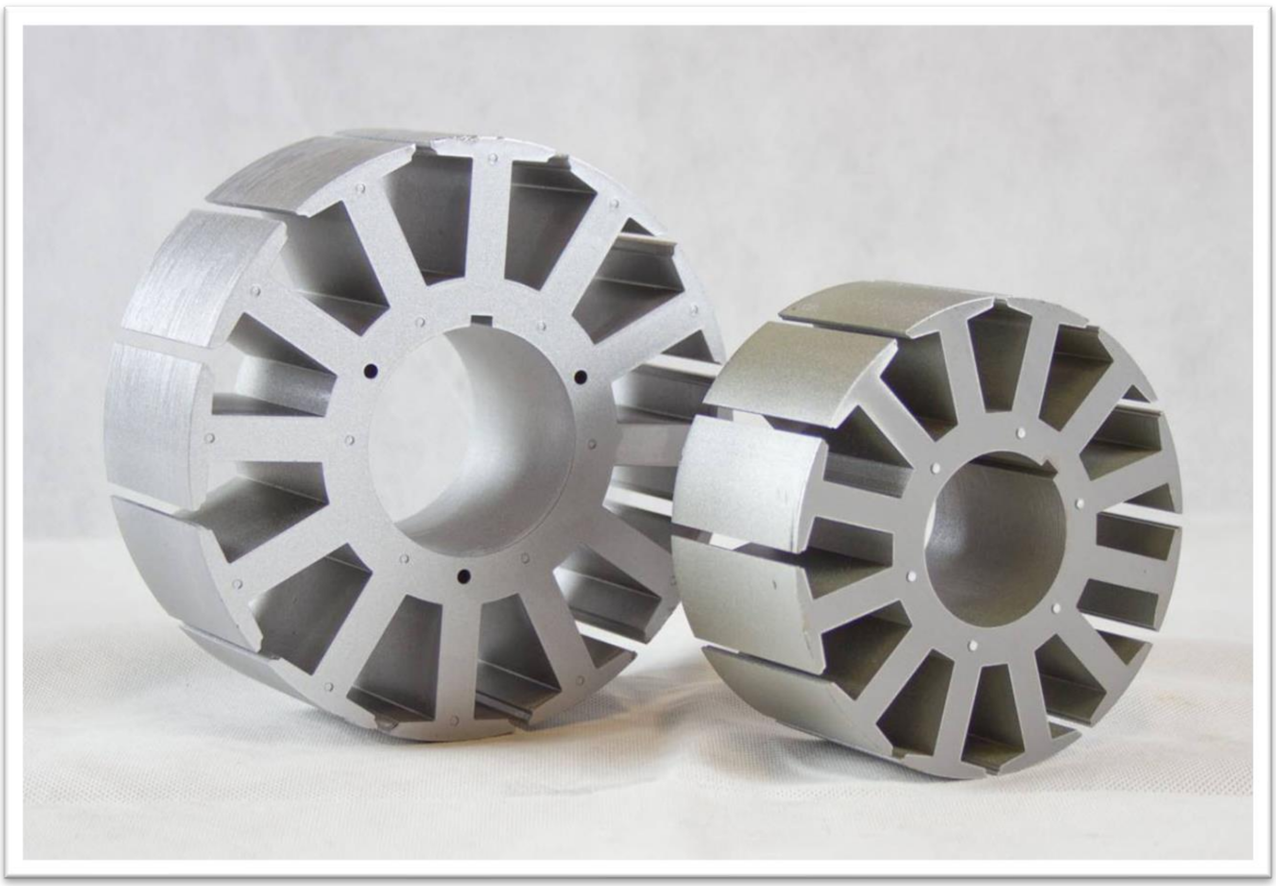
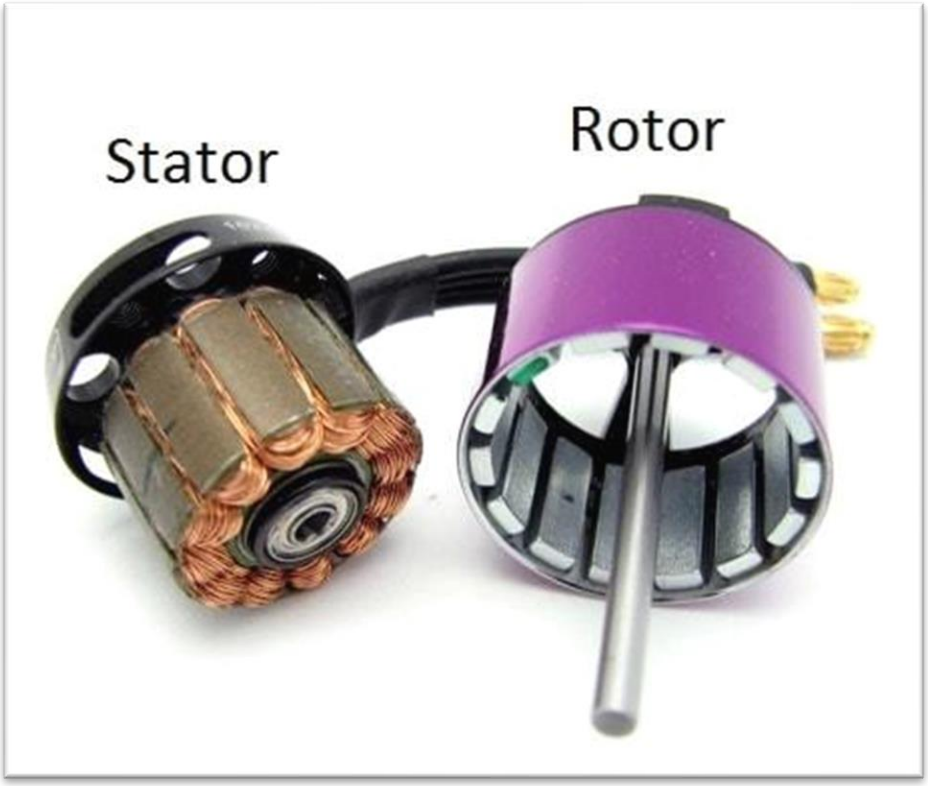
Motor Part Numbers: What do they mean? By: Lucien Miller

