

**Fusion3**

# **EDGE 3D Printer**

## **MAINTENANCE: BOWDEN TUBE SERVICE & REPLACEMENT**

**Revision 02/06/2023**

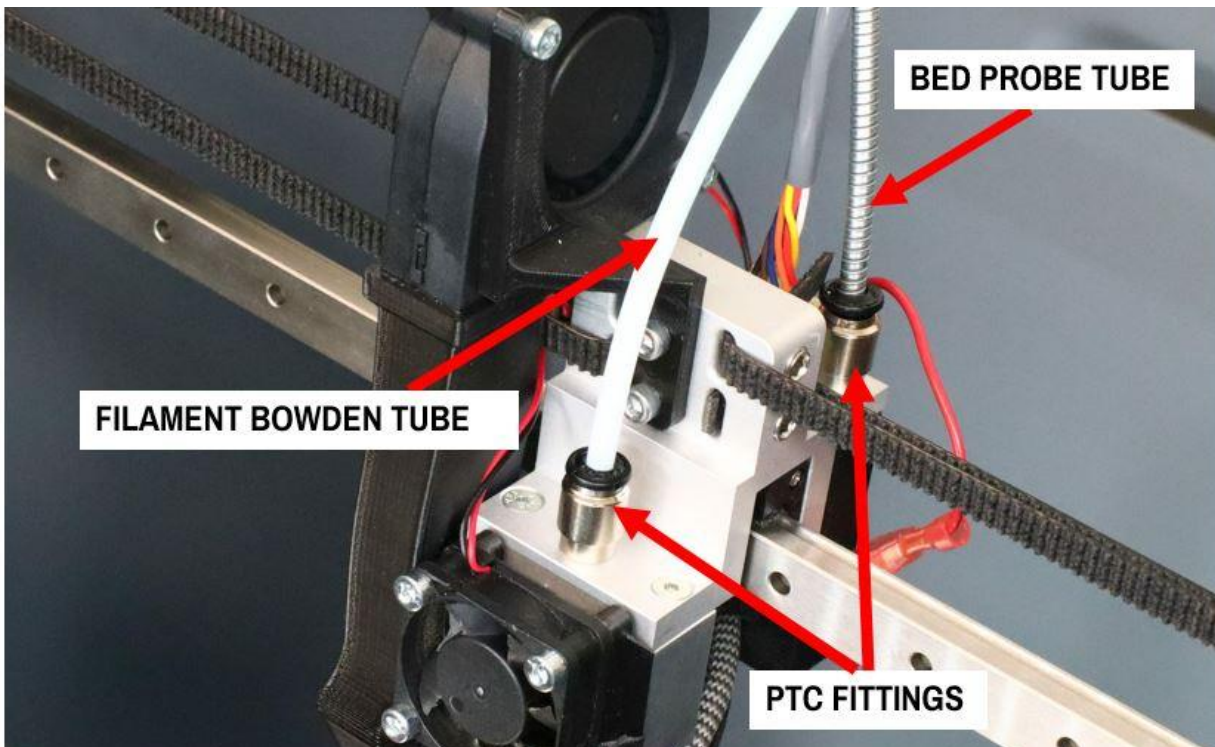
# BOWDEN TUBES & BED PROBE TUBES

Information on EDGE's bowden & bed probe tubes, and PTC fittings

## INTRODUCTION

EDGE has two flexible tubes that run up to the print head assembly:

- **Bowden Tube:** A semi-opaque plastic (PTFE) tube that runs from the outlet of the extruder to the top of the print head
- **Bed Probe Tube:** A metal spiral-wound tube that runs from the bed probe motor to the top of the bed probe body on the x carriage assembly.

