Precision Aerobatics Thrust 30 Brushless motor with RotorKool™ technology

The development of our new PA Thrust™ motors has followed our traditional design philosophy employed in our aircrafts; which is doing things better. Thrust™ motor is one of the coolest running high performance, high-torque and high efficiency brushless motor ever produced to date. The design incorporates our latest innovation, ***RotorKool™*** which keeps the stator core material, the low resistance windings, highly permeable stator plates, high quality NMB Japan triple bearings and powerful neodymium magnets at optimum operating temperatures regardless of duration or the number of consecutive flights made*.

*provided sufficient airflow is permitted.

Motor specs

Outside Diameter	37.2mm
Length	37mm
Weight (gr/oz)	105gr / 3.7oz
Motor Shaft Dia.	5.0mm
Mounting Bolts Dia.	M3
Max efficiency Current A *	18-28A
Peak current A (15 sec)*	39A
Battery pack range **	2~4 LiPo / 6-12 NiCd
Poles	14
KV rpm/V	905
Recommended ESC	PA Quantum 40
Peak Watts	420 watts

** Unrestricted airflow and air scoops are mandatory to ensure long service life and long term performance consistency. Extended Continuous Operation without the required cooling provisions may be detrimental to the coils and magnets and will void warranty.*

*** PA 3cells (11.1V) 2200mAh pack is recommended. With 4 cells pack the chosen propeller must fit within the motor's limits (current drawn).*

Prop selection

APC 11x5.5E Excellent lower range prop for the T30 with outstanding efficiency of over 82%!! Running cool and smooth

APC 12x6E Excellent overall propeller for 3D, aerobatics and pattern flying. Great thrust and very nice speed. This is our recommended prop for the Katana MD.

APC 13x4E If you are a thrust freak and want a 3D beast give this propeller a shot. Producing over 85.3oz of thrust!! This prop will impress your club mates. Not a good choice for pattern due to the lower speed (low pitch propeller).

APC 13x6.5E This is the higher range prop for the Thrust 30 and an excellent over all prop. Allow high speed maneuvers with a lot of punch. Adequate airflow to cool down the motor and ESC is required, as well as a good battery and throttle management.

We recommend getting a few different size propellers with your thrust 30 motor. Swapping a propeller is an easy task so you may want to experiment and feel the difference to fit different style of flying. Also in a hot summer day you may want to use a smaller propeller while in a cooler day you can run the motor with a larger propeller.

The iPAs Drive Test Methodology:- An Engineered Approach to Testing

Through hundreds of hours of flight testing our airframe designs, we have established that there is a direct correlation between the airframe and drive system and one affects the other with consequences to the desired aerodynamic performance. We designed our power plants with the airframe that promotes efficient cooling. The idea behind the design was to allow the power plant and airframe to work in harmony in order to achieve optimum performance, that could never be easily achieved with a mix and match approach.

Every step of the design from the airframe, motor, speed controller through to the matching power packs have been done in a very careful and measured fashion with the sole propose to achieve the maximum aerodynamic performance without compromising flight time.
We call the result **iPAs**, PA **I**ntegrated **P**erformance **A**irframe-Drive **S**ystem, allowing any modeler to get it right the first time in the simplest and shortest way; the completely hassle free buy, fix, fly and forget method.

Below we will tell you a bit about the task of testing the gear to confirm the performance results.

While this may sound easy, it is actually a very complex test that should be done carefully. Any variations with the type of ESC set up, ESC brand, type of battery, charging of the battery pack (can even vary between same brand and type of pack), type of chargers, climate (environment temperature) and testing gear will derive different results. Even the duration of the bench run will change the reads due to the battery voltage drop caused by the internal resistance of the battery as well as the age of the battery. All those factors can create A LOT of read variations.

We conducted **multiple** tests (both static and dynamic tests) on each of our motors in different climates/temperature, using different testing equipment, changed ESC and batteries to determine the real performance of the motor. We also had the model flown by multiple test pilots to obtain different individual flying styles.

We believe that drive system testing should not be purely based on bench testing, because those are clinical test done in controlled environments that are completely different from actual flight conditions. Interactions of external environmental factors such as cooling, prop loading, G-Force etc. can not be accurately simulated on the bench. The real performance data comes from actual flights because this is where it counts the most. Therefore, we have taken the approach to conduct actual live test to acquire our data, i.e. flying the actual aircraft and performing actual 3D maneuvers, like any other experienced modeler would for real. We do not simply fly straight and level circuits and performing simple aerobatic maneuvers during our flight test but we actually fly our aircraft to the maximum limits of their aerodynamic performance envelope.