When you get started using Electric Power Systems, one of the most confusing things you must deal with is all the different ways that motor companies use to describe and number their motors. Some use external dimensions, while others use stator dimensions. Some companies size their motors by comparing them to equivalent glow engines while others make up a numbering system that has nothing to do with the size or power of the motor. This can make it extremely confusing to compare a motor from one manufacturer to another with any degree of certainty. To be able to clear up a lot of the mysteries surrounding this problem, we will look at several of the different numbering systems that are currently being used and how they compare to one another.

With any brushless motor, the part of the motor that makes the power is the stator. The stator is made from a stack of steel laminations, most typically with 12 individual stator pole segments, and looks like the examples shown below.



These stators are wrapped with enamel coated copper wire to make each pole of the stator into an electromagnet. The Speed Controller then switches the power from the battery to each of the magnet poles in a rotary sequence, and then the magnets that are glued to the inside surface of the rotor can get attracted to, and then chase, the rotating magnetic field as it spins around the stator. An example of a typical wound stator and rotor assembly are shown in the next photo.



When you look at motors from various manufacturers, you can have 4 different motors, all with different numbering schemes, that sound like completely different motors, but are all physically the same size. The next photo shows 4 different motors from 4 different manufactures, with completely different model numbers, that are all based around a stator that is 28mm in diameter by 26mm in length.

The Cobra motor uses the stator size for its part number, followed by the number of turns of wire per stator pole pair. The Rimfire motor uses the name of the type of plane it is designed to go in, namely EF1 class pylon racers. The Turnigy motor uses the external dimensions of the motor, followed by the number of turns of wire per individual pole, and the E-Flite motor name gives no indication of motor size, it simply suggests that it makes about the same power as a .25 size 2-stroke glow engine.

In all cases, the amount of power that any motor can make is directly proportional to the surface area of the stator assembly, since this is where all the magnetic interaction takes place. Because of this, the most sensible way to describe the size and power output of a motor is to give the dimensions of the stator. Typically, in this numbering scheme, the stator size is represented by a 4-digit number, where the first two digits give the diameter of the stator in millimeters and the last two digits give the overall length of the stator, also in millimeters. For example, a 3520 motor would have a stator that is 35mm in diameter by 20mm in length. For larger motors, over 99mm in diameter, additional digits are used. In this case, a large multirotor motor that has a stator which is 120mm in diameter by 20mm in length would have a part number like 12020.

Most of the better motor manufacturers such as BadAss, Scorpion, Cobra, KDE, AXI and Tempest, to name a few, use this stator size numbering scheme to describe the size of their motors. With motors that use this numbering scheme it is relatively easy to compare one brand of motor to another. Motors with the same stator size and similar Kv values will make similar output power.

The next common numbering scheme for motors uses the external dimensions of the motor. Again, this is normally a 4-digit number, with the first 2 digits giving the outside diameter of the rotor can of the motor and the last 2 digits giving the over length of the motor, from the back mounting face to the front of the motor. A lot of motor companies such as EMP, RimFire, Leopard, NTM, Turnigy and others use this numbering scheme. While this numbering scheme does work, it is prone to many inaccuracies. If a motor has a longer rear housing, or if the front end has a raised bump on it for centering the prop adapter, different companies chose different external points to measure to, which leads to confusion. Because of this, you could have a 3538 motor, a 3536 motor and a 3540 motor that all have a 28mm x 20mm stator inside, and therefore all make about the same power, but the different part numbers make them sound like they are different size motors.

Describing a motor by the stator size would be the closest thing to the way internal combustion engines are sized by the cubic inches or liters of piston displacement. Using the external dimensions of a motor really does not tell you about the energy producing potential of a motor. A good example of this would be going to a car show. If you ask a guy what size engine he has in his car, and he says that it is a 327 cubic inch V8, you know exactly what size engine he has. If you go to another guy and ask him what size engine he has, and he tells you that it is 22 inches long and 23 inches wide and 20 inches tall, you have no idea of the motor size or power output whatsoever.

One key parameter that can let you know if two motors are the same “size” is the weight of the motor. No matter how you name it, any motor made with 2826 size stator is going to weigh roughly the same as any other motor made with a 2826 size stator, since they all have similar parts inside. If one company’s 2826 motor weighs 171 grams, and another company’s 3548 motor weighs 169 grams, then you can be pretty sure that they are physically the same size motor, and will produce similar power.

