

ASES Conference 2021

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Structural Batteries for Light Electric Vehicles & the Internet of Things



Battery Sizes

1865

10.8 Wh



2170

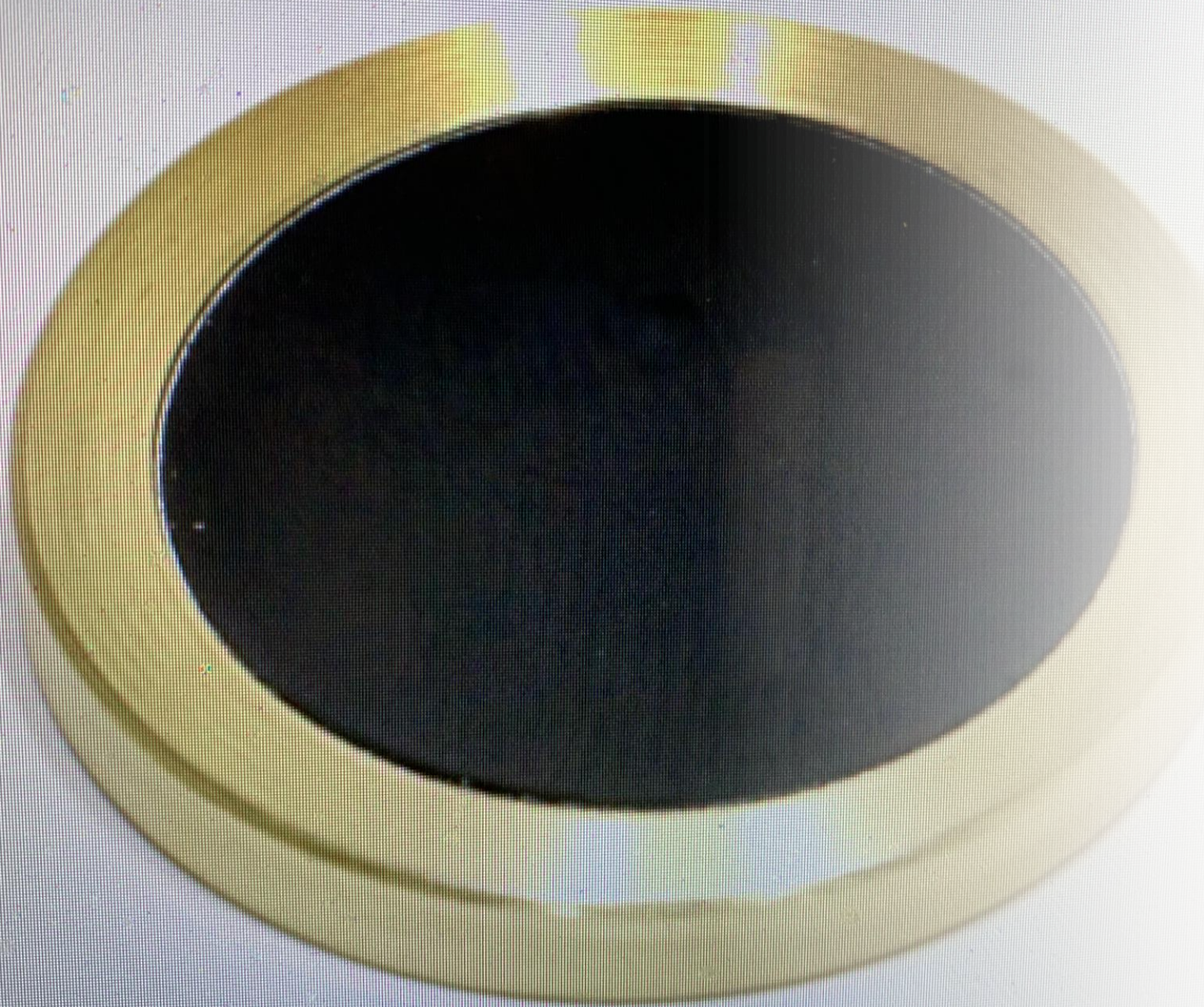
17.3 Wh



4680

103 Wh





Disc Battery Management System Chip

- Thermal sink (Thermal conducting electrical insulating plastic)
- RFID communication with memory (android app)
- Goes between cells
- Shuts off
- One per cell
- High/Low Voltage
- High/Low Amperage
- High/Low Temperature



Standard 14.4 volt ~12 volt replacement

Super Martin Battery

4 cells





Standard 28.8 volt ~ 24 volt replacement



8 cells

7 cells at 25.2 volts



10 cells at 36 volts

3, 12 volt
36 volt



Structural tubes

4680



2170



18650



14 cells 50.4 volts ~48 volt replacement

4 x12 volt =
48 volt





electric trike - Google Search

Super Long Range Electric Trikes for



Batteries and Structural Tubes



Powerwand (flashlight load)

