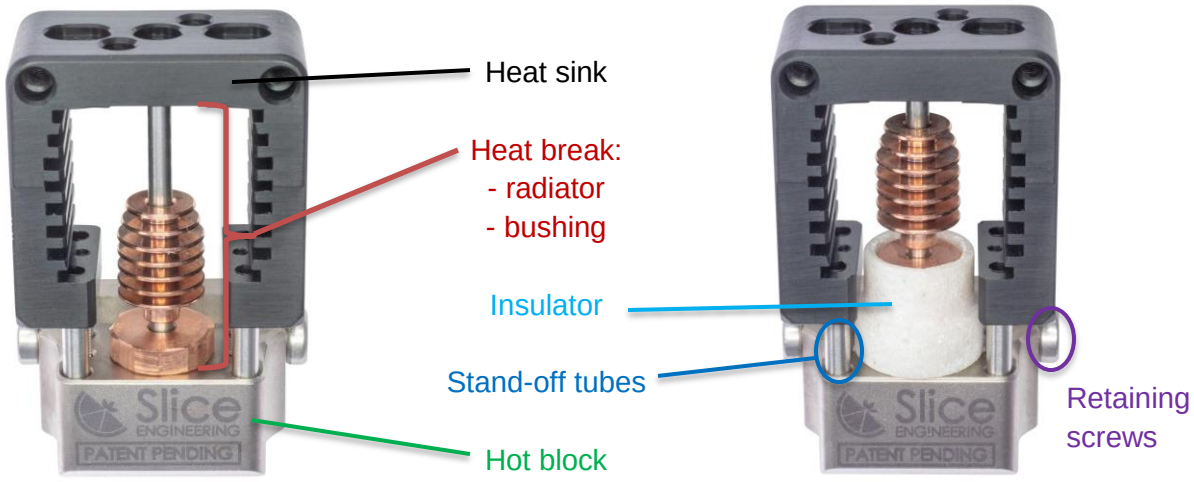
Slice Engineering

Mosquito™ Installation Instructions



Mosquito™ Performance Advantages

Swap nozzles with ease in 10 seconds with the Slice Engineering™ Mosquito™ all-metal hotend. The patent-pending Mosquito™ design resists the torque of nozzle changes; no longer must you grasp the hot block with a wrench, risk damaging wires, or pre-heat and risk burning yourself.

Additionally, Mosquito™ features a heat break of superior performance, with a wall thickness in the heat-breaking zone **less than 20%** that of monolithic all-metal heat breaks. Mosquito's supremely thin-walled heat break minimizes the undesirable flow of heat upward from the melt zone along the filament path. Yet Mosquito™ is still the most rugged hot end available, because its heat break doesn't serve as a structural element as heat breaks do in all other hotends. The Mosquito™ heat break features multi-body, bimetallic construction that places a copper alloy (thermal conductivity: 320 W/mK) where heat flow is desired and a stainless steel alloy (thermal conductivity: 15 W/mK) where it isn't.

Figure 1. Heat Break comparison

Mosquito™ is rated for operation up to 450°C, meaning it can print all printable thermoplastics, including PEEK, Ultem (PEI), ASA, Nylon, and others.

For a complete list of Mosquito's™ performance benefits, check out our website.

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How to Install a Mosquito™ on Your Printer:

1. Find an Adapter

Mosquito™ adapters for various printers are being developed by Slice Engineering™, other 3D printing companies, and by the enthusiastic 3DP community. Printable adapters can be found on our website or all metal adapters can be purchased on our webstore or at 713Maker.com. Additionally, Bondtech makes extruders specifically designed to integrate with the Mosquito™ hotend.