Where people run into problems is when they are trying to compare two brands of motors where one is using stator size, while the other is using external dimensions. They buy a kit that calls out an inexpensive import 2826 size motor, and then want to use a better-quality motor, so they get a 2826 from another vendor. When the motor arrives, they discover that it is WAY larger than they were expecting and does not fit in the airplane. A cheaper 2826 motor will have External dimensions of 28mm in diameter by 26mm in length. However, inside this motor, there is normally a stator that measures only 22mm in diameter by 8mm in length. To properly compare this motor to the other brand, that uses stator size, you should actually buy a 2208 size motor. This is where the weight of the motor can tell you if the motors are the same size or not.

For example, a Dualsky 2826-10 motor, that uses external dimensions for its model number, weighs just 43 grams and has a Kv value of 2200 RPM/Volt. If you look a Cobra 2826/10 motor, it weighs 171 grams and has a Kv value of 930 RPM/Volt. Obviously, these are two completely different motors, and are not interchangeable with one another!

If you look at the Cobra 2208/20 motor you will see that it weighs 46 grams and has a Kv value of 2000 RPM/Volt, making it a very close match to the Dualsky 2826 motor because it has the same size stator.

The next thing to look at is the Kv value of a motor. The Kv of a motor is not called Kilovolts as many people mistakenly refer to it. Kv is an engineering term that means the Voltage Constant of the motor and is expressed in units of RPM/Volt. Kv by itself tells you nothing about the power output of a motor, it simply states how fast the motor spins, in a no-load condition, with respect to the voltage applied to the motor. For example, if you have a motor that has a Kv value of 960 RPM/Volt, and you power it from a 3-cell LiPo battery that makes 11.1 volts, at full throttle, with no load applied, the motor will spin at approximately 960 x 11.1 or 10,656 RPM. The actual speed the motor spins at will vary a bit, depending on the ESC that is used to power the motor and the timing value set in the ESC.

The Kv value of a motor is usually represented in one of a few different ways. First, on motors like the BadAss, KDE and Tempest brands, the Kv value is explicitly stated as a dash number after the stator size. For example, a BA-2820-910Kv motor has a stator that is 28mm in diameter by 20mm in length and has a Kv value of 910 RPM per volt.

The next expression of the Kv value of the motor is given by the number of turns of wire wrapped around each individual stator pole of the motor. Dualsky and Suppo are two companies that use this numbering scheme, and these motors have part numbers such as 2830EA-10 or A2212/6 respectively. On these motors, the dash number at the end of the motor size number really does not tell you anything about the Kv value of the motor, it simply tells you how many turns of wire are wrapped around each stator pole. You must look up the actual Kv value in a specification table for the motor. Also, the Kv value given by the number of turns varies with every different stator size, so there is no consistency in this numbering scheme. Many companies will get around this by putting both the turns count and the actual Kv value of the motor, either on a sticker or by laser engraving directly on the motor.

Other companies will give the part number as the number of turns per pair of stator poles. Cobra motors and AXI motors are 2 of the companies that use this numbering method and have part numbers like C-2820/10 which means that the stator size is 28mm in diameter by 20mm in length, and there are 10 turns of wire per pair of poles or 5 turns per pole. These turn numbers are almost always even values like 8, 10, 12 or 14 and every pole has the same number of turns, with each being half of the number shown. Occasionally you will need a motor with a K value that is in between what you could get going from one even number to the next. In rare cases you will see a motor that uses the pole pair turns designation, but it is an odd number, one example is the Cobra C-2217/7. In this case in each pole pair, one pole will have 3 turns and the other will 4 turns. This provides a Kv value roughly half-way between what you would get in a 6-turn versus an 8-turn motor.

Further confusing the motor numbering issues are companies that use a type of hybrid numbering scheme that gives mixed information about the motor. Hacker motors use a numbering scheme like this with part numbers such as A20-26M or A30-14L. In these motors, the A means that it is an Airplane motor. The first two digits gives the diameter of the motor stator in millimeters. The next two numbers, after the dash, gives the number of turns of wire wrapped around each pole pair, and the letter at the end gives a relative length of the stator in that family of motors. For this S, M, L and XL are used to signify Small, Medium, Large and Extra-Large stator length. Further adding to the confusion is the fact that the length of the S, M, L and XL stators is different for each diameter of stator, so you need to go to the owner's manual and hope to find those values or resort to taking the motor apart and actually measuring the length of the stator with a ruler or set of calipers.

Torque motors is another brand that uses a mixed hybrid numbering scheme with part numbers such as 2830T/1095 or 2814T/820. In these part numbers, the first 2 digits is the diameter of the stator in millimeters and the next 2 digits followed by the letter T means that the motor has that many turns of wire per pole pair. No reference to stator length is given at all in these part numbers. Finally, the number after the slash indicates the Kv value of the motor in RPM/Volt. This causes confusion with modelers that want to use a different motor than the one recommended for their kit, and then buy another brand with a similar part number. For example, the Torque 2814T/820 motor actually has a 28x20mm stator in it with a 14-turn wind per pole pair. If someone buys a 2814 motor from another company with a Kv close to 820 RPM/Volt, when they get it they discover that it is 2/3 the size of the Torque motor and therefore only makes about 2/3 the amount of power. In this case looking at the motor weight tells the tale. The Torque 2814T/820 motor weighs 143 grams. If you look at the weight of an AXI 2814/20 motor, which has a Kv value of 840 RPM/Volt, it only weighs 106 grams, so it is obviously a smaller motor. The proper match for the Torque motor from AXI would be the 2820/14 motor, which has a Kv value of 860 and weighs 148 grams.

