Are heat-set inserts reusable?

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Abstract. Yes, twice over: the brass thread takes a screw in and out many times, and a pulled insert can be set again in a fresh hole. What to check, and what can't be reused.

Keywords: heat-set-inserts, threads-and-fasteners, home-repair

1 Are heat-set inserts reusable?

Yes, in both senses. A screw can go in and out of a set insert many times, because it threads into brass, not plastic. The insert itself can also be pulled with a hot screw and set again: CNC Kitchen says removed inserts can often be reused. The old hole is what you lose.

1.1 The number

Table 1. The number

What is reused	Figure	Source
Screw in an M3 insert, PLA, torque to failure	3 to 4 Nm; the bolt head sheared, the insert held	CNC Kitchen, Cheap vs Expensive
Screw straight into PLA, torque to failure	about 1 Nm; the plastic thread stripped	CNC Kitchen, Cheap vs Expensive
Screw in an M3 insert, PETG, torque to failure	3 Nm; the insert started to rotate in the plastic	CNC Kitchen, Helicoils vs Inserts vs Nuts
Screw straight into PETG, torque to failure	1 Nm; the plastic thread sheared	CNC Kitchen, Helicoils vs Inserts vs Nuts
Number of screw cycles an insert survives	no count published; SPIROL calls the metal thread “unlimited reusable”, Ruthex says “several times”	SPIROL design guide, Ruthex
Iron temperature to pull an insert, PLA	240 °C, printing temperature + 20 °C	CNC Kitchen removal guide
Time for PLA to let go	about 10 seconds	CNC Kitchen removal guide
Strength of a reinstalled insert	not published; CNC Kitchen says it “might not offer the same precision and strength as new ones”	CNC Kitchen removal guide

Torque figures are from CNC Kitchen’s two M3 tests, run on its own test machine in Prusament PLA (polylactic acid) and in PETG (glycol-modified PET). The reuse statements are from the SPIROL insert design guide, the Ruthex M3 product page and the Ruthex M4 description on 3DJake, and the removal figures from CNC Kitchen’s removal-tool guide.

1.2 Why the screw can go in and out

A thread cut or formed in plastic wears each time a screw goes in. DigiKey’s Maker.io guide says bare plastic can be threaded, but “repeated use can cause wear leading to threading failure.” In an insert the screw touches only brass, and the plastic grips the knurl on the outside. SPIROL notes that an insert is generally twice the screw’s diameter, which gives the plastic four times the shear surface.

Pull-out strength is not where inserts win. In CNC Kitchen’s PLA test a screw driven straight into the plastic held 142 kg against 181 kg for a Ruthex insert. The difference is torque and repeat use: the plain thread stripped at about 1 Nm, and every insert held until the bolt head broke. CNC Kitchen calls inserts “the king for durable connection that you want to use over and over.”

Overtightening is what ends an insert’s life. At 3 Nm in PETG, the insert itself spun in the plastic. CNC Kitchen points out that 1 Nm on an M3 bolt already gives more than 1500 N of clamping force, so snug is enough.

1.3 Why the insert can come out and go back in

Ruthex’s M3 page says its inserts “can be removed and reinserted if necessary.” Removal is the installation run backwards. Thread a screw into the insert, heat the screw head with the iron at about 20 °C above printing temperature, and pull straight up as the plastic softens. CNC Kitchen also sells an extractor for M2, M2.5 and M3 sizes, and the full steps are in How do you remove or fix a crooked heat-set insert?.

CNC Kitchen says pulled inserts “usually come out pretty clean,” with two limits. Plastic left in the knurl stays there, so do not move an insert between materials: its example is a PLA insert going into PETG, where “the leftover plastic residue may compromise the connection.” And it puts reused inserts in prototypes and non-critical parts, not load-bearing ones. No maker or tester publishes a pull-out or torque figure for a second installation.

1.4 What cannot be reused: the hole

UltiMaker warns that some plastic comes out with the insert. What stays behind is a hole opened out to the knurl’s full diameter: 4.6 mm for a Ruthex M3, against the 4.0 mm hole it

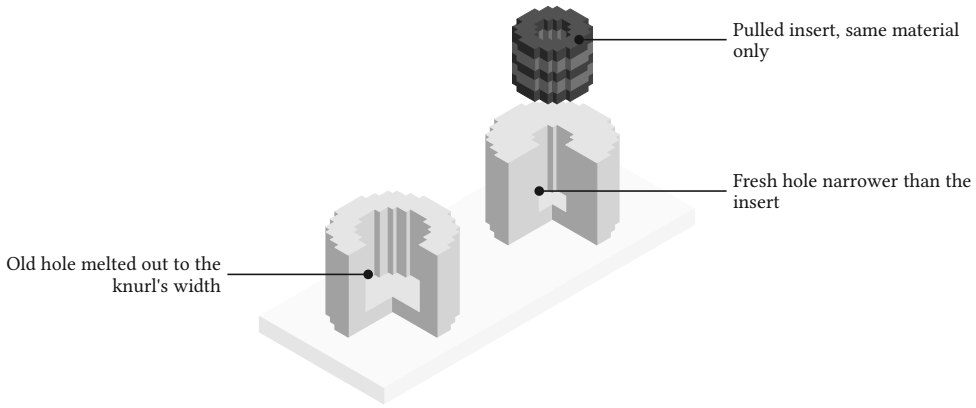


Figure 1. The pulled insert can go into a fresh hole, but the hole it left has been melted out to the full width of the knurl.

started from. A fresh insert of the same size has little undisturbed plastic to grip. No source measures that case.

The two fixes are to go up a size or to reprint. Per the Ruthex table, an M4 insert needs a 5.6 mm hole and a 2.1 mm minimum wall, so drill the old M3 hole to 5.6 mm only if the wall left around it is still 2.1 mm or more. Otherwise, reprint the part.

1.5 How to check it on your own print

1. Let the pulled insert cool, then unscrew the removal screw. Note what material it came out of; it only goes back into the same one.
2. Look at the knurl. The ridges should be sharp and visible all the way round. If they are flattened, chipped or packed solid with plastic, discard the insert.
3. Run a clean screw all the way through by hand. If it binds partway, plastic is in the thread: chase it with a tap of the same size, or bin the insert. CNC Kitchen traces a screw that binds at the end of a fresh insert to a burr of plastic from a hole printed too small.
4. Check the top face. A deformed flange or a burr on the rim stops the insert from seating flush.
5. Set it in a fresh hole of the datasheet size. The old hole has been melted once, so drill it out to the next insert size or reprint the boss rather than refilling it. Thread a screw in, pull hard by hand, and keep reused inserts for prototypes and parts that carry little load.

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