We strongly recommend going over the graphs below since they are the real dynamic test we've conducted with the motor.

iPAs Static Bench Testing Results **PA Thrust 30, PA Quantum 48, PA2200mah**

Prop Type	Battery Voltage (V)	Current (A)	RPM	Watts (W)	Static Thrust (oz)	Static Thrust (gr)
APC 11X5.5E	10.66	23	8415	250	49.80	1,412
APC 12X6E	10.62	29.5	7620	310	57.80	1,638
APC 13X6.5E	10.05	36.7	6870	370	64.70	1,832
APC 13X4E	10.44	28.1	7890	300	85.30	2,420

In 3D flights, thrust and power usually require the immediate power for few seconds to get out of a maneuver. We have based our static tests on this datum. We used 4 different brands of testing gear to verify the results and accuracy of reads. Test results may vary depend on your set up of your ESC, climate, altitude, duration of run etc.

Dynamic Flight Test

The dynamic test is real time data acquisition by onboard data loggers installed on the actual aircraft which the gear is designed for. These airplanes are deliberately flown by advanced pilots executing actual advanced maneuvers to simulate the real world performance conditions where these airplanes are expected to be flown.

We have included several graphs to cover as many advanced freestyle and 3D routines as possible especially maneuvers that places the most demand on the drive system. The graphs also show the actual motor cooling performance as it goes through each different maneuver and air speeds.

You may also want to look at all the temperature traces on the graph that indicates a fairly constant operating temperature throughout the flight in relation to the dynamic loads imposed by the propeller. This is where our exclusive Rotorkool™ feature comes into action to keep motor core temperature considerably below the critical temperature limits of the neodymium magnets allowing our Thrust Motors to provide consistent performance far longer than any other motor.