Another numbering method that is used by several motor companies, such as E-Flite, RimFire, NTM and some Turnigy models, is to give the motor size by the equivalent of the 2-stroke glow engine that the motor is designed to replace. This is done to try and simplify things for people that are making the switch from glow engines to electric motors, but there are several serious problems with this naming scheme. First is the fact that electric motor will often spin larger props at lower speeds than glow engines do. Also, because electric motors tend to spin at approximately the same speed, regardless of prop size used, the amount of power they make varies dramatically with prop size. A Power 25 motor ONLY makes the power of a .25 2-stroke glow engine with certain specific combinations of battery voltage and prop size. If you put a prop on that is too small, the Power 25 motor might only make the power of a .10 glow engine, and if you put too large of a prop on it, it could make the power of a .40 glow engine, right up to the point where it overheats and burns up!

This is where the commonly used rule of thumb that says "1 cubic inch of 2-stroke glow power is roughly equal to 2000 watts of electric power" comes into play. Using this comparison, a .25 glow engine is roughly equal to a 500-watt electric motor. Likewise, a .40 glow engine would be equal to 800 watts and a .60 glow engine would be equal to 1200 watts of electric power. If you use one of these types of motors, the best thing to do is use a wattmeter in between the battery and ESC to measure the voltage and current of the system, which can then be expressed as watts of input power. If you have one company's Power 40 motor, and it is running on a 4-cell battery with a prop that pulls 55 amps of current, you can calculate the watts by multiplying the battery voltage, 14.8 volts, by the current, and 14.8 x 55 equals 814 watts, which according to our rule of thumb truly is the power of a .40 glow engine.

On the other hand, if you are using a smaller prop, and the motor is only pulling 34 amps, then the motor is making 14.8 x 34 or 503 watts of power. With this prop, your Power 40 motor is effectively making the same power as a .25 glow engine, and the performance will suffer. This is why it is critically important to have a wattmeter to measure the actual power of your electric motors, so you know what performance to expect and to see what prop is best to use on the motor.

Understanding what motor part numbers actually mean is very important when it comes to selecting a motor for a given aircraft. However, this is not the only information you need to make an informed decision about a motor purchase. There is a TON of other important information that, unfortunately, most motor manufacturers leave out when listing their motors. Quite often a motor manufacturer will simply state that a motor is "For use on 4 to 6 cells with props from 12x6 to 15x8" and nothing else.

After reading this, many beginners to electric power systems will mistakenly think, "If I use a bigger battery, the motor will make more power, so I better use a bigger prop to absorb all that power" when in fact, the exact opposite is true. When the motor spins slower, you need to use a BIGGER prop to make the required power and when the motor spins faster you need a SMALLER prop to keep from pulling too much current from the motor. In this specific example, you would probably use a 15x8 prop on 4 cells, a 13x8 or 14x7 prop on 5 cells and a 12x6 prop on 6 cells to get the motor to pull the maximum safe current so that it makes the most power.

The absolute best information available in this regard is a performance data chart that shows the real performance values of the motor with a variety of different props over a range of battery voltages. Unfortunately, only a small handful of companies take the time to measure and publish this data. It is EXTREMELY time consuming to do this, taking several days of work to test, record and compile this data into meaningful charts for each and every motor, but without this data, you are essentially shooting in the dark, randomly trying different props to figure out which one will work for your motor.

Some of the brands that do provide this level of data are BadAss, Cobra, KDE, T-Motor and Tempest. The next few pages show examples of the data charts provided by these brands of motors. With this kind of data, it becomes very easy to know the exact performance that you can expect from any given motor and prop combination, running on a specific size battery. With the information about the Input Watts, you can calculate the Watts per Pound for a given model and get a good idea of the power level that the motor and prop combination is providing. This also allows you to make sure that you are selecting the correct size and capacity of battery, as well as the correct amperage of ESC to purchase to make sure that you have a completely matched power system that will work as expected and provide hundreds of hours of trouble-free operation.

Typical BadAss Motor Performance Data Chart

BadAss BA-2310-2350 Performance Test Data

Magnets	Motor Wind	Motor Kv	No-Load Current	Motor Resistance	I Max	P Max (4S)
14-Pole	12-Turn Delta	2350 RPM/Volt	Io = 2.34 Amps @ 10v	Rm = 0.029 Ohms	42 Amps	620 W

Stator	Outside Diameter	Body Length	Total Shaft Length	Shaft Diameter	Motor Weight
12-Slot	29.1 mm, 1.146 in.	27.6 mm, 1.087 in.	46.0 mm, 1.811 in.	4.00 mm, 0.157 in.	58.2 gm, 2.05 oz

Test Data From	Input	8.0 V	10.0 V	12.0V	14.0V	Measured Kv value	Measured Rm Value
Sample Motor	Io Value	1.873 A	2.337 A	2.582 A	2.756 A	2368 RPM/Volt @ 10v	0.0293 Ohms

