Nelson Global Products’ Flexible Metal Tubing (Flex) is available in stainless steel, aluminized or galvanized and is sold in a partially compressed state, providing 10% more length than competitive products sold in fully extended lengths! This document provides detailed information about properly measuring, cutting and joining Flex tubing.

Measuring Flex

- Difference between natural lie, fully compressed and fully extended states
- Determining the measured length
- Measuring in the extended state

Cutting Flex

- Approved methods

Joining Flex to Straight Pipe

- Type of clamps to use
Introduction

Nelson Global Products’ Flexible Metal Tubing (Flex) is strip-wound flexible round metal conduit, 3-6" (76.2-152.4 mm) ID. Flex is commonly used to absorb relative motion and vibration between a vehicle’s engine, frame and cab and as a means to account for dimensional differences and tolerance stack-up in the exhaust system. To avoid early failures that can occur when the flexibility of the tubing being used to adjust for misalignments is compromised, the tubing must be installed so that its maximum flexibility is preserved.

Nelson Global Products provides bulk Flex in over length rolls to assure that the correct amount of natural lie tubing is provided to the customer. In many cases, these rolls of bulk flex tubing are subsequently cut to length for the end user. Inconsistent measurement and cutting procedures can result in apparent shortages of bulk tubing.

To prevent any misunderstandings, Nelson Global Products recommends a standard method for measuring flex. The following terms are used to describe the Flex tubing:

**Fully Extended:** The tubing is in a fully expanded state and the convolutions are completely open. Approximately 20% less metal is required than fully compressed.

**Fully Compressed:** The tubing in a fully compressed state and the convolutions are completely closed. Approximately 20% more metal is required than fully extended.

**Natural Lie:** The average of fully compressed and fully extended lengths. Approximately 10% more metal is required than fully extended and 10% less metal is required than fully compressed. This is also referred to as the partially compressed state.

Measuring Flexible Metal Tubing

Shipping will cause the tubing to compress beyond the natural lie state. Before cutting flex tubing, one end of the tube must be anchored and the other end pulled to its fully extend state and quickly released so that it snaps back into its natural lie condition.

Whenever flex tubing is measured or cut, it must be properly oriented. The piece being cut from the tube must come off the open end of the bulk length of tube. The open end is the end at which the wraps appear to be on top of each other as they move away from the end of the tube. When measuring or cutting flex tubing, keep the open side of the tube to your right.

Figure 2 shows how to measure length with the Flex in the proper orientation - open end on the right. Note how wraps are on top of one another when looking right to left and underneath one another when looking left to right.
Measurement of Flex should be done by laying out the tube on a level surface and curving the entire tube or section into a tight radius so that the inner side of the curved tube has its convolutions touching as shown in Figure 3. When the inner radius of the Flex tubing is fully compressed, the outer radius will be fully extended and the center line of the tube will be at its natural lie length as depicted in the figure.

**Cutting Flex**

Ensure that the Flex tubing is straight and cut at the fully extended mark using one of these approved methods:

- **Chop Saw**: Use 1/16” (1.6 mm) wide blade for best results
- **Band Saw**: Use a no-set blade with 24-32 teeth per inch
- **Hack Saw**: Use a no-set blade with 24-32 teeth per inch

**Joining Flex to Straight Pipe**

It is important to use the correct type of clamp to hold and seal the tube-to-flex joint. A TorcTite™ clamp (see Figure 4) or equivalent must be used at both ends of the Flex tubing. This style of clamp is preformed to fit properly on the outer diameters of the Flex tubing and mating tubes.

*Figure 3: Measuring Flex Tubing Length*

**To measure in the extended state:**

1. Orient the Flex tubing with the open end on the right. Measurement begins at the open end.
2. Coil the Flex tubing in a tight radius, as shown in Figure 3.
3. Measure along the outside of the radius where the convolutions are all open.
4. Mark the point on the outer radius where the cut is to be made.
5. Cut using one of the methods described in the following section.

If the Flex is to be sold in the natural lie state, measure the length off the bulk flex roll after restoring it to its pre-shipping state. Use the cutting methods described in the following section.

*Figure 4: TorcTite™ Lap and Butt Clamps*

*Figure 5: Flex Tubing, Correctly Joined*