Which way up does a heat-set insert go?

Asked 3D Content Team
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Abstract. Which end of a heat-set insert goes into the hole first, for tapered, straight-with-pilot, symmetric and flanged inserts, from Ruthex, CNC Kitchen and SPIROL drawings.

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

1 Which way up does a heat-set insert go?

The narrow end goes into the hole first. On a tapered insert that is the small end. On a straight insert like the Ruthex or CNC Kitchen M3 it is the smooth, unknurled pilot band, which Ruthex sizes at 3.9 mm for a 4.0 mm hole. Symmetric inserts go either way. A flanged insert goes flange up.

1.1 The number

Table 1. The number

Insert style	How to spot the leading end	Which end goes in first
Tapered	The outside narrows from one end to the other	The small end, facing down into the hole
Straight with a pilot (Ruthex, CNC Kitchen)	A short smooth band at one end, narrower than the knurl (Ruthex M3: 3.9 mm against a 4.6 mm knurl)	The pilot end
Symmetric, sold as “any-orientation”	Both ends look the same	Either end
Flanged or headed	A wide collar at one end	The plain end; the flange finishes at the surface

The tapered row is from DigiKey Maker.io and McMaster-Carr, and the symmetric and flanged rows from SPIROL, McMaster-Carr and PEM. The pilot row is from the Ruthex and CNC Kitchen dimension drawings, which both show the pilot at the bottom with an arrow into the hole.

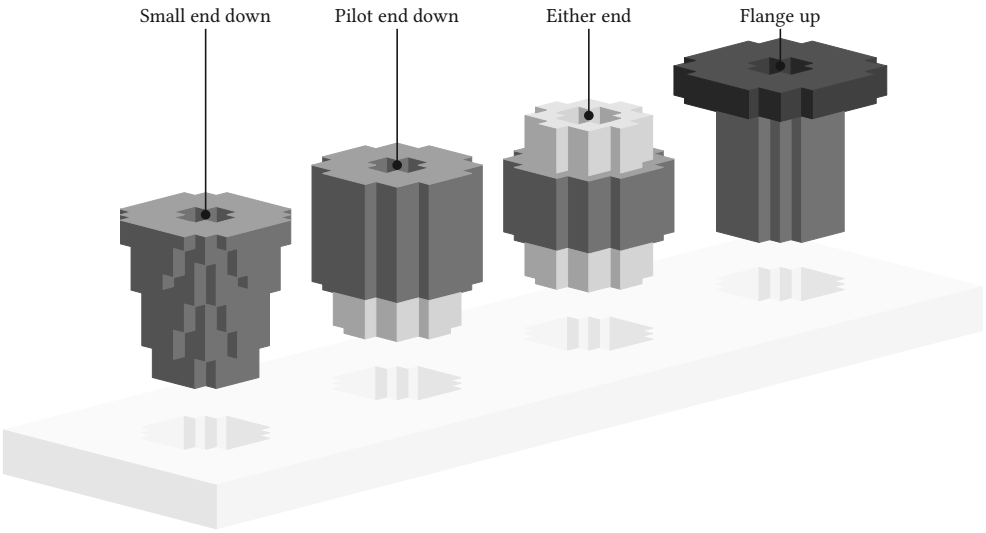


Figure 1. Tapered and pilot-ended inserts go narrow end first, symmetric inserts go either way, and a flanged insert goes in with the flange on top.

Table 2. How to check it on your own print

Ruthex insert	Leading end (d2)	Knurl (d1)	Hole (d3)
M2	3.1 mm	3.6 mm	3.2 mm
M3 and M3 Short	3.9 mm	4.6 mm	4.0 mm
M3x5x4 Voron	4.25 mm	5.0 mm	4.4 mm
M4 and M4 Short	5.5 mm	6.3 mm	5.6 mm
M5 and M5 Short	6.3 mm	7.1 mm	6.4 mm

1.2 Why

The leading end is narrower than the hole, so it drops in and stands on its own before any heat goes in. Ruthex's table puts the pilot 0.1 mm under the hole on its M2, M3, M4 and M5 inserts. The CNC Kitchen store says its pilot end "allows easy alignment and installation". Turn the insert over and the full knurl sits on the rim of the hole with nothing to center the insert. It can start off-center and go in at an angle.

