

Congratulations on your purchase of the Multiplex BL-480 brushless motor. Multiplex utilized the latest technology to provide a quality, high power brushless motor at an affordable price. Please read these instructions carefully before usage and store them in a safe place so that you can refer back to them as needed in the future.

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Specifications

Chart 1

Part#	M332481	M332484	M332485	M332480	M332483
Motor	BL-480 4D	BL-480 6D	BL-480 8D	BL-480 4G	BL-480 6G
Stator Winding (6 slot)	4 Turns	6 Turns	8 Turns	4 Turns	6 Turns
Rotor Magnet (4 pole)	Neodymium	Neodymium	Neodymium	Neodymium	Neodymium
Motor KV (RPM/Volt)	3250	2100	1600	3250	2100
Gear Ratio	N/A	N/A	N/A	4.4 to 1	4.4 to 1
No Load Current	1.7 amp	0.8 amp	0.6 amp	1.7 amp	0.8 amp
Maximum Current	30 amps	25 amps	20 amps	30 amps	25 amps
Maximum Power	250 watts	200 watts	150 watts	325 watts	275 watts
Maximum Motor Rpm	50,000 rpm	45,000 rpm	40,000 rpm	50,000 rpm	45,000 rpm
Current @ Maximum Efficiency	23A	18A	12A	23A	18A
Motor Weight	117 grams	117 grams	117 grams	117 grams	117 grams
Gear Box Weight	N/A	N/A	N/A	46 grams	46 grams
Motor Length	46mm	46mm	46mm	46mm	46mm
Gear Box Length	N/A	N/A	N/A	21.7mm	21.7mm
Prop Shaft Diameter	3.2 mm	3.2 mm	3.2 mm	4 mm	4 mm
*Prop Range	4-5"	5-7"	7-9"	10-13"	12-16"
**Battery (Nicad/NiMH)	6 to 8 cells	6 to 10 cells	6 to 10 cells	8 to 12 cells	8 to 14 cells
**Battery (LiPo)	2 cells	2 to 3 cells	2 to 3 cells	2 to 4 cells	2 to 4 cells
* Use smaller prop with higher cell count and larger prop with lower cell count					
** Battery must be able to handle current draw of the motor.					

Applications:

Listed below are the aircraft applications that we have tested each BL-480 series motor with. These will give you an idea of what motor will be best suited for your particular application. Note that these are just guidelines, and your application may vary depending on several factors. Be aware the key to a good set-up is allowing the motor to operate very close to its maximum efficiency current with the cell count and propeller. The more cells that are used, the smaller the propeller needs to be to keep the proper current level. More cells equal higher watts out but also increase the weight. A good rule of thumb is that at least 50 watts per pound are needed for a plane to take off the ground and fly. 70 watts per pound are needed for mildly aerobatic airplanes, and 100+ watts per pound for doing severe aerobatics. Watts in = Volts times Amps. I.E. Using an 8.4V battery with a motor drawing 20 amps is 168Watts. Watts out = Volts times Amps times the efficiency of the motor. The efficiency of the Permax BL-480 motors average about 80%.

Chart 2

Model #	Drive	Cells	KV	Watts out	Thrust	Amps	Plane Type	Plane Weight	Prop
BL-480/4G	Geared	10	3250	240	50 oz	25	Hotliner / Aerobatic	20to 45 oz.	12x6
BL-480/6G	Geared	12	2100	207	57 oz.	18	Motor Glider	25 to 55 oz.	13x8
BL-480/4D	Direct	7	3250	168	25 oz.	25	Pylon / Helicopter	12 to 20 oz.	5x5
BL-480/6D	Direct	7	2100	120	26 oz.	18	Fast Park Flyers	16 to 28 oz.	7x4
BL-480/8D	Direct	8	1600	115	25 oz.	15	Park Flyers	16 to 28 oz.	8x4

Installation

Located on the front of the motor or gearbox are four 2.5mm holes. The direct drive motors have two at 16mm and two at 18mm. The 16mm holes will fit a stock speed 400 motor mount. The geared versions have four holes spaced at 16mm only. For installation is specific aircraft refer to the instruction manual of the aircraft.

(Show illustration)

Wiring/ESC

Brushless motors have three wires, instead of the usual two wires of a brushed motor. These wires will be connected to the ESC. The motor will typically rotate counter clockwise if the colors on the ESC match up to the motor wires. However, if you need to the motor to operate in the opposite direction, swap any two wires; it does not matter which two. Be sure to always use an ESC that is capable of handling the current draw of the motor. Multiplex offers an ESC optimized for the BL-480 series motors and is strongly recommended. However, any manufactures brushless ESC will work but be aware some are programmed with higher timing which will affect the motors power characteristics. Higher timing provides higher RPM with lower torque so a smaller propeller should be used.

