



Cold Connection Techniques: Riveting with Metal Tubing or Wire



These techniques are written for a basic 16g or 14g wire rivet; 16g nail-head rivet; or tube rivet with 3/32", 1/8", or 9g watch band tubing. They will also work for other sizes of copper, brass or sterling wire and tubing.

Before you begin:

- Think about the entire layout and assembly order before you punch the first hole.
 - Most texturing should be done before punching/drilling holes and assembling components.
 - Oxidize after texturing, but before assembling, *especially* when mixing metals.
 - Liver of Sulfur works well for copper and sterling, but not in the presence of iron.
 - Win-Ox™ works well for brass, but causes a dangerous chemical reaction with aluminum.
 - Make sure all your components will fit together with the size(s) of rivets you have.
 - Make sure that each of your tools will reach all parts that you want punched with that tool.
- Wire or tubing should fit VERY snug through your components. For a nice, precise rivet, it's better to make the holes a bit too small (instead of too large), and then enlarge them with a manual bead reamer.
 - Can you rivet with wire that fits the hole loosely? Yes, but it is hard to hold loose-fitting sheets in the center of your wire, and make the rivet head the same size on both sides of your metal – one side might be tiny and barely hold, making the other side require a lot more hammering to smooth it down.
 - **Tips for too-large holes:** Use a ballpein hammer to gently texture (compress) around a too-large hole. This stretches the metal, making your hole a bit smaller. Or, stack a washer or seamless heishi bead over the large hole. (Punch or ream the washer/heishi hole to the right size.)
- If you're riveting 2 pieces of metal that don't fit perfectly together (such as a domed filigree to a flat sheet), fill the gaps with washers, heishi beads, or tubing that you've cut to the right length to fit the gap. Otherwise your rivet will bend sideways while you hammer.
- Protect your eyes when cutting, punching or drilling: **Wear safety glasses.** Even if you never cut steel or too-thick sheet, something will eventually break, sending sharp metal pieces flying in random directions.

| Wire size | Punch to use (see Appendix C for stock numbers) |
|--|---|
| 16g (1.3mm) | 1.25mm plier punch |
| 14g (1.63mm) | 1/16" (silver) side of 2-hole punch <i>plus</i> bead reamer |
| 12g (2.1mm) | 1.8mm punch <i>plus</i> bead reamer |
| Vintaj® nail-head rivets | Punch to use |
| Approx. 16g (varies slightly) | Follow instructions for 16g wire. Hole may need a bit of bead reaming. |
| Tubing size | Punch to use |
| 3/32" (2.4mm) | 3/32" (black) side of 2-hole punch |
| 9g (2.9mm) | 3/32" (black) side of 2-hole punch <i>plus</i> bead reamer |
| 1/8" (3.2mm) | EuroPower Punch |
| Seamless crimp tubes | Punch to use |
| 2mm crimp tubes | 1.8mm punch <i>plus</i> bead reamer |
| 2x2mm crimp tubes are too short to rivet 2 sheets. However, they are attractive on a single sheet. | |
| 2x3mm crimp tubes can be used as a tube rivet for two thin (24g or thinner) sheets | |

Tips to make your tools last:

- For the Plier-style punches, follow the manufacturer's recommendations:
 - Don't punch sheet over 18g, and don't punch multiple sheets at once that add up to thicker than 18g.
 - Don't punch steel (they are intended for soft metals like copper, sterling and aluminum).
- The #69-235 2-hole Eurotool metal punch is strong and durable, as long as you use it on softer metals such as copper, brass, sterling and aluminum. Order spare parts *before* attempting to cut steel or thick found objects with it.

Instructions for basic 14g or 16g wire rivet:

