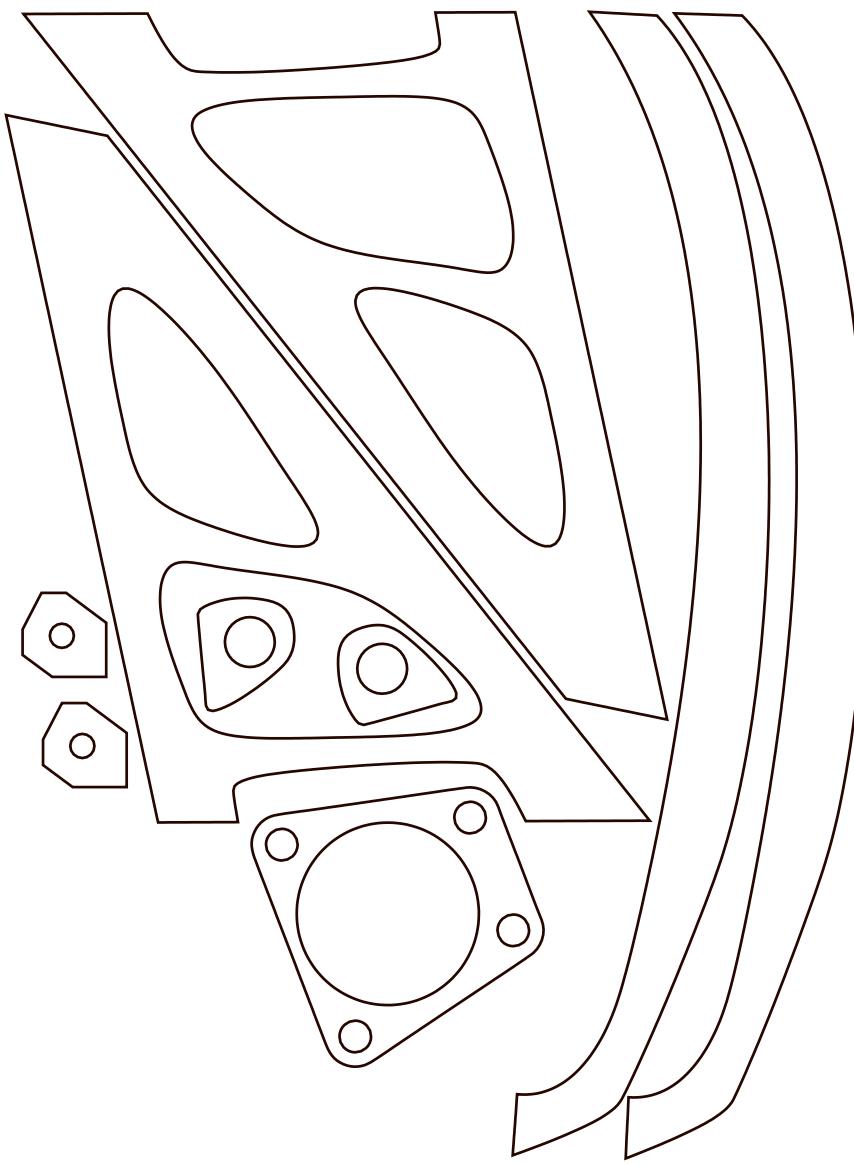


Bicycle wheel hub brake disc fittings are used twice in the project.
Once on the main Power Take Off wheel to attach a power meter to
the large chainring

Custom cut SRM PM7 Crank Power Meter used by
serious cyclists the shell centre has been recut to
allow fitting to the standard bike hub brake disc fitting
we use on the Power Take Off Wheel



The bicycle wheel hub brake disc fitting standard is used again with a velosolo
small gear to attach to the brake disc mount already on the motor



www.brindley-steel-forging.co.uk/acatalog/info-RNF.html

