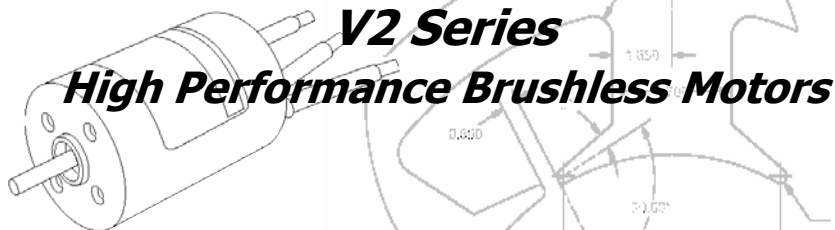




medusa
research Inc.

Engineered Products for the RC Enthusiast



V2 Series

High Performance Brushless Motors

Installation and Operation

Models: MR-028-xxx-xxxxV2



www.MedusaProducts.com

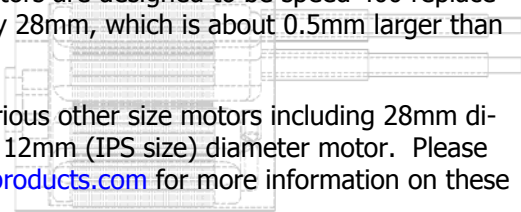
INTRODUCTION

Congratulations on your purchase of a Medusa Research *Afterburner* V2 series motor!

With all of the brushless motor choices available on the market, it is important to understand why we are different. Anyone can wind magnet wire and assemble a motor, but only a few can *design* a motor specifically for the RC enthusiast. All of our motors are designed in the USA by Medusa Research's experienced electric motor engineers, and they were created with the needs of RC models in mind. Our design is the result of cutting edge computer simulation and years of real-world testing. For performance, price, and quality of workmanship, our motors are simply the best on the market today.

Medusa's 28mm Afterburner motors are designed to be speed 400 replacements. Their diameter is exactly 28mm, which is about 0.5mm larger than a standard speed 400.

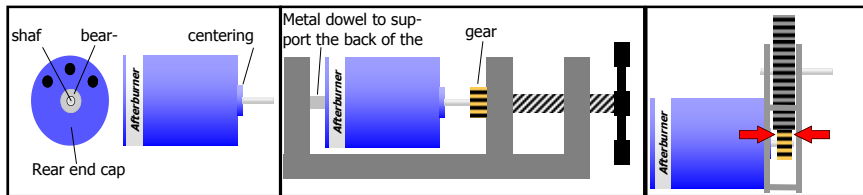
Medusa Research also offers various other size motors including 28mm diameter motors (400-size) and a 12mm (IPS size) diameter motor. Please visit our website, www.medusaproducts.com for more information on these motors.



INSTALLATION

Gearbox Mounting

Using our motor with a gearbox will require a *pinion* gear to be pressed onto the motor shaft. It is important that the gear is pressed on with the proper technique or damage to the gear or motor can occur. Afterburner motors feature a recessed rotor shaft in the rear to save weight and improve the appearance of the motor. When pressing on a gear, it is important to press on the rear of the shaft, not the rear end cap. A short solid metal dowel, or a flat head machine screw can be used to press directly on the rear of the shaft. Using an arbor press or a vise, press the gear on as shown in the diagram below.



1. Understand the procedure

2. Press on the gear

3. Verify the pinion is centered on the main gear

INSTALLATION

The motor will typically be mounted in your gearbox using the threaded screw holes in the front of the motor. The length of the screw should be no longer than the *maximum mounting screw depth* plus the thickness of the plate that the motor is mounted to. Using a longer screw may damage the motor. After mounting the motor, verify that the pinion gear is centered in the main gear of the gearbox. If a planetary gear box is used, ensure the pinion is in the correct position to engage the planet gears in the gearbox. To remove the gear, a proper gear puller should be used. Using the wrong tools to remove the gear can damage the gear and motor.

Direct-Drive Mounting

Afterburners may also be used in direct-drive applications without a gearbox. We recommend using the *collet* type propeller adapters, not the set-screw type. Many of the direct drive propellers and fans for use with our 12mm motor are plastic, and can be pressed on by hand. Push the propeller or propeller adapter as far down the shaft and as close to the motor body as possible but leave room to use a propeller puller. This will minimize the risk of bending the shaft in a crash.

Connecting to an ESC

The output wires of your ESC output wires may be connected to the motor in any combination. There is no optimal direction of rotation and Afterburner motors operate equally well in either direction. To change the direction of rotation, swap any two output wires.

