How to install heat-set inserts without a soldering iron

Asked 3D Content Team
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Abstract. No-iron ways to fit heat-set inserts: a flame-heated screw, a hot plate, presses and cold options, with what controls the temperature and how each one fails.

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

Table 1. The number

Method	Heat source	What controls the temperature	Typical failure	Documented by
Screw threaded into the insert, heated	Butane torch or gas flame on the screw	Nothing: you judge by feel	Insert too hot (plastic floods the thread) or cooling mid-push (stalls, tilts)	Hackaday readers, in the comments on Hackaday's insert guide
Hot plate, then press	Hot plate	The plate's setting, then lost in transit to the hole	Insert cools before it is seated	McMaster-Carr, for its male-threaded heat-set inserts
Thermal insertion press	Heated tip in a press	Adjustable temperature, force and depth	Production equipment, not a workshop tool	SPIROL
Ultrasonic insertion	Vibration at around 20 kHz melts the plastic	Machine settings	Suits amorphous plastics; struggles with semicrystalline ones	SPIROL, Plastics Technology, CNC Kitchen
Cold press-fit or screw-to-expand insert	None	Not applicable: interference fit	Weakest joint of the three installation methods	Plastics Technology, Formlabs
No insert: screw direct, Helicoil or captive nut	None	Not applicable	1 Nm torque to failure for a direct screw or Helicoil, against 3 Nm for a heat-set insert	CNC Kitchen

1 How do you install heat-set inserts without a soldering iron?

Thread a matching screw a few turns into the insert, heat the insert on a hot plate or with a gas flame, then press it into the hole with the screw as a handle. McMaster-Carr documents the hot plate for its male-threaded inserts; the flame method comes from Hackaday readers. Neither controls temperature the way an iron does.

1.1 The number

Torque and pull-out figures are from CNC Kitchen's M3 test in PETG (glycol-modified PET), and the 20 kHz figure is from Plastics Technology. The other rows come from the sources named in the last column. We found no insert maker or published test for a hot-air rework station or a wood-burning pen, so neither is listed.

1.2 Why

An iron is the standard because it holds the brass at a set temperature. CNC Kitchen sets it 10 to 20 °C above the printing temperature: about 225 °C for PLA (polylactic acid), 245 °C for PETG and 265 °C for ABS (acrylonitrile butadiene styrene). The full table is on the iron temperature page. UltiMaker gives the reason: an iron puts heat into the insert "without heating the surrounding plastic more than necessary."

A flame gives you no number, and a hot plate's number is gone by the time the insert reaches the hole. Too hot and the plastic goes runny and floods the thread; CNC Kitchen warns that overheating decomposes it. Too cool and the insert stalls part way. Hackaday adds that slow heating lets heat soak into the part and warp it.

No published test compares an insert fitted with a heated screw against one fitted with an iron, so nobody has measured how much strength the workaround costs.

The cold routes are measured. In CNC Kitchen's M3 test in PETG, a screw driven straight into the plastic pulled out at 118 kg and a Helicoil at 120 kg, against 119 kg for a heat-set insert. Torque is where they fall short: 1 Nm to strip against 3 Nm for the insert. A bottom-pocket nut held 166 kg and 2 Nm. If you will undo the screw often, that torque gap matters; the trade-offs are on the inserts or captive nuts page.

Do not cold-press a heat-set insert with a vise. Plastics Technology calls room-temperature press-fit the weakest joint, and Formlabs rates heat-set inserts stronger than press-fit, screw-to-expand inserts. For resin prints, which do not melt, CNC Kitchen glues the insert in with thick CA (cyanoacrylate) glue once the part is fully cured. No heat is needed.

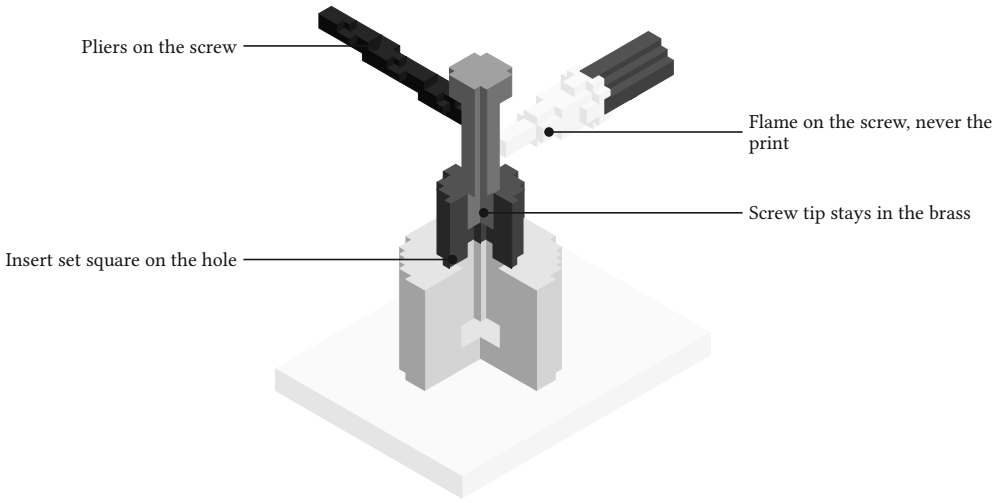


Figure 1. The screw threaded a few turns into the insert is the handle, and the flame heats the screw and brass, never the print.

1.3 How to check it on your own print

1. Print a test boss in the same filament, with the hole from the insert maker's table (for M3, see the M3 hole size page).
2. Thread a matching screw into the insert by a few turns only, so its tip stays inside the brass. The screw is your handle, and it keeps melted plastic out of the thread.
3. Grip the screw with pliers or forceps and heat it with a butane flame until the brass is hot, or warm the insert on a hot plate first. Keep the flame on the screw, never on the print. For a straighter push, a Hackaday reader clamps a pin in a drill press that is not turning and uses it as the press.
4. Set the insert square on the hole and push gently. Stop about 90 % of the way, the depth CNC Kitchen uses with an iron, and press the rest flush with a flat tool. If it stalls, reheat and push again; do not force it. Getting it straight is harder without a steady tip.
5. Let it cool fully and unscrew the handle. Check that the insert sits flush and square with no plastic in the thread.
6. Thread a screw back in and pull hard by hand. A sound insert holds and stays flush.

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