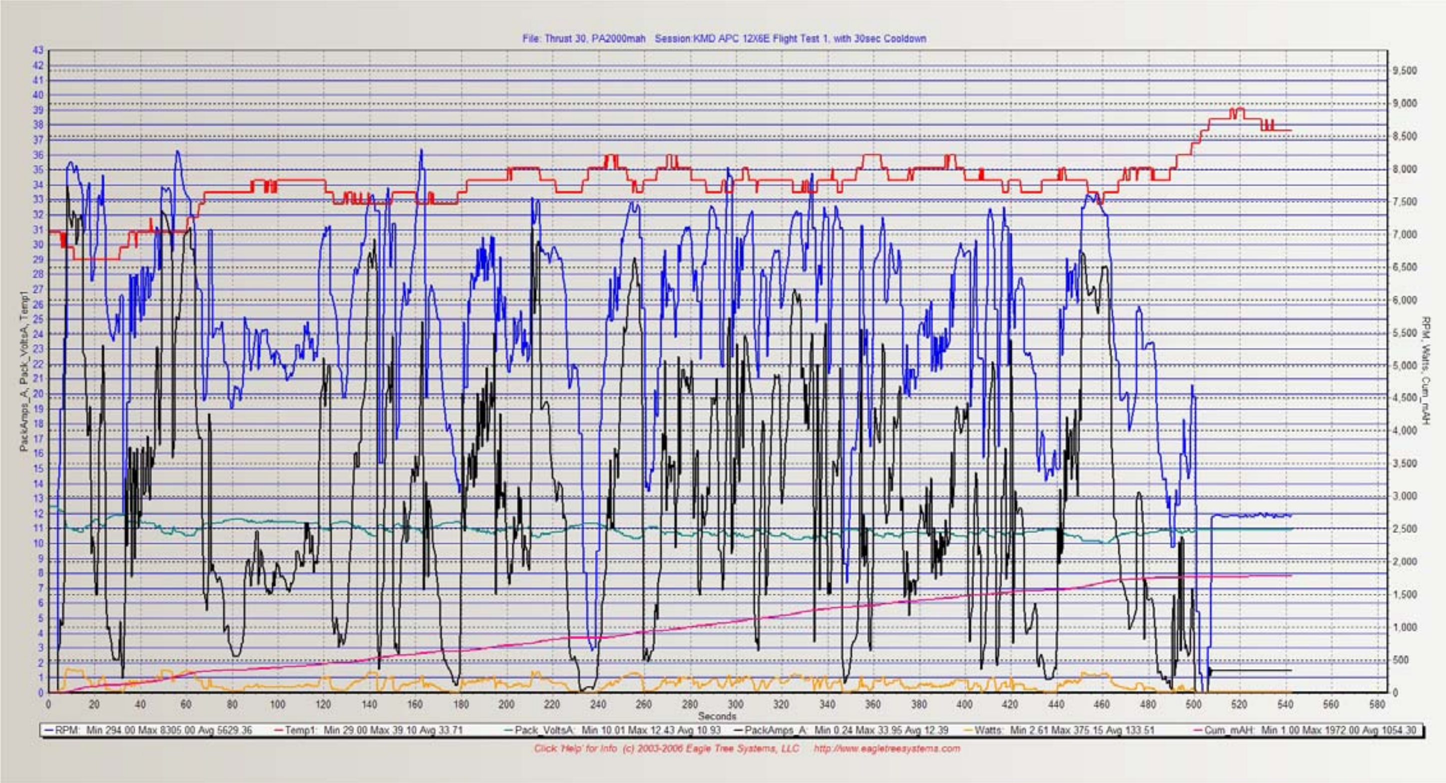
iPAs Dynamic Flight Test Results

PA Thrust 30, PA Quantum 40, PA2200mah (General Freestyle/3D Maneuvers)

Engineering Units

Current = Amps, Voltage = Volts, Power = Watts, Temperature = Deg C., RPM = RPM, Battery Capacity = mAh.

Test Flight 1 APC 12X6E



Graph interpretation & Flight Report:

Dynamic test deliberately conducted in a hot summer day with ambient Air temperature of 31 Deg C (87.8F).

The **red line** shows the motor operating temperature throughout the flight is between 32.5 Deg C to 36 Deg C (90.5-96.8F). The operating