2-cell Li-Po Test Data

Prop Manf.	Prop Size	Li-Po Cells	Input Voltage	Motor Amps	Input Watts	Prop RPM	Pitch Speed in MPH	Thrust Grams	Thrust Ounces	Thrust Eff. Grams/W
APC	6x4-E	2	7.4	15.83	117.1	15,313	58.0	470	16.57	4.01
APC	6x4.3-E	2	7.4	21.61	159.9	14,580	59.4	649	22.90	4.06
APC	6x4.5-E	2	7.4	20.94	155.0	14,648	62.4	657	23.19	4.24
APC	6x5.5-E	2	7.4	19.58	144.9	14,844	77.3	505	17.81	3.49
APC	6x6-E	2	7.4	21.56	159.5	14,564	82.8	523	18.43	3.28
APC	7x4-E	2	7.4	25.72	190.3	13,977	52.9	811	28.60	4.26
APC	7x5-E	2	7.4	30.95	229.0	13,218	62.6	776	27.38	3.39
APC	7x6-E	2	7.4	32.06	237.2	13,068	74.3	836	29.50	3.53
APC	7x7-E	2	7.4	36.72	271.7	12,370	82.0	779	27.47	2.87
APC	8x4-E	2	7.4	34.56	255.7	12,666	48.0	1014	35.78	3.97
APC	8x6-E	2	7.4	46.19	341.8	11,363	64.6	1046	36.91	3.06

3-cell Li-Po Test Data

Prop Manf.	Prop Size	Li-Po Cells	Input Voltage	Motor Amps	Input Watts	Prop RPM	Pitch Speed in MPH	Thrust Grams	Thrust Ounces	Thrust Eff. Grams/W
APC	4.7x4.25-E	3	11.1	18.97	210.5	23,174	93.3	457	16.13	2.17
APC	4.75x4.75-E	3	11.1	21.61	239.9	22,955	103.3	462	16.29	1.92
APC	4.75x5.5-E	3	11.1	23.71	263.2	22,454	116.9	425	15.01	1.62
APC	5x4.3-E	3	11.1	25.81	286.5	21,677	88.3	782	27.57	2.73
APC	5x4.5-E	3	11.1	26.79	297.4	21,474	91.5	775	27.33	2.61
APC	5x4.6-E	3	11.1	26.82	297.7	21,509	93.7	821	28.96	2.76
APC	5x5-E	3	11.1	23.55	261.4	22,091	104.6	470	16.58	1.80
APC	5.25x4.75-E	3	11.1	26.71	296.5	21,530	96.8	649	22.89	2.19
APC	5.25x6.25-E	3	11.1	34.03	377.8	20,555	121.7	597	21.07	1.58
APC	5.5x4.5-E	3	11.1	28.24	313.4	21,804	92.9	701	24.74	2.24
APC	6x4-E	3	11.1	31.59	350.7	21,232	80.4	923	32.55	2.63
APC	6x4.3-E	3	11.1	39.91	443.0	19,840	80.8	1234	43.54	2.79
APC	6x4.5-E	3	11.1	38.22	424.3	20,143	85.8	1237	43.64	2.92
APC	6x5.5-E	3	11.1	37.07	411.5	20,331	105.9	967	34.11	2.35
APC	6x6-E	3	11.1	40.99	455.0	19,701	111.9	954	33.66	2.10
APC	7x4-E	3	11.1	50.15	556.7	18,688	70.8	1534	54.12	2.76

4-cell Li-Po Test Data

Prop Manf.	Prop Size	Li-Po Cells	Input Voltage	Motor Amps	Input Watts	Prop RPM	Pitch Speed in MPH	Thrust Grams	Thrust Ounces	Thrust Eff. Grams/W
APC	4.1x4.1-E	4	14.8	19.88	294.3	31,372	121.8	535	18.85	1.82
APC	4.5x4.1-E	4	14.8	25.74	381.0	30,433	118.2	739	26.06	1.94
APC	4.7x4.25-E	4	14.8	31.44	465.3	29,635	119.3	758	26.73	1.63
APC	4.75x4.75-E	4	14.8	35.23	521.4	28,982	130.4	745	26.29	1.43
APC	4.75x5.5-E	4	14.8	38.01	562.5	28,484	148.4	688	24.28	1.22
APC	5x4.3-E	4	14.8	44.75	662.3	27,600	112.4	1277	45.04	1.93
APC	5x4.5-E	4	14.8	47.67	705.4	27,150	115.7	1259	44.40	1.78
APC	5x4.6-E	4	14.8	46.13	682.7	27,321	119.0	1355	47.80	1.99
APC	5x5-E	4	14.8	39.24	580.8	28,253	133.8	759	26.78	1.31
APC	5.25x4.75-E	4	14.8	46.24	684.3	26,804	120.6	1034	36.46	1.51
APC	5.5x4.5-E	4	14.8	46.41	686.9	27,400	116.8	1114	39.28	1.62

Typical Cobra Motor Performance Data Chart

Cobra C2814/10 Motor Propeller Data

Motor Wind	Motor Kv	No-Load Current	Motor Resistance	I Max	P Max (3S)
10-Turn Delta	1700 RPM/Volt	Io = 2.06 Amps @ 10v	Rm = 0.024 Ohms	48 Amps	530 W

Outside Diameter	Body Length	Total Shaft Length	Shaft Diameter	Motor Weight
35.0 mm, 1.38 in.	34.1 mm, 1.34 in.	54.0 mm, 2.13 in.	5.00 mm, 0.197 in.	109 gm, 3.84 oz

Prop Manf.	Prop Size	Input Voltage	Motor Amps	Watts Input	Prop RPM	Pitch Speed	Thrust Grams	Thrust Ounces	Thrust Eff. Grams/W
APC	6x4-E	11.1	13.79	153.1	16,583	62.8	608	21.45	3.97
APC	6x5.5-E	11.1	17.24	191.4	16,243	84.6	642	22.65	3.35
APC	7x4-E	11.1	23.22	257.7	15,652	59.3	1045	36.86	4.05
APC	7x5-E	11.1	29.55	328.0	15,038	71.2	1068	37.67	3.26
APC	7x6-E	11.1	30.61	339.7	14,918	84.8	1138	40.14	3.35
APC	8x4-E	11.1	34.41	381.9	14,567	55.2	1431	50.48	3.75
APC	8x6-E	11.1	50.17	556.8	13,026	74.0	1507	53.16	2.71
APC	9x4.5-E	11.1	46.23	513.2	13,410	57.1	1917	67.62	3.74