(Show illustration)

Batteries

As a general rule, for any high wing trainer type electric airplanes, you will want one NiCad or NiMh cell for every 45-50 square inches of wing area, and for an aerobatic plane, use one cell for every 35-40 square inches of wing area. We have found the 2/3A size NiMh cells like the HeCell 1100's and KAN 1050's are a very good mate to the BL-480 series motors due their low resistance and weight. Lithium Polymer (LiPo) batteries can also be used, but there are a couple things to remember. First, you must make sure that the cell you select will handle the current of the motor. You can find this out by the "C" rating of the pack. For example a 3000mah LiPo pack with an 8C rating is capable of producing 24 amps of current. This is really about the minimum you will want to use for the BL-480 motors. Another factor is that one LiPo cell is equal to about 3.4 Nicad or NiMh cells. Therefore, a two cell LiPo pack is about equal to a 7 cell Nicad/NiMh, and a 3 cell LiPo is about equal to a 10 cell Nicad/NiMh. Multiplex offers a full line of Lithium packs, look for the Multiplex Li-Batt's if you want longer runtime and reduced weight for greater performance!

Propeller

The propeller is a vital component to the performance of the airplane. If the propeller is too small you won't get all the power from the motor. If the propeller is too big then the current draw may exceed that of what the motor can handle causing the motor to overheat and suffer damage. Chart # 2 lists combinations of batteries and propellers for each motor that we have found to be effective. However, there are many other combos possible. Chart #1 shows a range of propeller sizes and cell counts. Use the smaller recommended size propeller with the higher cell recommendation and the larger propeller with the lower cell count. Remember not to push the motor past the recommended maximum amperage or you may damage the motor by overheating it.

Motor Temperature

While high temp Neodymium magnets are used in the BL-480 motors, it is vital not to overheat the motor or they can be damaged. This is a big factor as to how much you can push the motor. The motor temp should never exceed 200 degrees Fahrenheit. Ideally the motor temp should be about 140 degrees after use if propped correctly. At 140 degrees you should be able to put your finger on the motor for 2 to 3 seconds without needing to remove it. Again, keeping the motor current below the recommended maximum should prevent overheating but other factors such as airflow and how long the motor is running at that current need to also be considered. Typically full throttle is only used for take off and maneuvers; if the motor is running at full throttle constantly just to fly the plane then the heat will be much higher. If this is the case then the motor selected is probably not powerful enough for the application.

Gearbox

Installed on the "G" version of the BL-480 motors is Multiplex's heavy duty, planetary gearbox. This high performance gearbox is made of high quality components for long life and low drag. The gear ratio is 4.4-1. This means that for every 4.4 revolutions of the motor output shaft, the gearbox output shaft rotates once. With this gear reduction, the

motor can swing a much larger propeller thus creating much greater thrust with lower forward speed.

Maintenance

A great feature of the brushless motor is there is virtually no maintenance required. However, care should be taken to keep the bearing clean and free of debris. If the bearings do get dirty, it is best to blow them off with compressed air. Re-oil with a VERY small amount of light household oil. Use only a small amount, as it can seep into the motor. This should only be necessary after many hours of usage.

Warranty

Multiplex Permax BL-480 Brushless motors carry a Two-Year limited warranty.

Multiplex Warrantees:

1. Manufacturer's defects.
2. Motor damaged during normal conditions.

Multiplex does not Warranty:

1. Crash damage or problems caused by neglect or abuse by the user.
2. Modifications to the motor of any kind.
3. Normal wear and tear. I.E. Components worn by use.
4. Application of improper voltage (more cells than recommended.)
5. Over-propping thus causing the motor to draw more current than maximum suggested and overheat.

Warnings

Never

1. Disassemble the motor.
2. Exceed the maximum RPM, cells or current recommendations.
3. Allow the motor to get hotter than 200 degrees Fahrenheit.
4. Use a speed control with a lower amp rating than the motor is capable of
5. Use spray oil on the bearings.

Always

1. Make sure your batteries are fully charged before you fly.
2. Do a pre-flight check on the airplane to make sure all control surfaces are functioning correctly and move in the proper direction.
3. Let the motor cool to at least 10 degrees above the ambient temperature prior to the next flight.
4. Make sure the throttle is in the low position and your finger and any other body parts are away from the propeller when plugging in the battery.
5. Be prepared for the propeller to "accidentally" start up.
6. Check the motor operation the first time without the propeller attached.

Resources

There are many great resources on the Internet to help you with your set up and to learn more about the great world of electric flight and brushless motors. Below is a list of resources Multiplex highly recommends you check out.

Motor calculation programs:

<http://www.motorcalc.com> (Download free trial)

<http://brantuas.com/ezcalc/dma.asp> (Free on-line program courtesy of Diversity Model Aircraft <http://www.flydma.com>)

While the Multiplex Permax BL-480 Brushless motors are not available in the motor selections yet, hopefully they will be in the future. Until then you can select a motor in a similar size and KV rating to give you a good idea of the set up. Try different cell counts, types of cells, and propellers to see what performance you can expect. Remember to use these programs only as a baseline, as your real world results may differ.

On-line magazines and forums:

<http://www.ezonemag.com>

<http://www.rcuniverse.com>

These are two great sources for R/C information. We strongly recommend becoming a member of both and using the forums to search for topics of interest and also to post your own questions as needed.