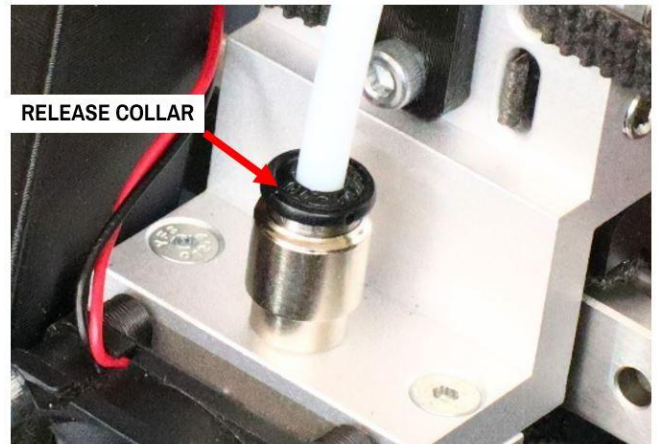


Both of these are retained by push-to-connect (PTC) fittings on both ends.

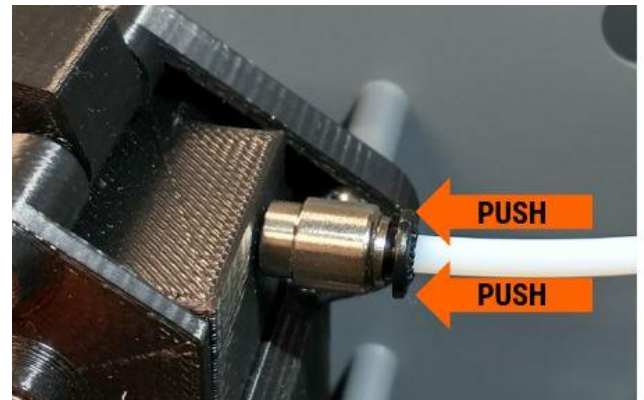
# HOW TO USE A PTC FITTING

## To Release A Tube

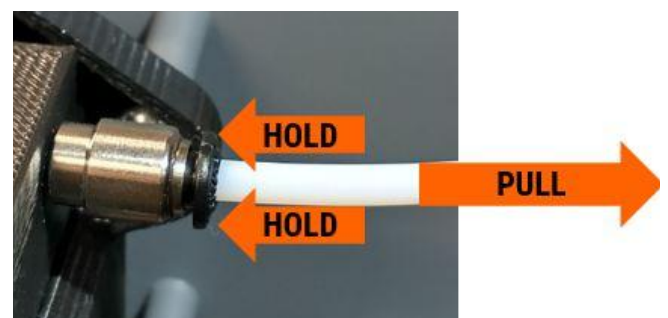
1. **Do not** try to remove the tube while it's under tension. If it is, gently push the tube into the fitting as you do the next steps.
2. Locate the release collar on the fitting. This is a black ring around the top of the fitting that stands up slightly.



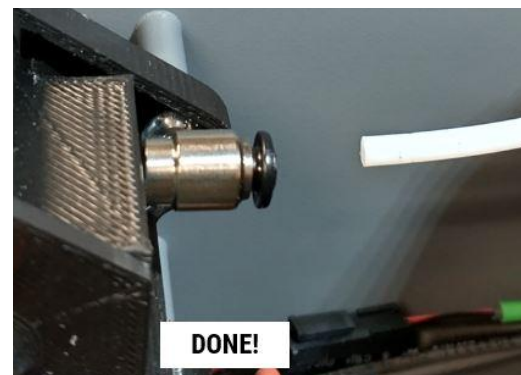
3. Press the release collar into the fitting body and hold it down.



4. Gently pull on the tube to remove it from the fitting. If it will not come out, try twisting it slightly or pushing it further into the PTC body while still holding down the release collar.



5. The tube should now come out of the fitting easily.



## To Install A Tube

1. Make sure the end of the tube is cut square and cleanly. If you purchased the tube from Fusion3 it will come pre-prepped.
  - a. (PTFE filament tube) It should be cut with a razor blade or other very sharp knife. **Do not use** something like scissors or diagonal cutters or wire cutters, as this will deform the tube.
  - b. (Metal spiral probe tube) It should be cut with a cutoff wheel and cleaned up with a hand file. Again, do not use any cutting implement that might deform or crush the tube.