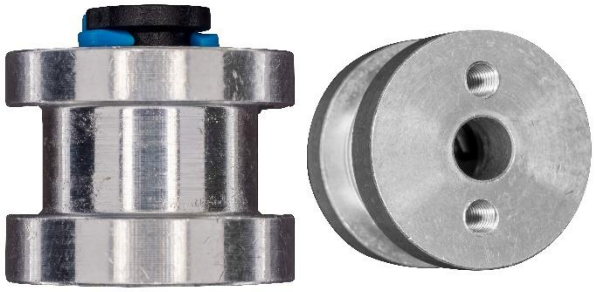

Figure 2. Groovemount adapter for Mosquito™ from Slice Engineering™

Figure 3. Threaded Stem adapter for Mosquito™ from Slice Engineering™

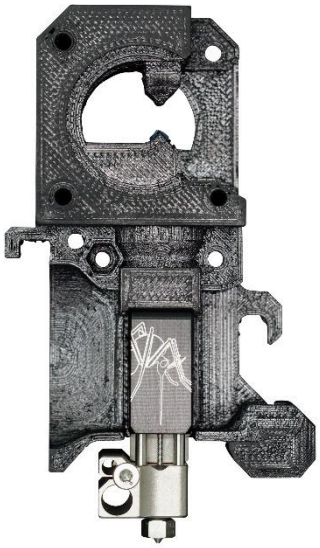

Figure 4. Printable adapter for Mosquito™ on the Prusa Mk3

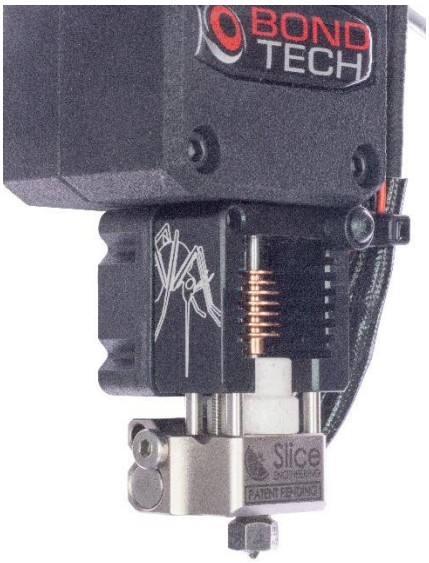

Figure 5. Mosquito™ mounted to the Bondtech BMG-M

Mosquito's™ black aluminum heatsink features a pair of M2.5x0.45 tapped holes and M2.5 counterbored clearance holes for mounting to its top surface (see Fig. 6) and a pair of M2.5x0.45 tapped holes for mounting to its bottom surface. Any of these three pairs of holes

may be used to mount Mosquito to your machine. The M2.5 clearance holes may be used with M2.5x0.45 socket head cap screws, or if fastening Mosquito™ to a plastic component, with special M2.5 thread-forming screws for plastic.

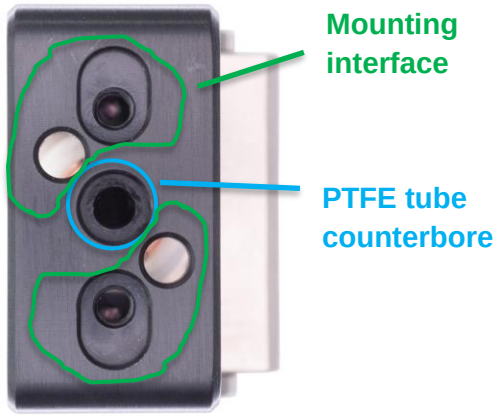

Figure 6. Hole patterns on the Mosquito™ heat sink

The 4.1mm diameter, 1mm deep counterbore on the top surface of Mosquito's™ heatsink is designed to locate PTFE tubing with 4 mm outer diameter, aligning the tubing's hole precisely with the heat break's hole. Slice Engineering™ recommends Capricorn XS tubing since its 1.9 mm inner diameter will prevent dramatically oversize filament from entering the heat break where it could become lodged.

2. Use Boron Nitride Paste

Figure 7. Boron Nitride Paste

Slice Engineering™ recommends Boron Nitride Paste for use in hotends of any brand. For decades it has been used as a "heat transfer and release coating" for industrial cartridge heaters. Use it to improve heat transfer:

- From the cartridge heater to the hot block, to extend the life of the cartridge heater
- From the hot block to the temperature sensor, to shorten response time and improve accuracy of temperature measurements
- From the hot block to the heat break to improve high flow rate performance when printing with large diameter nozzles
- To improve the seal between nozzle and heat break

Boron Nitride Paste may be used generally, in assemblies operating in temperatures up to 1000°C, as an electrically insulative heat transfer and anti-seize compound.

The paste is aqueous, so the water carrier must evaporate before the compound becomes an electrical insulator. Paste bridging a temperature sensor's lead wires will affect the sensor's measurements while the paste remains wet. Dry the paste by allowing it to set overnight, or to save time, heat it to a temperature below 100 °C by activating the cartridge heater in short

bursts. The paste will dry completely, and temperature measurements will return to normal upon first use of the hotend.

Note: Avoid exceeding 100 °C while drying, to keep the water from boiling and ejecting the paste with steam.