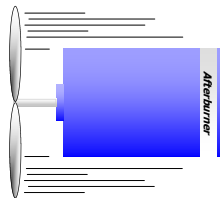
INSTALLATION

Mounting in the model

The gearbox or direct drive motor should be mounted securely to the model as described in the model's assembly instructions. Screws used to mount the motor should not be inserted any further than the *maximum mounting screw depth* into the motor housing to prevent motor damage. Motors should be mounted in a location where they will get adequate airflow. If the motor and gearbox are covered by a shroud or cowl, vent holes should be cut that will allow air in the front, and also allow it to go out the back of the model. Ensure all mountings are secure and hardware is full tightened before testing your model. Properly configured, *Afterburner* motors can generate significant thrust. **Failure to properly secure the gearbox or motor to the model can result in a hazardous situation.**

OPERATION

Afterburner motors are designed to operate continuously at their maximum power rating as long as they are behind the propeller wash as shown. Operating a motor at a voltage, current, or wattage higher than the maximum rating, or operating the motor with inadequate airflow can cause overheating. We recommend using a motor calculator program such as the one available at our website, www.medusaproducts.com to predict the power used by a particular battery pack and propeller. After setting up your model with



the *Afterburner* use a power meter, such as our *Power Analyzer*, to verify the motor draws the correct amount of power. Finally, after running the motor for several minutes at full throttle, check the motor temperature with a temperature probe or with a touch test.

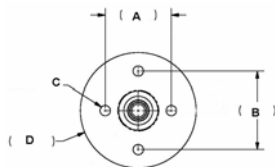
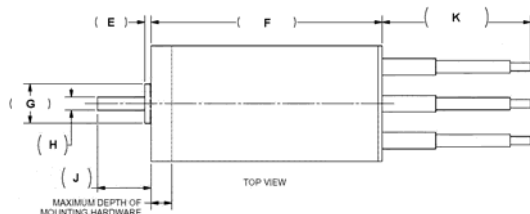
The motor temperature should never exceed 90°C (194°F), and ideally it will be around 60°C (140°F). With the motor case at 60°C (140°F) you can touch the motor for about 2 or 3 seconds before you have to withdraw your hand. **Always use caution with the touch test; if the motor is hotter than you expect, you may be burned.** If you are unable to touch the motor for at least a couple seconds, try modifying the model to improve airflow around the motor or attach motor heat sinks.

For the best efficiency, your ESC should be setup with 8° to 15° advance, and a switching rate of 10 to 20kHz.

Always use caution when working with your model, radio glitches can cause the motor start unexpectedly. Keep the model secured when not flying, and stay clear of the propeller at all times.

Mechanical

| Parameter | MR-028-032 | MR-028-040 | MR-028-056 |
|---------------------------------|------------|------------|------------|
| A Screw hole spacing | 16.0mm | 16.0mm | 16.0mm |
| B Screw hole spacing | 18.0mm | 18.0mm | 18.0mm |
| C Screw thread | M3x0.5 | M3x0.5 | M3x0.5 |
| D Outer Diameter | 28.0mm | 28.0mm | 28.0mm |
| E Centering Hub height | 1.5mm | 1.5mm | 1.5mm |
| F Length w/o shaft | 32.0mm | 40.0mm | 56.0mm |
| G Centering Hub diameter | 9.53mm | 9.53mm | 9.53mm |
| H Shaft diameter | 3.175mm | 3.175mm | 3.175mm |
| J Shaft Length | 13.0mm | 13.0mm | 13.0mm |
| K Wire length | 39mm | 39mm | 39mm |
| Max mounting screw depth | 5mm | 5mm | 5mm |
| Weight | 70g | 100g | 160g |
| Max RPM | 60,000 RPM | 60,000 RPM | 60,000 RPM |
| Poles | 4 | 4 | 4 |