temperature rises and drops corresponding to the loads being imposed and only rises after the motor has stopped after the flight indicating the Rotokool™ HVFCV feature was managing the temperature while the motor was in operation. This is indicative of both the **blue** (RPM) and **Black** (Motor current) lines.

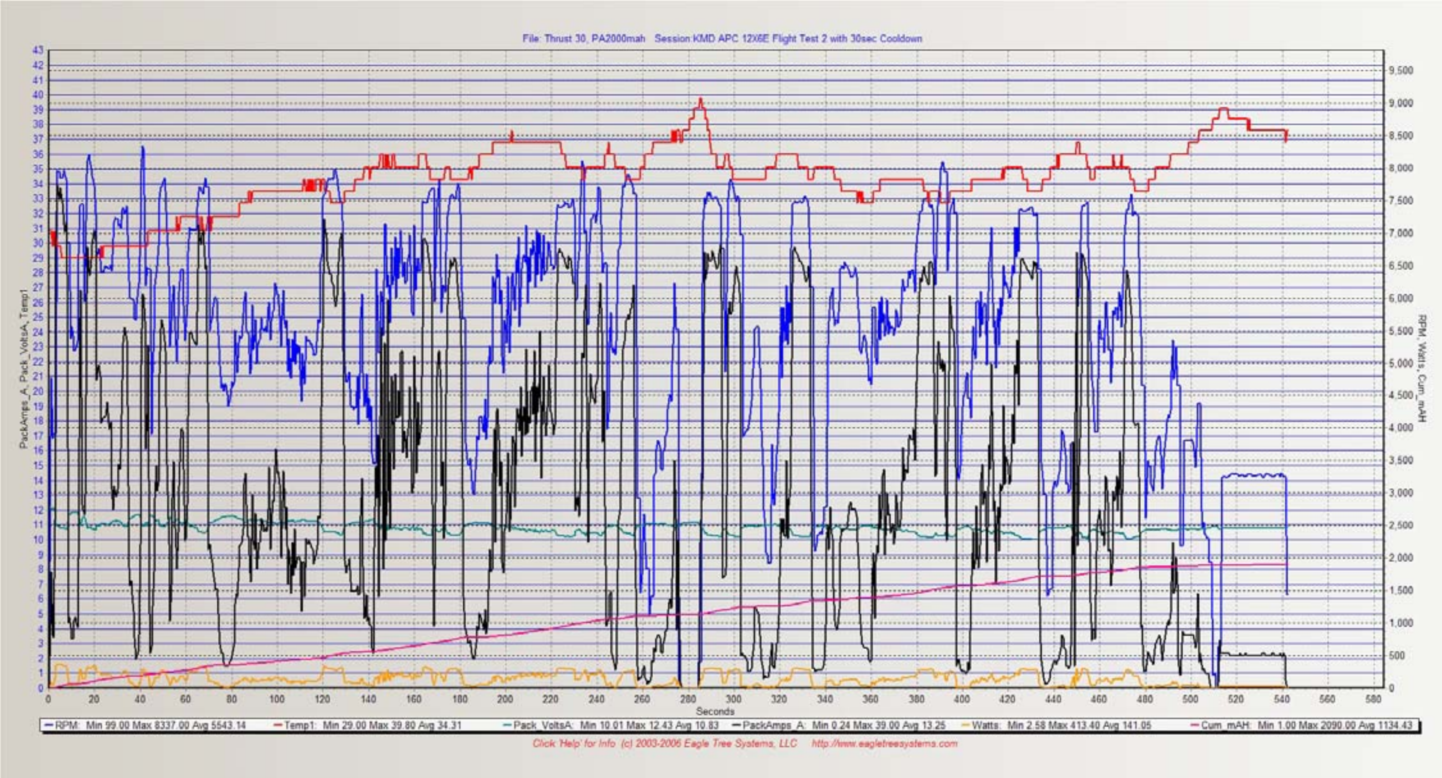
Please note that the momentary max current draw (33.95A) caused by a full powered vertical climb after takeoff is actually higher than the static bench test results clearly underscores the importance of dynamic flight testing.