3. Install the Temperature Sensor

Mosquito works with all temperature sensor types commonly found in 3d printers:

<u>Cartridge sensors of 3mm diameter such as those from Slice Engineering™</u>:

1. Remove either retaining screw (M3 low head socket cap) from the hot block.
2. Apply Boron Nitride Paste inside the hot block's sensor slot with the provided applicator swab and onto the surface of the cartridge.
3. Insert the sensor into the sensor slot.
4. Reinstall the removed retaining screw.
5. Wipe away any excess Boron Nitride Paste using a cotton swab, then allow it to dry as described in the preceding section.

Figure 8. Mosquito™ heater and sensor slots

<u>Threaded stud sensors with M3 threads</u>:

1. Remove either retaining screw from the hot block.
2. Apply Boron Nitride Paste onto the threads and shoulder of the sensor.
3. Install the sensor into the threaded hole previously occupied by the retaining screw
4. Wipe away any excess Boron Nitride Paste using a cotton swab, then allow it to dry as described in the preceding section.

<u>Glass bead sensors</u>:

To achieve accurate temperature measurements with this sensor type, Boron Nitride Paste must fill the space between the glass bead and the wall of the sensor hole. This is achieved by potting the sensor into the hole.

1. Fill the sensor slot with Paste and insert the glass bead deeply into the wet paste
2. Anchor the sensor's leads to the Mosquito™ heatsink using the included Panduit zip tie for cable control and strain relief.
3. Wipe away excess Boron Nitride Paste using a cotton swab or sponge and allow it to dry as described in the preceding section.

4. Install the Cartridge Heater

Any cartridge heater that has a 6 mm outer diameter and a cartridge length less than 22.5 mm may be used with Mosquito™.

Note: A low-quality cartridge heater may have a substantially oversize (out of specification) outer diameter and not fit Mosquito™. If the heater inserts easily, use it, otherwise replace it. Do not force an oversize heater into the cartridge heater slot in the Mosquito™.

1. Remove either retaining screw from the hot block.
2. Apply Boron Nitride Paste inside the hot block's heater cartridge slot with the provided applicator swab and onto the surface of the cartridge.
3. Insert the heater into the slot.
4. Reinstall the removed retaining screw.
5. Wipe away any excess Boron Nitride Paste using a cotton swab and allow it to dry as described in the preceding section.

5. OPTIONAL: Install the Fan

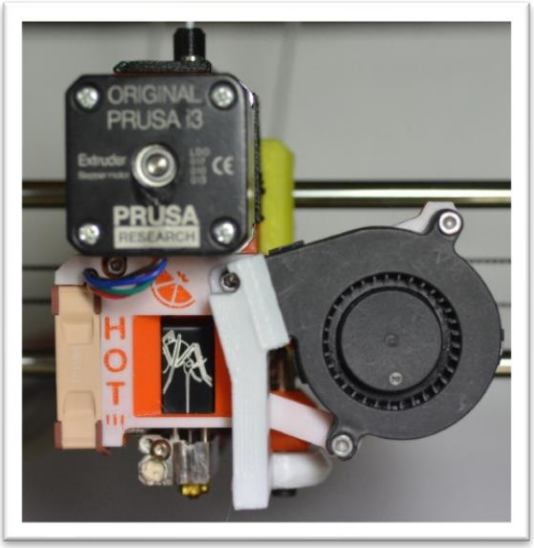

Figure 9. Mosquito installed on a Prusa printer with the Noctua fan that comes with the Prusa

The Mosquito™ needs significantly less cooling than a traditional hotend, so just about any cooling fan will provide enough airflow to cool the heat break. When installing the Mosquito™ as a retrofit the existing cooling fan on the 3D printer is generally acceptable.

If the Mosquito™ is being installed on a clean build, or brand-new printer the Mosquito™ fan can be used. We use a tiny, but surprisingly high flow fan on the Mosquito™ hotend. High flow does generally equal more noise, however Mosquito™ doesn't actually require much airflow, but it can be useful for high temperature prints in a warm/heated enclosure.

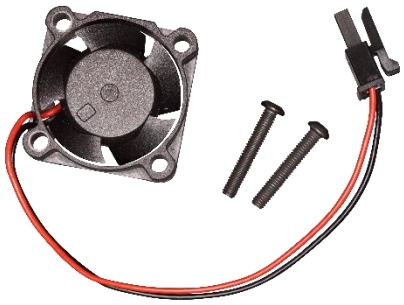

Figure 10. Mosquito™ fan

For everyday use, most users will prefer to turn down the fan in their slicer. 70% speed is a good starting point. You can always turn a fan's speed down, but you can't turn it up past 100%, so by giving you a faster fan we provide a greater range of options for different applications.