Prop Manf.	Prop Size	Input Voltage	Motor Amps	Watts Input	Prop RPM	Pitch Speed	Thrust Grams	Thrust Ounces	Thrust Eff. Grams/W
APC	6x4-E	14.8	23.49	347.7	21,348	80.9	1017	35.87	2.93
APC	6x5.5-E	14.8	28.89	427.6	20,711	107.9	1043	36.79	2.44
APC	7x4-E	14.8	40.23	595.4	19,494	73.8	1707	60.21	2.87

Propeller Chart Color Code Explanation

The prop is to small to get good performance from the motor. (Less than 50% power)

The prop is sized right to get good power from the motor. (50 to 80% power)

The prop can be used, but full throttle should be kept to short bursts. (80 to 100% power)

The prop is too big for the motor and should not be used. (Over 100% power)

Typical KDE Multirotor Motor Performance Data Chart

MOTOR VERSION	VOLTAGE LiHV [V]	PROPELLER SIZE	THROTTLE RANGE	AMPERAGE [A] (LOWER IS BETTER)	POWER INPUT [W] (LOWER IS BETTER)	POWER INPUT [hp]	THRUST OUTPUT [g] (HIGHER IS BETTER)	THRUST OUTPUT [N]	THRUST OUTPUT [lb]	RPM [rev/min] (HIGHER IS BETTER)	EFFICIENCY [g/W] (HIGHER IS BETTER)	EFFICIENCY [lb/hp]
KDE5215XF-435 (435Kv) KDEXF-UAS95HVC S.R. ENABLED	15.4V (4S) 17.4V MAX	18.5" x 6.3 DUAL-EDN (KDE)	25.0%	2.0	34	0.05	370	3.63	0.82	1880	10.88	17.89
			37.5%	3.9	67	0.09	680	6.67	1.50	2520	10.15	16.69
			50.0%	6.8	118	0.16	1100	10.79	2.43	3220	9.32	15.33
			62.5%	11.3	196	0.26	1600	15.69	3.53	3840	8.16	13.42
			75.0%	17.4	302	0.40	2170	21.28	4.78	4440	7.19	11.81
			87.5%	24.9	433	0.58	2810	27.56	6.19	5840	6.49	10.67
			100.0%	33.9	589	0.79	3650	35.79	8.05	6800	6.20	10.19
		18.5" x 6.3 TRIPLE-EDN (KDE)	25.0%	2.2	38	0.05	460	4.51	1.01	1800	12.11	19.90
			37.5%	4.6	80	0.11	830	8.14	1.83	2480	10.38	17.06
			50.0%	8.6	149	0.20	1310	12.85	2.89	3040	8.79	14.45
			62.5%	14.5	252	0.34	1900	18.63	4.19	3660	7.54	12.40
			75.0%	22.6	393	0.53	2560	25.11	5.64	4280	6.51	10.71
			87.5%	31.6	549	0.74	3240	31.77	7.14	4880	5.90	9.70
			100.0%	43.5	756	1.01	4180	40.99	9.22	5360	5.53	9.09
		21.5" x 7.3 DUAL-EDN (KDE)	25.0%	3.2	55	0.07	750	7.35	1.65	1880	13.64	22.42
			37.5%	7.0	121	0.16	1330	13.04	2.93	2520	10.99	18.07
			50.0%	13.5	234	0.31	2110	20.69	4.65	3120	9.02	14.82
			62.5%	23.2	403	0.54	3030	29.71	6.68	3780	7.52	12.36
			75.0%	36.4	633	0.85	4040	39.62	8.91	4320	6.38	10.49
			87.5%	51.5	896	1.20	5150	50.50	11.35	4880	5.75	9.45
			100.0%	69.0	1200	1.61	6380	62.57	14.07	5340	5.32	8.74
	23.1V (6S) 26.1V MAX	15.5" x 5.3 DUAL-EDN (KDE)	25.0%	2.6	67	0.09	580	5.69	1.28	3180	8.66	14.23
			37.5%	5.3	138	0.19	1090	10.69	2.40	4320	7.90	12.99
			50.0%	9.3	242	0.32	1730	16.97	3.81	5400	7.15	11.75
			62.5%	14.9	388	0.52	2460	24.12	5.42	6420	6.34	10.42
			75.0%	23.6	615	0.82	3400	33.34	7.50	7580	5.53	9.09
			87.5%	33.9	884	1.19	4370	42.86	9.63	8580	4.94	8.13
			100.0%	46.6	1216	1.63	5730	56.19	12.63	9600	4.71	7.75
		15.5" x 5.3 TRIPLE-EDN (KDE)	25.0%	3.1	80	0.11	690	6.77	1.52	3060	8.63	14.18
			37.5%	6.5	169	0.23	1290	12.65	2.84	4180	7.63	12.55
			50.0%	11.4	297	0.40	2010	19.71	4.43	5160	6.77	11.13
			62.5%	18.3	477	0.64	2850	27.95	6.28	6180	5.97	9.82
			75.0%	29.6	772	1.04	3920	38.44	8.64	7240	5.08	8.35
			87.5%	42.7	1114	1.49	5040	49.43	11.11	8240	4.52	7.44
			100.0%	58.5	1526	2.05	6540	64.14	14.42	9120	4.29	7.05
		18.5" x 6.3 DUAL-EDN (KDE)	25.0%	3.9	101	0.14	990	9.71	2.18	3000	9.80	16.11
			37.5%	7.8	203	0.27	1730	16.97	3.81	3980	8.52	14.01
			50.0%	14.4	375	0.50	2670	26.18	5.89	4920	7.12	11.71
			62.5%	24.0	626	0.84	3830	37.56	8.44	5880	6.12	10.06
			75.0%	39.5	1030	1.38	5310	52.07	11.71	6900	5.16	8.48
			87.5%	58.6	1529	2.05	6850	67.18	15.10	7800	4.48	7.37
			100.0%	74.5	1944	2.61	8420	82.57	18.56	8460	4.33	7.12
	30.8V (8S) 34.8V MAX	15.5" x 5.3 DUAL-EDN (KDE)	25.0%	4.3	149	0.20	1100	10.79	2.43	4320	7.38	12.14
			37.5%	7.9	274	0.37	1840	18.04	4.06	5560	6.72	11.04
			50.0%	14.2	494	0.66	2840	27.85	6.26	6900	5.75	9.45
			62.5%	23.2	807	1.08	4080	40.01	8.99	8220	5.06	8.31
			75.0%	36.6	1273	1.71	5540	54.33	12.21	9540	4.35	7.15
			87.5%	56.1	1952	2.62	7480	73.35	16.49	10920	3.83	6.30
			100.0%	72.7	2529	3.39	9110	89.34	20.08	11880	3.60	5.92
		15.5" x 5.3 TRIPLE-EDN (KDE)	25.0%	4.8	167	0.22	1230	12.06	2.71	4040	7.37	12.11
			37.5%	9.3	323	0.43	2120	20.79	4.67	5260	6.56	10.79
			50.0%	17.9	622	0.83	3340	32.75	7.36	6640	5.37	8.83
			62.5%	29.0	1009	1.35	4690	45.99	10.34	7820	4.65	7.64
			75.0%	45.5	1583	2.12	6320	61.98	13.93	9060	3.99	6.56
			87.5%	66.0	2296	3.08	8260	81.00	18.21	10160	3.60	5.91
			100.0%	85.5	2975	3.99	9810	96.20	21.63	11060	3.30	5.42