The **green line** shows the performance of the PA2200mah, 18C-30C packs throughout the flight. Here you can see the maximum current draw is kept below the critical 30C burst rates meaning that the packs are not being over stressed and are maintaining performance.

The (cumulative mAh) indicates the accumulated battery capacity throughout the flight and consumed approximately 80% of the pack's capacity after a hard 8 minute flight.

The **orange line** (watts) shows the motor power output throughout the flight. No issues were noted on the Quantum 40 and the throttle response was smooth and linear.

Test Flight 2 APC 12X6E



Graph interpretation & Flight Report:

Dynamic test deliberately conducted in a hot summer day with ambient Air temperature of 31 Deg C (87.8F).

This graph shows a consecutive flight right after Test Flight # 1 (after a period long enough only for a battery change)

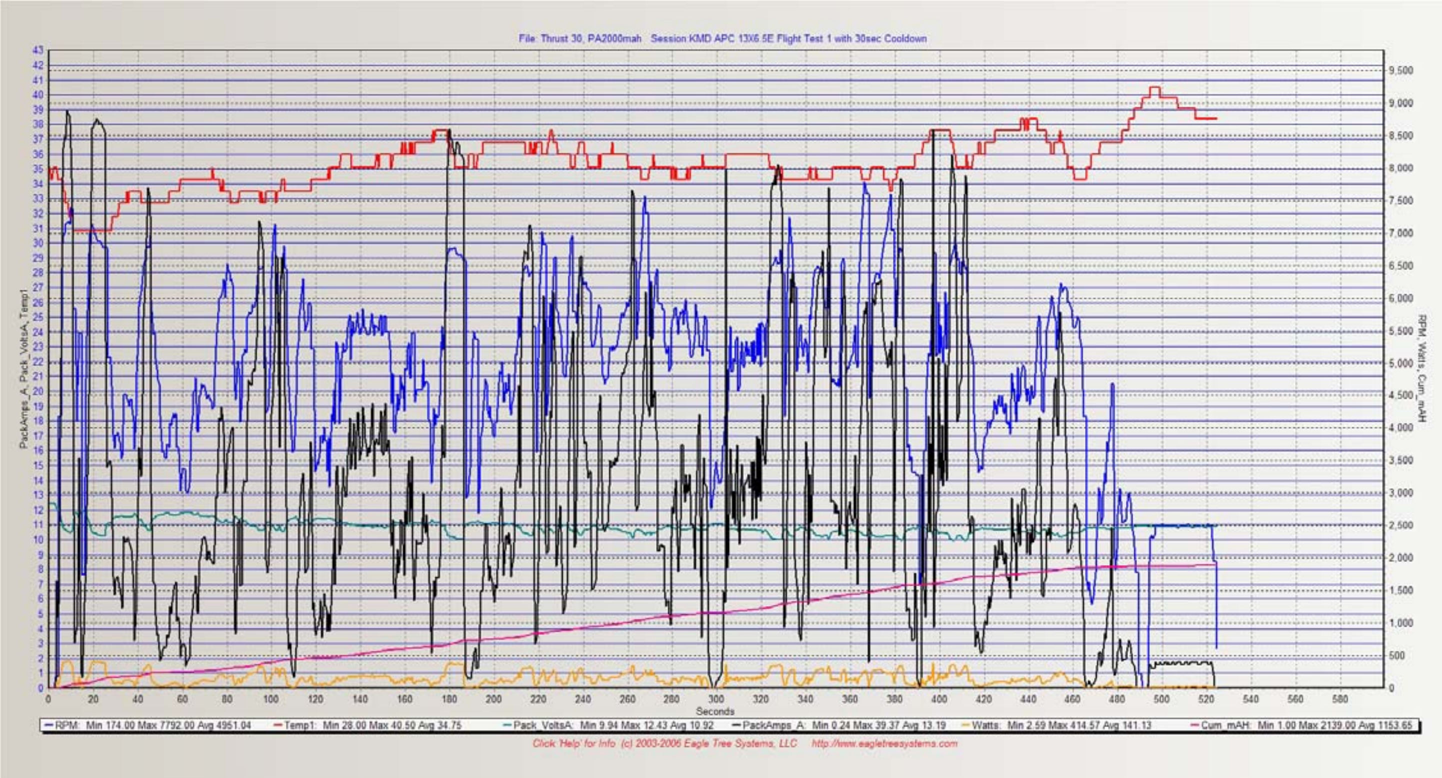
The **red line** shows the motor operating temperature throughout the fight is between 33–39 Deg C (91.4-102.2F) (rising and dropping corresponding to the loads being imposed).

You may note the temperature dropped from 31 to 29 Deg C (87.8-84.2F) after the motor initially started showing the effectiveness of the Rotokool™ HVFCV feature. The temperature peak mid point (280 seconds into the flight) in the graph was where the aircraft landed and had the motor stopped, without cooling for a few seconds, then took off again.
You will note that the temperature peak of 39 Deg C (102.2F) and started dropping back to about 34 Deg C (93.2F) again shows how RotoKool™ manages the temperature so effectively.

The cumulative battery capacity (**pink line**) after the 8.5 minute flight is also consistent in this flight providing reliability to flight timer estimates to avoid unwanted LVC (Low Voltage Cutoff) issues.

No issues were noted on the Quantum 40 and the throttle response was smooth and linear.

Test Flight 3 APC 13X6.5E



Graph interpretation & Flight Report:

Dynamic test deliberately conducted in a hot summer day with ambient Air temperature of 31 Deg C (87.8F).