1. Double-check your pattern, required hole sizes, layers, etc.
Depending on your components and needs, you might mix rivet sizes and types.
2. Put on safety glasses.
3. Use pattern stamps or texturing tools as desired. Oxidize to bring out the stamped/textured patterns.
Rinse/clean/polish as appropriate.
4. Determine the first hole. Dimple it with a center punch or mark with an extra-fine-point Sharpie®.
5. Punch or drill appropriate-size hole in top piece. See Appendix B for tips about using each type of hole punch.
6. On next layer, draw dot with extra-fine-point Sharpie, or use center punch. Punch. Repeat as necessary for the number of components that will be riveted at this spot.
7. Make sure the end of the wire is smooth. Cut with flush cutters and file flat.
8. Fit wire through the components. If necessary, ream holes with manual bead reamer and a bit of beeswax or Cut Lube.
9. Cut wire to proper length, using flush cutters. About half the wire diameter should stick out on each end.
With 16g and 14g wire, this is about 0.6-0.8mm.
10. Set item on a steel bench block, and keep the components centered on the wire. Using flat side of a riveting hammer or 4oz ballpeen hammer, tap a few times on the top of the wire, then flip the piece over and tap a few times on the other end of the wire. This starts mushrooming the wire.
 - Hammering too hard at this point, too long on either side, or when there are gaps between the layers, will bend your rivet! Bent rivets are rarely recoverable.
11. Hammer gently around edges of the wire on one end (about 8 strokes), then flip piece over and repeat on other end.
 - A tiny hammer and light strokes gives you a more precise, even rivet. A heavier hammer or heavier strokes gives a more organic look. Some people prefer to use a ballpeen hammer for all these steps. Others use the flat side for step 10, and switch to the ballpeen end partway through step 11.
 - When using a nail-head rivet, like the 16g Vintaj rivets, half the work is already done for you. You simply decide whether you want their pre-formed nail head on the front or the back, and then finish the second side by cutting it to length and hammering with the same technique as above.

Instructions for a tube rivet:

1. Follow the same steps for layout, hole punching and bead reaming, as for basic wire rivets.
2. Make sure the end of your tubing is smooth and flat – not angled. File flat if necessary (before cutting).
3. Fit the tubing through your components. Use an extra-fine-point marker to mark the length.
How long? About half the wire diameter should stick out on each end. With 3/32" tubing, this is about 1mm on each side. With 1/8" or 9g tubing, it is about 1.6mm on each side.
4. Take components off tube, and hold tubing with your thumb on a wooden bench pin. Or, hold it in a pair of tube-cutting pliers. If using tube-cutting pliers, you don't need a bench pin.
5. Put a catch tray or box underneath to catch the tube when it is cut.
6. Use a jeweler's saw to cut the tubing, making sure to keep the cut very straight and flat, not angled.
See Appendix A for how to use a jeweler's saw. File end of tubing flat if necessary.
7. Insert tubing through components. Set item on steel bench block, and keep the components centered on the tubing. Put the plain/pointed part of a universal eyelet setting combo tool (or a very wide center punch, at least 1/4" wide) into the center of the tube. Don't let your components slide down to the bottom of the tube!
Give 3 taps with a brass hammer or 3 light taps with a utility hammer. Turn piece over and repeat with same tool. This begins to gently splay the tube rivet outwards. If you were too gentle at first, then repeat this step on both sides. You should see a slight curve outwards.
8. Use a riveting hammer or the pein side of a 4oz ballpeen hammer to tap in a circular pattern around the outside edges of the rivet, with an outward and downward motion. Push the metal outwards, not just down. Flip piece over and repeat on other side. Do a little on each side (about 8 taps), to make sure the tube doesn't bend and the components don't slip. (If they slip, you'll have a tiny flimsy rivet on one side and a huge lumpy rivet on the other side.)

To practice tube riveting, or when you only need an ornamental rivet (rather than a tube that rivets 2 sheets together), you can use 2x2mm or 2x3mm seamless crimp tubes. Crimp tubes are usually not long enough to rivet 2 pieces of metal together, but can give a nice look.

Appendix A – Using a Jeweler’s Saw

How to use a jeweler’s saw to cut tubing:

- Use a fine saw blade (size 4/0 to 6/0) for sterling, copper or brass tubing, or for 24g sheet.
- Insert saw blade:
 1. Unscrew the bottom screw (near the handle), and insert one end of the blade between the layers of metal. Face the teeth *outward* and *down* (toward the handle). If they are too fine to see, then gently run your thumb along the blade to figure out which way to point the teeth.
 2. Tighten bottom screw.
 3. Adjust frame to appropriate length for your blade.
 4. Loosen top screw. Stand near a sturdy table or convenient wall. Brace handle of frame against your hip or ribs, and push far end of frame (near the top screw) against the table or wall. The purpose is to slightly curve the frame ends toward each other. Insert blade into top section, and (while maintaining pressure on saw frame) tighten screw. Release the pressure on the frame, and flick the blade. If it makes a high, taut “Ping!” then it’s good. If it makes a low, flat “Thunk”, try again.
- Carefully mark your spot to cut, with an extra-fine-point permanent marker.
- If cutting on a wooden bench pin:
 - Find a good position so you can make a nice, straight cut perpendicular across the tubing. Put a tray or box underneath, to catch the tubing after it is cut.
- If using tube-cutting pliers, line up your mark in the center slot of the pliers.
- Put a little beeswax or Cut Lube on the blade. This makes it much easier to cut, and it extends the life of the saw blade.
- Begin cutting on the marked line, keeping in mind that the blade cuts *only* when you pull the blade toward you.
- Jeweler’s saws do not require much pressure. If your tubing moves much while you cut it, you are pushing down too hard with the saw blade.