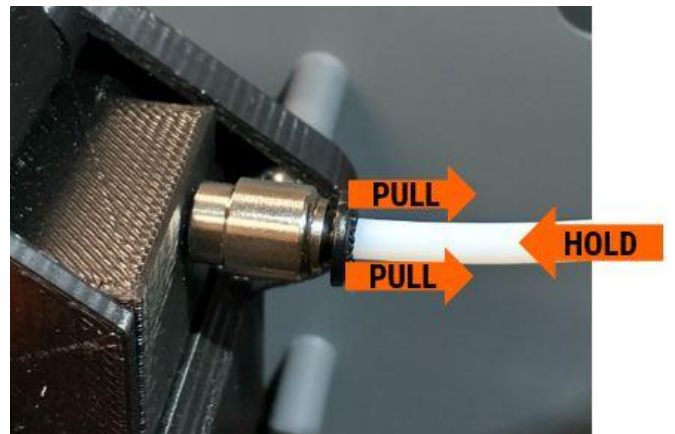


2. Press the tube straight into the PTC fitting until it bottoms out. You should feel two discrete detents. If you only feel one, the tube is not fully inserted.



3. Pull up gently on the locking collar and push the tube down again to make sure it's firmly seated in the bottom of the fitting.

4. The tube is installed correctly when you can feel and see less than 0.25mm of play between the tube and fitting when you gently push and pull on the tube.



## BED PROBE TUBE (SPIRAL METAL)

This tube should rarely need service or replacement, since it is under light mechanical force and is made of metal. If you need to remove the bed probe for service, you may need to disconnect this tube at one or both ends. We do not anticipate this component needing to be replaced in the machine's useful life.

## BOWDEN TUBE (OPAQUE PTFE)

The use of PTC fittings over F400/F410-style fittings has good and bad points:

- The good:
  - It's fast and easy to disconnect a bowden tube for maintenance, replacement, or troubleshooting.
  - The tube is a low-cost, easily-replaced component.
- The bad:
  - The tube must be replaced more often than on other Fusion3 products.
  - Printing performance can degrade if the tube is not replaced when needed.

### When To Replace:

- Replaced on a maintenance schedule - notification will appear when due for replacement
- If you remove 1 or both ends from a PTC fitting for any reason. **DO NOT** reuse a bowden tube once it has been inserted into a PTC fitting for any reason.
- You observe poor print quality (stringing, flow starvation, retraction issues)
- You observe the tube can move back-and-forth in the PTC fitting more than 0.25mm with light force.
- The tube becomes warped, deformed, droopy, etc.

### Bowden Tube / PTC Fitting Failures In The Filament Path

If too much backpressure is generated in the filament feed path, it's possible to "blow out" a PTC fitting and/or the bowden tube. Possible failure modes include:

- Exceeding the tensile strength of the tube and it snaps. This will leave a small piece of tube in the PTC fitting that may be difficult to remove.
- The latching teeth in the PTC fitting cut through the tube, causing it to snap or cutting it through completely. This will leave a small piece of tube in the PTC fitting that may be difficult to remove.
- In extreme cases, it's possible to blow the latching teeth out of the PTC fitting entirely, although this is rare.

The potential of the tubes and fittings to fail is intentional; it serves as a "safety valve" to inform you something is wrong in the filament path and print head, in a way that doesn't cause lasting damage to the equipment. If you see repeated tube failures of these types, you should evaluate the extruder and print head to find the root cause.

In the case of these failures, **replace both the PTC fitting and the bowden tube**. Blowout failures damage the gripping mechanism inside the PTC fitting and it will not hold securely. The outer shape of the bowden tube is also impacted in a way that make it hold less securely in the PTC fitting.

**IMPORTANT NOTE: Tube failures as described here will not be caught by the filament monitor! The extruder will continue to push filament, but the filament will not make it to the print head.**

## PTC FITTINGS

The PTC fittings are less consumable than the bowden tubes, but are still considered a consumable item. In the event of a tube blowout as described above, the PTC fitting should also be replaced.



### How to Replace A Fitting

1. Remove the tube from the fitting, if possible.
2. Insert a 2.5mm hex drive into the bore of the fitting.
3. Unthread the fitting.
4. Install a new fitting using the hex drive.

If you cannot remove the tube from the fitting, use slip-jaw pliers on the outside of the fitting to unthread it.

Blue plastic-safe thread locker is recommended for PTC fittings on the print head assembly, since they vibrate and move around.