The fan ships with a pair of M2.5 screws to fasten it to the heat sink of the Mosquito™ as shown in Figure 11.

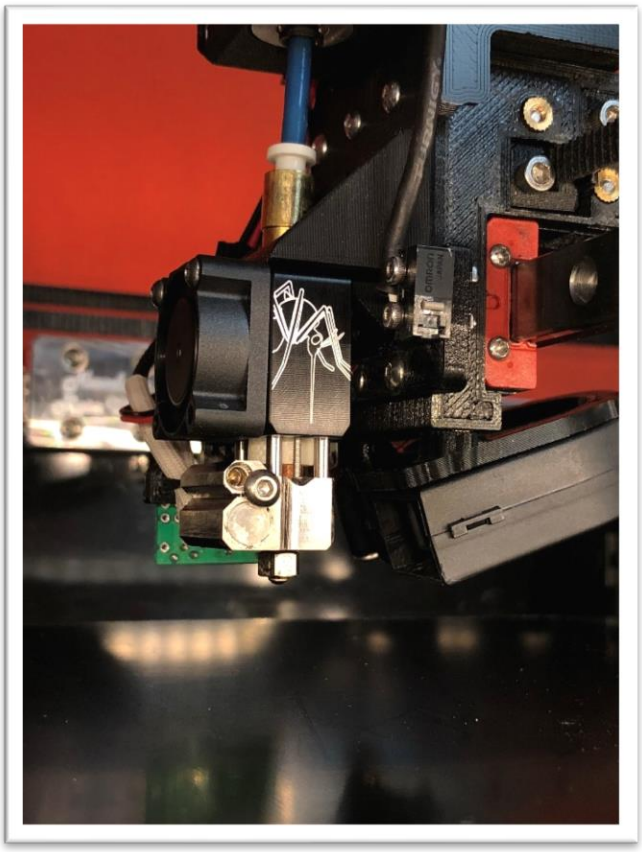

Figure 11. Mosquito™ with fan installed

6. Install the Nozzle

If the threads of the nozzle and the hot block are clean of thermoplastic residue, there is no need to "pre-heat" Mosquito™ to change nozzles. If thermoplastic residue exists, a traditional hot nozzle change is required as it with other hot ends. With proper tightening and use of high-quality nozzles, threads will stay clean. Use of Boron Nitride Paste on the threads and sealing surfaces of nozzle and heat break improve sealing and boost conduction of heat. Slice Engineering™ recommends the use of a 1.5 Nm torque wrench for tightening nozzles to prevent plastic leakage.

Figure 12. Slice Engineering™ Nozzle Torque Wrench™

Note: Not all nozzles are manufactured to withstand 1.5 Nm of torque. Low-quality nozzles may snap under these loads. Do not use the Nozzle Torque Wrench™ on low quality nozzles.

7. Provide Strain Relief and Cable Management

Use the included Panduit® zip tie to capture and contain the heater cartridge, temperature sensor, and fan cables as shown in Figures 13-14.

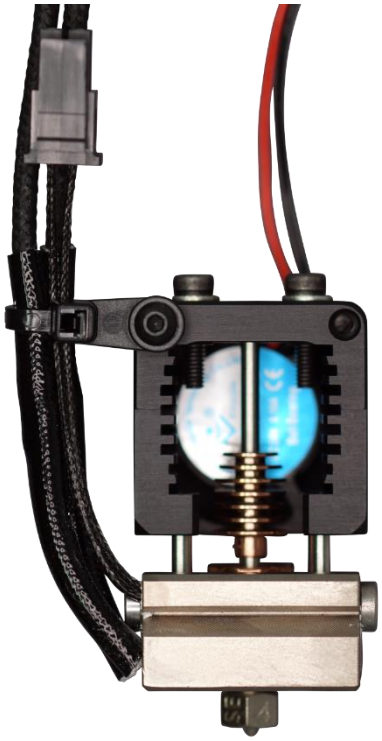

Figure 13. Mosquito™ with temperature sensor, heater cartridge, fan, and nozzle installed with strain relief.

Figure 14. Mosquito™ with temperature sensor, heater cartridge, fan, and nozzle installed with strain relief on the Bondtech BMG-M