Electric Brewing Heater Element Using Cam & Groove Couplings

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Parts List

- 2” Cam & Groove Dust Cap (ProFlow Dynamics: DC200-AL)
    - Alternative: 1-1/2” Cam & Groove Dust Cap (ProFlow Dynamics: DC150-AL)
- 2” Cam & Groove Type “F” Adapter (ProFlow Dynamics: F200-AL)
    - Alternative: 1-1/2” Cam & Groove Type “F” Adapter (ProFlow Dynamics: F150-AL)
- 2” Hex Locknut Pipe Fitting (Amazon: B003GXF5F8)
    - Alternative: 1-1/2” Hex Locknut Pipe Fitting (Amazon: B003GXF5F8)
- 1” Hex Locknut Pipe Fitting (Amazon: B003GXF5EO)
- Dash 229 (2-3/8”) Silicone O-Ring (Amazon: B000FMWQQE)
    - Alternative: Dash 225 (1-7/8”) Silicone O-Ring (Amazon: B000FN0ZXE)
- Dash 218 (1-1/4”) Silicone O-Ring (Amazon: B000FMUW7O)
- Gorilla Polyurethane Glue (Amazon: B0001GAYRC)
    - Alternative: High Viscosity FDA Medical Grade Epoxy Adhesive (Atom Adhesives: AA-BOND FDA22)
- Blue Hawk 0.5-in x 21-ft Plumber's Tape (Lowes: 456831)
- ¾” Strain Relief Cord Grip (Amazon: B000VYHDQY)
- 10 Oz Stainless Steel Shaker w/o handles (wiring housing) (WEBstaurant Store: 407DR10T)
- 10-3 SJOOW Power Cord (Lowes: 56502)
- 30 Amp 250 Volt Plug (Builder’s choice; suggested Amazon: B001735W34)
- Ideal 20 pack terminal assortment (3 ring terminals) (Lowes: 770306)
- Utilitech 5500 watt water heater element (Lowes: 362369)
    - Alternative: Utilitech 4500 watt water heater element (Lowes: 362344)

Tools Used

- Drill
- 3/16” Drill bit
- Soldering iron & lead-free solder
- Utility knife
- #2 Philips screwdriver
- 2-1/4” or 1-3/4” Bi-metal Hole Saw bits
- 1-3/8” Titanium Step bit
- Wire stripper/crimper/cutter
- Angle Grinder
- Caulking gun

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Construction

Figure 1: Paper template to position hole for element.

Make a paper template of the profile of the water heater element. This will assist in positioning the hole that will be drilled in the Cam & Groove cap coupling, so that the element tube will be centered in the coupling. This is necessary for fold-back style elements. Straight elements can be drilled centered on the cap (and can also utilize a smaller 1-1/2" Cam & Groove cap and F-style coupling).

Remove the gasket from the inside of the cap. Grind down the nub on the top of the cap. Position the template and mark the center point for the element hole. Drill a pilot hole for the step bit. Drill a 1-1/4" hole in the cap using the step bit. Sand off any burs and clean the surfaces of any oil residue.

Figure 2: Cam & Groove cap coupling with 1-1/4" hole drilled for element.

Figure 3: Cam & Groove cap with locknut epoxied on.

Using epoxy or polyurethane glue, apply a ring of adhesive around the hole in the Cam & Groove cap. Position the locknut over the hole with the groove for the O-ring gasket facing up, and press into the adhesive ring. Clean up any excess adhesive. Clamp and allow adhesive to cure for 48 hours.

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Drill a 1-1/4” hole using the step bit in the shaker cap. This hole will be used to slip the cover over the threads of the element. Drill a 1” hole using the step bit in the bottom of the shaker. This hole will be used to mount the strain relief. Drill a 3/16” hole in the side of the shaker for the ground wire.

Figure 4: Stainless steel shaker with holes drilled in cap and bottom of shaker.

Figure 5: Ring terminals soldered onto the ends of the power cable.

Cut back the cable sheathing and bare ¼” of copper wire. Leave yourself about 4” of wire to reach the terminals of the element and maneuver the wires in the housing. Slide the terminals onto the bare wires and solder on the connections with the soldering iron.

Slide the cable through the strain relief and through the shaker canister. Attach the ground wire to the shaker canister using a 10-32 x ½” screw and nut. Slip the shaker cap over the element threads and then slip the 1-1/4” O-ring over the element threads. Then screw the element into the Cam & Groove cap and nut assembly. Orient the element tubes so they are centered in the cap. Attach the power wires to the element, then tighten the strain relief, and screw the canister into its cap. Strip back the other end of the cable and install the L6-30P plug.

Figure 6: Final assembly of the Cam & Groove electric heater element.

Kettle Installation

Depending on whether you went with a 2” or 1-1/2” Cam & Groove coupling, use a bi-metal hole saw to cut a 2-1/4” or 1-3/4” hole in the kettle. I found that the Home Depot Milwaukee brand hole saw bits worked best. The Lowes brand saw bits tore too aggressively at the metal.

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Figure 7: Locknut glued to exterior of kettle.

Glue the 2” or 1-1/2” Locknut to the outside of the kettle, using epoxy or polyurethane adhesive. Clamp and let cure for 48 hours. To clamp, I used two 6” x 6” square pieces of plywood (one on the inside of the kettle and one on top of the locknut) and drilled a wood screw through them in the center of the hole. You can try to go the weld-less method with a couple of O-rings, but I didn’t have any luck getting a good seal. Plus I like that the inside of the kettle has no obstructions with the glue on method. If you are concerned about the small gap between the kettle and the nut, or want to seal away the polyurethane/epoxy adhesive, you can apply a bead of food grade silicone (Amazon: B005XP5HO6) to seal it up.

To finish the installation, wrap plumber’s tape around the threads of the Cam & Groove “F” style coupling, slide on an O-ring (may not be needed depending on coupling fit in locknut), and screw into the locknut on the kettle. Slide the element through the coupling and lock in place closing the Cam & Groove levers.

Figure 8: Cam & Groove electric heater element attached to kettle.

Resources:

- Amazon.com
  - Cord Grip – ¾” Low Profile Strain Relief: http://tinyurl.com/pkp4d4y
  - Gorilla Polyurethane Glue: http://tinyurl.com/mcl52yt
  - L6-30P Twist-lock Plug 250V 30A: http://tinyurl.com/plq23kr
  - Silicone O-rings: http://tinyurl.com/pxhxl4p
  - Stainless Steel Hex Locknuts: http://tinyurl.com/oxmtcgl
- Atom Adhesives
  - FDA Grade Two-part High Viscosity Epoxy Adhesive: http://tinyurl.com/ovt2pfu
- Lowes
  - 10-3 SJOOW Power Cord: http://tinyurl.com/ocvrwdh
  - Electric Water Heater Elements: http://tinyurl.com/p8rzf9m – Alternative: http://tinyurl.com/pyxcedr
  - Plumber’s Tape: http://tinyurl.com/qgd775z
  - Wire connectors (Ring Terminals): http://tinyurl.com/one4yus
- ProFlow Dynamics
  - Aluminum Cam & Groove Couplings: http://tinyurl.com/otvshj8
  - Stainless Steel Cam & Groove Couplings: http://tinyurl.com/pbn5hdu
- WEBstaurantStore.com
  - 10oz Stainless Steel Shaker w/o handle: http://tinyurl.com/qamlw2b