A tapered insert works the same way: the small end seats in the hole and centers the rest. Hackaday notes that the taper seats the insert in a plain straight hole as well as a tapered hole would, so you don't need to model one. For printed parts, CNC Kitchen asks for a straight hole with no chamfer.

A symmetric insert has a lead-in at both ends. SPIROL says its symmetrical designs remove the need to orient the part before installation. McMaster-Carr sells them as any-orientation inserts that go in "from either side".

A flange is a bearing face for the part screwed on top. SPIROL says the head stops the insert being jacked out of the hole. PEM gives its flanged inserts a self-aligning lead-in. The flange is wider than the hole, so only the plain end can go in first.

1.3 Which face of the part should the insert go in from?

Usually the face the screw comes in from, with the flange there if it has one. When a screw load would pull the insert out of the plastic, put it in from the far side instead. SPIROL says a headed insert used in reverse prevents pull-through, and PEM rates its flanged inserts for "high pullout in reverse entry applications". Screw tension then pulls the insert into the part, not out through the face.

1.4 Does the hole's print orientation matter?

It changes the hole size, not which end goes first. CNC Kitchen found that a hole printed horizontally, on a vertical wall, can come out smaller at the top because the material sags. Your best hole diameter can then differ between vertical and horizontal holes. Tune cooling or bridging, or model that hole at a different diameter in CAD (computer-aided design). Test each orientation the part uses.

1.5 How to check it on your own print

From the Ruthex size table on its product page; the M3 row is also in 3DJake's listing.

1. Look at both ends of one insert. A smooth band or a visibly narrower end marks the leading end. Two identical ends mean a symmetric insert.
2. If you can't tell by eye, measure both ends with calipers. The end that matches the leading-end figure above goes down. On other brands, check the maker's drawing for the end next to the hole.
3. Drop the insert into the hole cold. The right way up, it stands upright with the narrow end inside the hole. If it perches on the rim, flip the insert.
4. Install it with the iron and check it went in square; the full method is in how to install heat-set inserts straight. If one went in upside down and crooked, reheat and pull it out, then install it the right way up.

References

[1] ruthex M3 thread insert RX-M3x5.7 product page and size table. https://www.ruthex.de/en/products/ruthex-gewindeeinsatz-m3-100-stuck-rx-m3x5-7-messing-gewindebuchsen. Accessed October 10, 2026.

[2] ruthex Threaded Insert M3 (100 pieces), specification table (3DJake). https://www.3djake.com/ruthex/threaded-insert-m3-100-pieces. Accessed October 10, 2026.

[3] CNC Kitchen Heat Set Insert M3 x 5.7 product page and dimensions drawing. https://cnckitchen.store/products/heat-set-insert-m3-x-5-7-100-pieces. Accessed October 10, 2026.

[4] Tips & Tricks for Heat-Set Inserts used in 3D printing, CNC Kitchen. https://www.cnckitchen.com/blog/tipps-amp-tricks-fr-gewindeeinstze-im-3d-druck-3awey. Accessed October 10, 2026.

[5] Tips and Tricks: Heat-Set Inserts (DigiKey Maker.io). https://www.digikey.com/en/maker/projects/tips-and-tricks-heat-set-inserts/20d08299316c4ed6b66c730de4923ced. Accessed October 10, 2026.

[6] How to use threaded inserts (EPFL MAKE, SPOT 3D printing wiki). https://make.epfl.ch/wiki/public/spot_-_3d_printing/how_to_use_threaded_inserts. Accessed October 10, 2026.

[7] Heat-Set Inserts (McMaster-Carr catalog). https://www.mcmaster.com/heat-set-inserts. Accessed October 10, 2026.

[8] Heat / Ultrasonic Inserts (SPIROL). https://SPIROL.com/product/threaded-inserts-for-plastics/heat-ultrasonic-inserts/. Accessed October 10, 2026.

[9] Flanged, Straight-wall, Thru-threaded Inserts, Type IUTFA, IUTFB, IUTFC (PEM catalog). https://catalog.pemnet.com/category/flanged-straight-wall-thru-threaded-inserts-type-i. Accessed October 10, 2026.

[10] Threading 3D Printed Parts: How To Use Heat-Set Inserts (Hackaday). https://hackaday.com/2019/02/28/threading-3d-printed-parts-how-to-use-heat-set-inserts/. Accessed October 10, 2026.

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