***Note** : performance chart provided under the test conditions listed below. Measurements taken under alternate conditions will affect the final results.*

***Location** : KDE Direct HQ Dynamometer V2 (Bend, Oregon)*

***Altitude** : 3730 ft (1137 m)*

***Pressure** : 30.3 inHg (1026 hPa)*

***Temperature** : 72 °F (22°C)*

***Humidity** : 35% (Relative)*

Typical T-Motor Multirotor Motor Performance Data Chart

Test Report			
Test Item	P60 KV170	Report NO.	P.00002
Specifications			
Internal Resistance	80mΩ	Configuration	24N28P
Shaft Diameter	6mm	Motor Dimensions	Φ69×37mm
Stator Diameter	62mm	Stator Height	15mm
AWG	16#	Cable Length	600mm
Weight Including Cables	373g	Weight Excluding Cables	343g
No.of Cells(Lipo)	6-14S	Idle Current@10v	1A
Max Continuous Power 180S	1800W	Max Continuous current 180S	38A
Load Testing Data			
Ambient Temperature	18℃	Voltage	DC Power Supplier

Item No.	Voltage (V)	Prop	Throttle	Current (A)	Power (W)	Thrust (G)	RPM	Efficiency (G/W)	Operating Temperature (℃)
P60 KV170	48	T-motor 20*6CF	50%	5.4	259.20	2116	4152	8.16	55
			55%	6.4	307.20	2371	4425	7.72	
			60%	7.7	369.60	2762	4709	7.47	
			65%	9.3	446.40	3125	5014	7.00	
			75%	13.2	633.60	4002	5626	6.32	
			85%	17.3	830.40	4821	6177	5.81	
			100%	25.4	1219.20	6246	6992	5.12	
		T-motor 22*6.6CF	50%	6.6	316.8	2801	3703	8.84	85
			55%	8.6	412.8	3312	4005	8.02	
			60%	9.9	475.2	3763	4289	7.92	
			65%	12.4	595.2	4356	4575	7.32	
			75%	17.1	820.8	5372	5091	6.54	
			85%	23.2	1113.6	6582	5635	5.91	
			100%	34	1632	8414	6374	5.16	

Notes:The test condition of temperature is motor surface temperature in 100% throttle while the motor run 10min.

