

# Tube Fittings, SAE Flareless Installation Instructions

## 1. Tubing Selection

In order for SAE Flareless fittings to operate properly, they must be attached to the correct tubing. The tubing must be of proper hardness and roundness. Use tubing that is either seamless or welded and drawn over a mandrel. It should also be fully annealed and suitable for bending and flaring. Be particularly careful when using welded and drawn tubing that no flat spot remains at the area of the weld seam.

For stainless applications, use Type 304 or 316 tubing with the above description manufactured in accordance with ASTM-A213, A249, or A269 latest revisions, with a maximum hardness of Rockwell B90. For Monel use Alloy 400 seamless tubing with the above description made to ASTM-B165 latest revision and with a maximum hardness of Rockwell B70.

The wall thickness of the tubing must meet or exceed the requirements shown in Figure 1.

Figure 1. Minimum  
Tube Wall Thickness

Tube Size O.D. - In.	Size No	Min Tube Wall
1/8	2	.010
3/16	3	.020
1/4	4	.028
5/16	5	.028
3/8	6	.035
1/2	8	.049
5/8	10	.065
3/4	12	.065
7/8	14	.083
1	16	.083
1 1/4	20	.095
1 1/2	24	.095
2	32	.095

## 2. Tube Cutting

Use a tube vise (vee blocks or flaring blocks) to hold the tube securely without squashing or distorting it. Cut the tube square within  $\pm 1^\circ$  using a fine tooth hacksaw or power cut-off saw. Manual tube cutters that rotate a wheel around the tube are not recommended. Inspect the tube to be certain it has been cut square so that it will make a full  $360^\circ$  contact with the tube stop inside the body of the fitting.



## 3. Deburring And Cleaning

Use a file, abrasive wheel, deburring knife, or emery paper to remove any cut-off burrs from the both inside and outside of the tube. Burrs could prevent proper assembly. Be careful not to do more than just break the corners. The end of the tube must be flat and even where it contacts the tube stop inside the fitting.

Carefully clean the tube to be sure no dirt, grit, or any foreign matter remains on the inside or outside. Solvent, compressed air, or a soft cloth may be used.



## 4. Lubrication

Use a high quality heavy oil or grease to ease installation and permit proper movement of the components, lubrication should be applied at points that will come in contact with other surfaces. Carefully apply lubricant to the leading edge and rear angle of the ferrule. Also lubricate the tapered seat and the treads of the preset tool.



## 5. Nut And Ferrule Assembly

Slip the tube nut and ferrule onto the tube. The nut goes first with the open threaded end pointed back at the end of the tube. Then guide the ferrule over the tube with the larger diameter end first. The smaller diameter end (with the bite edge) points towards the end of the tube.



## 6. Preset

### Hydraulic Method

To properly install a fitting the ferrule must be preset on the tube in one of two ways: manually with the use of an SSP manual preset tool (described below), or hydraulically with an SSP hydraulic preset tool, the manual method involves threading together the tube nut and preset body. The hydraulic method is easier and faster and uses a hydraulic cylinder to move the tube nut. The fitting body itself should not be used for presetting.



### Manual Method

Hold the preset body in a vise. Insert the tube into the body until it bottoms against the tube stop. Screw the tube nut onto the body until it is hand-tight. While holding the tube snug against the tube stop, tighten the tube nut another 1-3/4 turns. If working with a long length of tubing, support it so it does not sag and fall out of alignment with the axis of the body. Do not over-tighten. Over-tightening can cause the ferrule to penetrate too far and weaken the tube wall.



## 7. Disassemble And Inspect

Now untighten the nut and slide it away from the ferrule in order to inspect the results of the presetting. It is imperative to check the following points to be certain the ferrule is set correctly on the tube. If any of these conditions are not present, try again or contact your local distributor or SSP for assistance. Be sure that:

- A. The leading edge of the ferrule has piled up a ridge of metal where it bites into the tube. This ridge or bite must cover at least half of the leading edge and also must run evenly around the entire outside of the tube. See Figure 3, A.
- B. A slight bow may be seen in the tube ahead of the bite. This is caused by the forward action of the ferrule as the tube is trapped against the tube stop. It is more likely to occur in lighter wall tubing. See Figure 3, C. Also, the leading edge of the ferrule has been flattened by forward pressure, See Figure 3, B.
- C. There is a slight bow in the front section of the ferrule. Figure 3, F. Also, the rear of the ferrule is snug against the tube. Figure 3, D.
- D. There is a slight marking or indentation all around the end of the tube. See Figure 5, E. This indicates that the tube was firmly seated against the tube stop in the preset tool during presetting (Step 6), and that it was cut squarely (Step 2).

If the marking is not visible along the complete circumference of the end of the tube, either the tubing was not squarely cut or the ferrule is not biting. Verify that the tubing is the correct size and not out of round by using dial calipers or a micrometer. If it is not completely marked, disassemble and return to Step 2.

- E. The ferrule may rotate on the tubing, but there should never be an uneven gap between the ferrule and bite. The ferrule must never be able to move forward ahead of the bite.

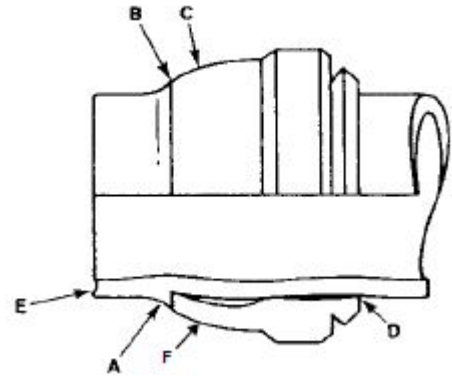


Figure 3



Figure 4

## 8. Reassemble For Final Installation

After all the inspection criteria have been verified, the preset ferrule may be installed in its body for use. Insert the tube into the fitting body and wrench the nut down easily until a sudden increase in resistance is felt. From this point, turn the nut an additional 1/6 turn (1 wrench flat) to compress the ferrule into place. This completes the assembly, sealing the tubing, ferrule and fitting body. See Figure 4.

Proper general installation procedures for tubing systems must be followed. This involves correct tube bending and support. The fitting is only one part of an entire system that must be properly designed and installed.