

# Limited experiences with nozzles and wear

After printing hundreds of kilograms of filament through several printers and consequently destroying dozens of nozzles along the way; I have probably learned nothing, but let's take a look anyway!

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## Cheap brass nozzles

- These can be found in a 10 pack for around \$20 USD including shipping to the door
    - At least 5 are completely usable out of the box
    - Usually a couple more can be made functional with some cleanup and deburring
    - Never had a complete batch that were all usable out of the box (No threads on one)
  - For this price, it is an acceptable choice for those willing to tinker, replace nozzles more often, and get less overall reliable quality
    - Had more than one break out the nozzle tip after some long PLA prints (turns into 1.75mm nozzle)
  - Occasionally seen warping or crumbling brass after torching nozzles to burn out a clog
  - These WILL work in a pinch so *I used to* keep a handful for emergencies
  - Brass nozzles in general, have the best print quality and reliability across all materials they can be used for (no abrasive materials)
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## Cheap "Hardened" nozzles

- Cost is similar to a good brass nozzle at ~\$5 USD
  - Inconsistent internal geometry due to poor machining or dull tools
  - Nozzle out of round leading to over/under extrusion in complex parts
  - Depending upon the material used to create the nozzle, all nozzle temperatures will need to be raised by 5-20 C
    - Hardened steel has a bit better heat conductivity compared to most stainless steels
  - These CAN work for abrasive materials but they require luck and/or patience to get good results over time
  - Unfortunately, sometimes unhardened stainless steel nozzles are sold as "Hardened" nozzles
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## E3D brass v.6 nozzles

- These seem reasonably priced to me at around \$5 USD so I now keep a handful of these around instead
  - When I want a brass nozzle for highest print quality, this one has great tolerances and longevity (for brass)
  - Tolerates being torched out after a clog now and then without issues
  - Brass nozzles in general, have the best print quality and reliability across all materials they can be used for (no abrasive materials)
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## E3D Hardened Steel and Nozzle X coated v.6 nozzles

- These are quite affordable for Wear Resistant nozzles at around \$20 to \$30 USD
  - Raise all nozzle temperatures 5-10 C to accommodate it's low thermal conductivity compared to brass
  - Wear resistant nozzles are REQUIRED to print abrasive materials such as composites (Carbon/Glass Fiber, Glow-In-The-Dark, Sparkles, Wood, Stone, etc.)
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## Everything else I haven't tried yet

Any opinions I have on other nozzles are based purely upon the evil marketing strategies of 3D printer nozzle manufacturers

- Low thermal conductivity makes sense (to me) as a real limitation to quality etc. in wear resistant nozzles
    - Makers of the DiamondBack nozzle claim it has a thermal conductivity comparable to brass, with wear resistance close to raw diamond
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