Individual Cell Information

	18650	2170	4680
	18 mm thick	21 mm thick	46 mm thick
	65 mm long	70 mm long	80 mm long
	45 g (1.6 oz)	70 g (2.5 oz)	(350 g)(12.4 oz)
volume	660 mm3	970 mm3	4,850 mm3
	3.6 volt	3.6 volt	3.6 volt
current	3 Ah	4.8 Ah	28.8 Ah
Power	10.8 Wh	17.3 Wh	103 Wh
Density	.240 Wh/g	.247 Wh/g	.290 Wh/g

Products

12 volt Powerwand (4 cell 14.4 v)

	18 mm thick	21 mm thick	46 mm thick
	260 mm long	280 mm long	320 mm long
	180 g	280 g	1,200 g
Power	43.2 Wh	69.2 Wh	412 Wh

Powerwand (5 cell, 18 v)

	18 mm thick	21 mm thick	46 mm thick
	325 mm long	350 mm long	400 mm long
	225 g	350 g	1,750 g
power	54 Wh	87 Wh	515 Wh

24 volt Powerwand (7 cell 25.2 v)

	18 mm thick	21 mm thick	46 mm thick
	455 mm long	490 mm long	560 mm long
	315 g	490 g	2,450 g
Power	75.6 Wh	121 Wh	721 Wh

36 volt Powerwand (10 cell 36 v)

	18 mm thick	21 mm thick	46 mm thick
	650 mm long	700 mm long	800 mm long
	450 g	700 g	3,500 g
Power	108 Wh	173 Wh	1,030 Wh

48 volt Powerwand (14 cell 50.4 v)

	18 mm thick	21 mm thick	46 mm thick
	910 mm long	980 mm long	1,120 mm long
	630 g	960 g	4,900 g
Power	151 Wh	242 Wh	1,442 Wh

Powerwand (15 cell 54 v) 675 g 162 Wh

Powerwand (16 cell 57.6 v) 720 g 172.8 Wh

1,050 g	260 Wh	5,250 g	1,545 Wh
1,120 g	276 Wh	5,600 g	1,648 Wh



60 volt <u>Powerwand</u> (17 cell 61.2 v)			
	18 mm thick	21 mm thick	46 mm thick
	1,105 mm long	1,190 mm long	1,360 mm long
	765 g	1,190 g	5,950 g
Power	184 <u>Wh</u>	294 <u>Wh</u>	1,751 <u>Wh</u>

72 volt <u>Powerwand</u> (20 cell 72v)			
	18 mm thick	21 mm thick	46 mm thick
	1,300 mm long	1,400 mm long	1,600 mm long
	900 g	1,400 g	7,000 g
Power	216 <u>Wh</u>	346 <u>Wh</u>	2,060 <u>Wh</u>

96 volt <u>Powerwand</u> (28 cell 100.8 v)			
	18 mm thick	21 mm thick	46 mm thick
	1,820 mm long	1,860 mm long	2,240 mm long
	1,260 g	1,920 g	9,800 g
Power	302 Wh	242 <u>Wh</u>	2,884 <u>Wh</u>

Metric to English conversion 36 v and 42 v systems

36 volt <u>Powerwand</u> (10 cell)			
	.70 in. thick	.82 in. thick	1.81 in thick
	25.5 in. (2.13 ft.) long	27.6 in. (2.3 ft.) long	31.5 in (2.62 ft) long
	15.9 oz. (.99 lb.)	24.7 oz (1.54 lb.)	123.5 oz (7.72 lb.)
Power	108 <u>Wh</u>	173 <u>Wh</u>	1,030 <u>Wh</u>

48 volt <u>Powerwand</u> (14 cell)			
	.70 in. thick	.82 in. thick	1.81 in thick
	35.8 in. (2.99 ft) long	38.6 in. (3.22 ft) long	44.1 in. (3.7 ft) long
	22.3 oz. (1.4 lb.)	33.9 oz (2.2 lb.)	172.8 oz. (10.8 lb.)
Power	151 <u>Wh</u>	242 <u>Wh</u>	1,442 <u>Wh</u>
	108 <u>Wh</u> /lb.	110 <u>Wh</u> /lb.	134 <u>Wh</u> /lb.

(gasoline= ~840 Wh/lb. at 14% efficiency or 600 Wh/lb. at 10% efficiency for LEVs)
 Energy Density comparison 7.8 x/13% Low or 4.5x/22% High

- Disc Battery Management System
 Thermal Sink (Thermal conducting electrical insulating plastic)
 RFID communication with memory (android app)
 High/Low Voltage
 High/Low Current
 Temperature Sensor
 One per cell

18 mm diameter	21 mm diameter	46 mm diameter
.70 in. diameter	.82 in. diameter	1.81 in diameter
Penny	Nickel	Poker chip



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