Appendix B – Metal Hole Punches

- **Plier punch** (such as #69-233 or #69-234): To avoid marring the surface of your metal, punch from the back or insert a piece of plastic mesh (the type used for craft projects) between the pliers and the metal. Quickly and easily punch clean holes in soft metals (brass, copper, sterling) up to 18 gauge. Pins are replaceable.
- **Eurotool 2-hole punch** (#69-235): Use with soft metals (copper, sterling, brass). Screw action makes perfect holes every time without deforming metal. Pins are replaceable.
 1. Put a dot where you want the hole.
 2. Slide piece (dot side down) into the appropriate end of the tool (silver side is 1/16”; black side is 3/32”).
 3. Look in hole on bottom of tool to center your dot.
 4. Turn screw clockwise, while holding your piece firmly to prevent scratches.
 5. When a tiny circle falls out of the bottom, you’ve punched your hole.
 6. Release by unscrewing until your piece falls off on its own – do not attempt to pull your punched piece off!
 - If you cut a tiny item (like a #26-233 metal heishi bead for use as a washer or spacer), you can unscrew the pin all the way, then use nylon-jaw pliers to grasp the bead and pull it off.
- **EuroPower Punch** (#69-214): This powerful tool easily cuts 7 sizes of holes (3/32", 1/8", 5/32", 3/16", 7/32", 1/4" and 9/32"), up to 2" from edge. Follow manufacturer’s instructions, included with product.
- **Using a center punch to mark a hole:** Place the tip where you want the mark, then tap the top with a brass hammer or utility hammer. This leaves a visible dimple. (Don’t use texturing hammers to hit metal tools.) If you have a spring-loaded center punch, you don’t need a hammer – just push down until it marks and recoils. Why use a center punch? If drilling, the dimple prevents your drill tip from dancing across the piece of metal. If using a hole punch, the dimple simply allows you to see a nice precise spot for the center of the hole. (You can mark the spot with an extra-fine-point marker instead.)

Appendix C – Recommended Products, with Stock Numbers

Materials to use as rivets:

16g wire (copper #47-401-sp or #46-407-11, sterling #64-525, or brass #47-201-sp or #46-407-27)

14g wire (copper #47-402-sp, sterling #64-524, or brass #47-202-sp)

12g wire (sterling #64-523)

1/8" or 3/32" tubing (brass #64-995-332, copper #64-985-332, or sterling), or 9g (3mm) "watch band" tubing #64-591

Vintaj nail-head rivets, approx. 16g (#88-108-01-0 or #88-108-02-0)

Optional: Misc. supplies from scrapbooking aisle (colorful rivets) or hardware store (tiny brass or steel bolts and nuts)

Items to rivet:

24g Sheet, blanks, charms or found objects – copper, brass, sterling, aluminum (any soft metal)

Bottle caps (caution – these may wear out your punches)

Watch parts / gears (These are tough on cutters and punches)

Tools & Supplies:

#69-125, #68-123, or #69-108 steel bench block

#69-351 safety glasses

#85-395 bead reamer (plus #69-189 Cut Lube or #69-022 beeswax)

#69-135 4oz ballpeen hammer and/or #69-137 swiss-style hammer

Hole punch(es):

#69-235 2-hole punch

#69-234 1.25mm punch

#69-233 1.8mm punch

#69-214 EuroPower Punch

#83-101 extra-fine point Sharpie marker

#69-236 center punch

Rivet setter (scrapbooking store) or center punch at least 1/4" wide

Utility hammer (the type you have in your garage) or #69-345 2 lb brass hammer

#69-343 rawhide mallet or #69-136 nylon hammer - for smoothing deformed metal

#69-047 (or other) files for smoothing sharp edges

Wire cutters – A good pair of flush cutters, and a sacrificial pair.

Additional tools if using tubing:

#69-226 tube-cutting pliers or #69-129 bench pin with anvil

#69-170 jeweler's saw

#4/0, #5/0 or #6/0 fine saw blades

#69-189 Cut Lube or #69-022 beeswax for blade. These reduce friction, speed up production, and prevent broken blades.

Additional Resources:

#62-929 [Making Connections: A Handbook of Cold Joins for Jewelers and Mixed-Media Artists](#), by Susan Lenart Kazmer

#62-380 [Stamped Metal Jewelry: Creative Techniques and Designs for Making Custom Jewelry](#), by Lisa Niven Kelly

#62-010 [The Complete Metalsmith: An illustrated handbook](#), by Tim McCreight