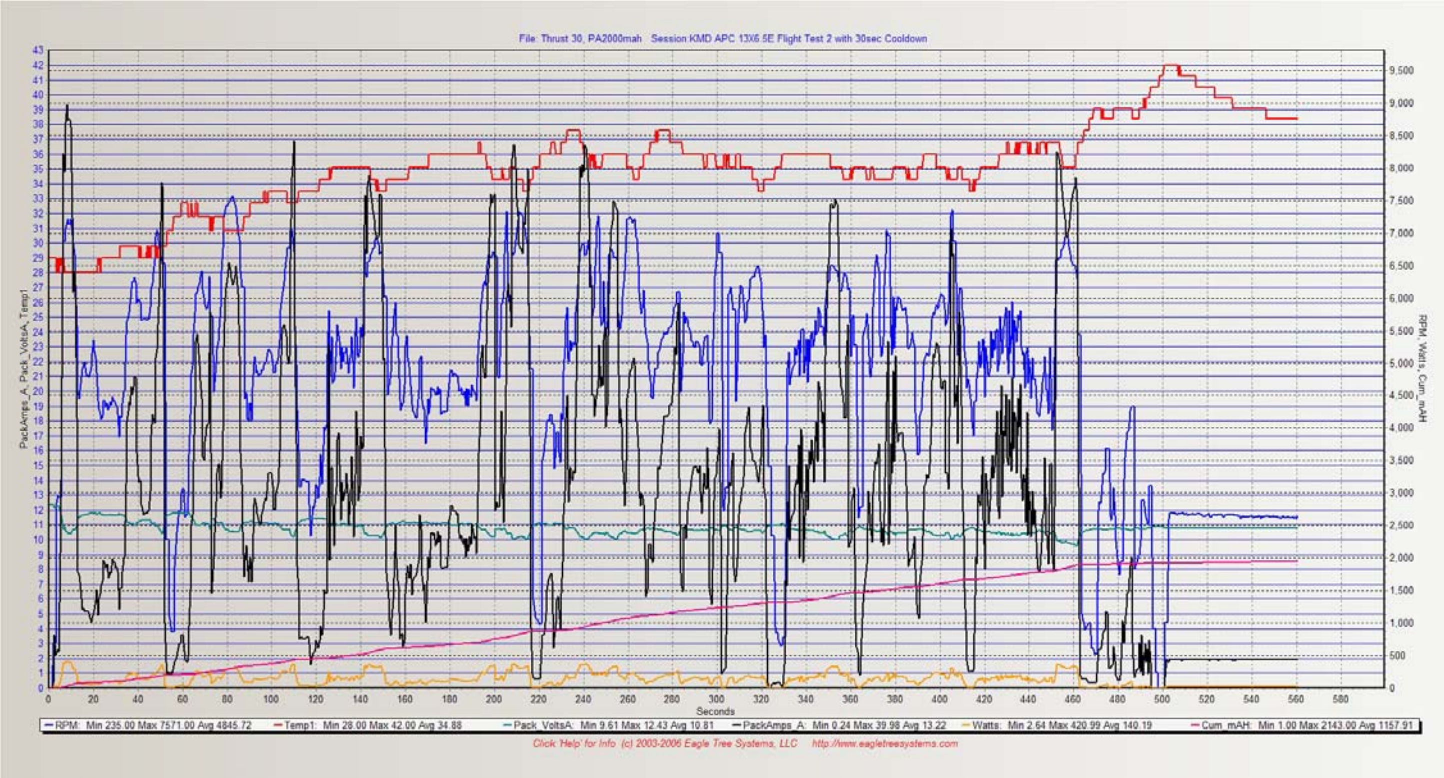
This graph is of the third consecutive flight with the motor still warm at 34.5 Deg C (94.1F) and drops back to 31 Deg C (87.8F) upon motor startup in spite of the hard vertical climb after take off drawing 39.37A.

The **red line** shows the motor operating temperature throughout the fight is between 33 to 37.5 Deg C (91.4-99.5F) rising and dropping corresponding to the loads being imposed in-spite of the additional loads imposed by the larger 13X6.5E prop.
The **green line** (battery voltage) shows how well the battery is coping with the additional loads imposed on the motor throughout the flight. It never dropped below 9.94V DC and therefore provides a safe LVC-free flight in-spite of the pack being driven very hard **(414.57W)**.

The cumulative battery capacity (**pink line**) after the 8.3 minute flight shows how much stress was subjected to the pack and it still retains the required voltage. This pack was flown to 97% of its capacity.

No issues were noted on the Quantum 40 and the throttle response was smooth and linear.

Test Flight 4 APC 13X6.5E



Graph interpretation & Flight Report:

Dynamic test was conducted in a warm summer day with ambient air temperature of 28 Deg C (82.4F). The motor was allowed to rest for a period of time.

The **red line** shows the motor operating temperature throughout the fight is between 33 to 37.5 Deg C (91.4-99.5F) rising and dropping corresponding to the loads being imposed in-spite of the additional loads imposed by the larger 13X6.5E prop.

The **green line** (battery voltage) shows how well the battery is coping with the additional loads imposed on the motor throughout the flight. It never dropped below 9.61V DC and therefore provides a safe LVC-free flight in-spite of the pack being driven very hard **(420.99W)**.

The cumulative battery capacity (**pink line**) after the 8.3 minute flight shows how much stress was subjected to the pack yet it still retains the required voltage to maintain performance and safety. This pack was also flown to 97% of its capacity. Under normal circumstance only 80% of the pack's capacity should be used to maximize battery lifespan.

No issues were noted on the Quantum 40 and the throttle response was smooth and linear.