Electrical

| Model | Kv (RPM/V) | Io @ 8V | Rm | Cont Input Power ¹ | Cont Input Current | Max Current ² | Max Volts |
|-------------------|---------------|------------|---------|----------------------------------|-----------------------|-----------------------------|--------------|
| MR-028-056-2800V2 | 2800 | 2.50 A | 0.007 Ω | 500 W | 57 A | 69 A | 21 V |
| MR-028-056-1900V2 | 1900 | 1.30 A | 0.016 Ω | 500 W | 44 A | 52 A | 32 V |
| MR-028-056-1400V2 | 1400 | 0.90 A | 0.025 Ω | 500 W | 36 A | 43 A | 43 V |
| MR-028-056-0900V2 | 900 | 0.45 A | 0.053 Ω | 500 W | 26 A | 31 A | 67 V |
| MR-028-040-3400V2 | 3400 | 2.00 A | 0.010 Ω | 350 W | 42 A | 50 A | 18 V |
| MR-028-040-2500V2 | 2500 | 1.20 A | 0.017 Ω | 350 W | 37 A | 45 A | 24 V |
| MR-028-040-2200V2 | 2200 | 1.00 A | 0.021 Ω | 350 W | 33 A | 40 A | 27 V |
| MR-028-040-1700V2 | 1700 | 0.65 A | 0.036 Ω | 350 W | 27 A | 32 A | 35 V |
| MR-028-040-1200V2 | 1200 | 0.50 A | 0.066 Ω | 350 W | 20 A | 24 A | 50 V |
| MR-028-040-1000V2 | 1000 | 0.30 A | 0.101 Ω | 350 W | 17 A | 20 A | 60 V |
| MR-028-032-4200V2 | 4200 | 1.85 A | 0.016 Ω | 275 W | 33 A | 40 A | 14 V |
| MR-028-032-3400V2 | 3400 | 1.30 A | 0.020 Ω | 275 W | 29 A | 35 A | 18 V |
| MR-028-032-2800V2 | 2800 | 1.00 A | 0.027 Ω | 275 W | 27 A | 32 A | 21 V |
| MR-028-032-2400V2 | 2400 | 0.75 A | 0.036 Ω | 275 W | 24 A | 29 A | 25 V |
| MR-028-032-1900V2 | 1900 | 0.50 A | 0.058 Ω | 275 W | 20 A | 23 A | 32 V |
| MR-028-032-1500V2 | 1500 | 0.40 A | 0.082 Ω | 275 W | 17 A | 20 A | 40 V |
| MR-028-032-1200V2 | 1200 | 0.25 A | 0.137 Ω | 275 W | 13 A | 16 A | 50 V |

1) Continuous input power is with adequate airflow around the motor.

Input power should be de-rated for models with low airflow

2) Maximum current may be run for no more than 30 seconds.

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SUPPORT

SUPPORT

If you are still having difficulties, or have questions that aren't covered in this manual, you can contact Medusa Research for support.

Our contact information is:

World Wide Web

<http://www.medusaproducts.com>

E-Mail

support@medusaproducts.com

Telephone Support

Phone Number: 508.675.0200 (in Fall River, Massachusetts)

Hours: Monday-Friday 10am to 5pm eastern time,
(excluding business holidays)

WARRANTY

LIMITED WARRANTY

Medusa Research Incorporated warrants this product to be free of manufacturing defects in material and workmanship for a period of 12 months from the original date of purchase. Should any defects covered by this warranty be found, this product shall be repaired or replaced with a unit of equal performance by Medusa Research Incorporated.

In the event of a product defect during the warranty period, see the directions in the "Returns and Return Authorization."

LIMITS AND EXCLUSIONS

This warranty may be enforced only by the original purchaser, who uses this product in strict accordance with the information provided in this operation guide. This warranty does not apply to damage resulting from failure to follow instructions provided in this operations guideline, misuse, abuse, neglect, incompatibility, mechanical failure of user installed parts, or repairs/alterations performed by someone other than Medusa Research Inc., bent or broken output shafts, broken wires, demagnetized rotors, and burnt windings.



WARRANTY

LIMITATION OF LIABILITY

(i) UNDER NO CIRCUMSTANCES WILL MEDUSA RESEARCH, INC. BE LIABLE FOR ANY INDIRECT, THIRD PARTY, SPECIAL, INCIDENTAL, CONSEQUENTIAL OR EXEMPLARY EXPENSES, COSTS, LIABILITY, LOSS, OR DAMAGE WHATSOEVER IN ANY CONNECTION WITH THE USE OR MISUSE OF, OR INABILITY TO USE THIS PRODUCT;

(ii) that Medusa Research, Inc. shall not be liable for any harm, loss, damages, expenses, costs, suit, claim or demand whatsoever against the user of this product;

(iii) that neither Medusa Research, Inc., nor any of its representatives, employees, officers, directors, agents, distributors, affiliated corporations or any other person, shall be responsible for nor shall incur, any liability, damages, loss, obligations or responsibility whatsoever (whether in equity, contract, tort or otherwise) for any harm, loss, reliance, or damages, whatsoever, that may arise in any connection with or result from any promise, advice, arrangement, agreement, statement, technical support or maintenance, representation, warranty, or information whatsoever, that may have been made to by Medusa Research, Inc.;

RETURNS AND RETURN AUTHORIZATIONS

RETURNS AND RETURN AUTHORIZATION:

For warranty and repair returns, please download a *returns form* from our website. Instructions for packaging and shipping returns are also on our website. If you do not have access to the internet, please call or fax us at the number below.

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