Typical Tempest Motor Performance Data Chart

Tempest 2814-2100 Performance Test Data

Magnets	Motor Wind	Motor Kv	No-Load Current	Motor Resistance	I Max	P Max (4S)
14-Pole	8-Turn Delta	2100 RPM/Volt	Io = 4.17 Amps @ 10v	Rm = 0.017 Ohms	68 Amps	1010 W

Stator	Outside Diameter	Body Length	Total Shaft Length	Shaft Diameter	Motor Weight
12-Slot	35.4 mm, 1.394 in.	32.4 mm, 1.276 in.	54.8 mm, 2.157 in.	5.00 mm, 0.197 in.	109 gm, 3.84 oz

Test Data From	Input	8.0 V	10.0 V	12.0V	14.0V	Measured Kv value	Measured Rm Value
Sample Motor	Io Value	3.835 A	4.171 A	4.534 A	4.879 A	2081 RPM/Volt @ 10v	0.0170 Ohms

3-cell Li-Po Test Data

Prop Manf.	Prop Size	Li-Po Cells	Input Voltage	Motor Amps	Input Watts	Prop RPM	Pitch Speed in MPH	Thrust Grams	Thrust Ounces	Thrust Eff. Grams/W
APC	6x4.3-E	3	11.1	34.41	381.9	19,355	78.8	1157	40.81	3.03
APC	6x4.5-E	3	11.1	32.63	362.2	19,595	83.5	1152	40.64	3.18
APC	6x5.5-E	3	11.1	30.74	341.2	19,790	103.1	896	31.61	2.63
APC	6x6-E	3	11.1	35.06	389.2	19,341	109.9	897	31.64	2.30
APC	6.5x5.0-P	3	11.1	32.93	365.6	19,338	91.6	941	33.19	2.57
APC	6.5x5.5-P	3	11.1	35.08	389.4	19,250	100.3	962	33.93	2.47
APC	6.5x6.0-P	3	11.1	38.65	429.0	18,896	107.4	942	33.23	2.20
APC	6.5x6.5-P	3	11.1	40.99	455.0	18,695	115.1	882	31.11	1.94
APC	7x4-E	3	11.1	45.82	508.6	18,331	69.4	1524	53.76	3.00
APC	7x5-E	3	11.1	53.70	596.1	17,549	83.1	1434	50.58	2.41
APC	7x6-E	3	11.1	55.18	612.5	17,393	98.8	1506	53.12	2.46
APC	7x7-E	3	11.1	64.17	712.3	16,458	109.1	1402	49.45	1.97
APC	8x4-E	3	11.1	61.28	680.2	16,748	63.4	1837	64.80	2.70
MAS	6x4x3	3	11.1	27.91	309.8	20,127	76.2	1016	35.84	3.28
MAS	7x4x3	3	11.1	43.11	478.6	18,611	70.5	1454	51.29	3.04

4-cell Li-Po Test Data

Prop Manf.	Prop Size	Li-Po Cells	Input Voltage	Motor Amps	Input Watts	Prop RPM	Pitch Speed in MPH	Thrust Grams	Thrust Ounces	Thrust Eff. Grams/W
APC	5x4.3-E	4	14.8	36.39	538.5	26,285	107.0	1148	40.49	2.13
APC	5x4.5-E	4	14.8	38.75	573.5	26,034	110.9	1130	39.86	1.97
APC	5x4.6-E	4	14.8	37.78	559.1	26,121	113.8	1202	42.40	2.15
APC	6x4-E	4	14.8	43.16	638.7	25,506	96.6	1331	46.95	2.08
APC	6x4.3-E	4	14.8	55.29	818.3	24,226	98.6	1845	65.08	2.25
APC	6x4.5-E	4	14.8	50.98	754.4	24,651	105.0	1843	65.01	2.44
APC	6x5.5-E	4	14.8	50.23	743.4	24,741	128.9	1390	49.03	1.87
APC	6x6-E	4	14.8	56.31	833.3	24,156	137.3	1375	48.50	1.65
APC	6.5x5.0-P	4	14.8	53.30	788.9	24,238	114.8	1483	52.31	1.88
APC	6.5x5.5-P	4	14.8	56.50	836.2	23,963	124.8	1494	52.70	1.79
APC	6.5x6.0-P	4	14.8	61.19	905.6	23,521	133.6	1471	51.89	1.62
APC	6.5x6.5-P	4	14.8	63.73	943.2	23,230	143.0	1407	49.63	1.49
APC	7x4-E	4	14.8	76.73	1135.6	22,377	84.8	2253	79.47	1.98
MAS	6x4x3	4	14.8	43.53	644.3	25,529	96.7	1619	57.11	2.51
MAS	7x4x3	4	14.8	68.39	1012.1	23,183	87.8	2137	75.38	2.11

5-cell Li-Po Test Data

Prop Manf.	Prop Size	Li-Po Cells	Input Voltage	Motor Amps	Input Watts	Prop RPM	Pitch Speed in MPH	Thrust Grams	Thrust Ounces	Thrust Eff. Grams/W
APC	5x4.3-E	5	18.5	53.98	998.6	31,273	127.3	1630	57.50	1.63
APC	5x4.5-E	5	18.5	58.62	1084.4	30,758	131.1	1585	55.91	1.46
APC	5x4.6-E	5	18.5	56.34	1042.3	30,959	134.9	1707	60.21	1.64
APC	6x4-E	5	18.5	63.71	1178.6	30,066	113.9	1839	64.87	1.56
APC	6x5.5-E	5	18.5	73.71	1363.6	29,220	152.2	1880	66.31	1.38
MAS	6x4x3	5	18.5	63.38	1172.5	30,204	114.4	2063	72.77	1.76

As you can see, there are a lot of lot of different ways that motor manufactures use to describe the physical size and power output of their motors. Once you understand these differences, and know exactly what to look for, it does start to make sense and then becomes easier to cross reference one motor brand to another when picking out a motor. Obviously, the more data that a specific motor company provides about their products, the easier it is to make sure that you are getting the right motor for your specific application.

Learning all the details that go with electric power systems can be a bit challenging at first, but once you have an understanding about all the different terminology and numbering schemes used to name motors, the process to get the correct motor becomes fairly easy.

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