

The patented **icengineworks®** tack-welding clamps have been specifically designed to simplify the actual fabrication of complex multi-section exhaust headers and other tubular projects that need to be welded, or even joined together like when using V-band clamps. When properly used these clamps will reduce, or even replace the need for complete assembly jigs and other traditional supporting devices giving the fabricator a new level of efficiency and flexibility.

The **icengineworks®** tack-welding clamps offer the unprecedented ability to temporarily build, support and hold together, complex tubular assemblies through concentric and gapless joints for preview and test-fit prior to tack welding or when planning for V-band clamping. Regardless of how many sections need to be joined, precise rotational adjustments for each joint can be quickly made until the entire assembly fits comfortably its intended endpoints. This new feature becomes extremely useful when building small runs of the same assembly whose individual tube sections may seem to be identical initially (but may actually be slightly different) and may require minor adjustments during their individual setup stages

to guarantee proper fit. With all the joints locked in place, the entire assembly can be safely tack-welded together at once. Or if it will be V-clamped, the clamp sealing flanges can be simply welded to the tube ends with absolute confidence.

**Remove the tiny rubber bands holding the clamp rings together.** They prevent the locking nuts from falling off during shipping. Refer to the picture above for the installation procedures of the **icengineworks®** tack-welding clamps as described below.

### Installation



This manual will describe the recommended way to set the **icengineworks®** tack-welding clamps between two same-diameter tubular metal sections that need to be TIG welded together (or V-clamped). The metal sections should be ready for welding following industry standard procedures. In addition, they should feature round ends (as opposed to “egged” or oval ends) for better results.

If you are building an exhaust header following a plastic model generated with the **icengineworks®** exhaust header modeling block system, start by locating all the sections in the runner and creating an assembly keeping track of the proper flow direction of each section. Precision is not critical at this point.

Otherwise, it may help to scribe a witness line on the metal sections for each joint as a starting reference. Precision is not important at this point as the actual relative rotation between tubes will be easily adjusted for fit later.

The **icengineworks®** tack-welding clamps require 2 basic adjustments and their fine tuning afterwards. The nylon nuts on the pivoting hinge don't require adjustment during use. Simply verify periodically that the hinge can move with some even resistance and without slack for both rings.



The first adjustment is the radial location of the setting ring and its pivoting hinge around the **first** tube. It determines the swinging angular motion for the adjustable ring to follow the bend of the second tube. So, it helps to always make the **first** tube to be the “straighter” of the two. The second adjustment is done by locking the adjustable ring along the adjustable link when the second tube has been “buted” against the first. For best performance, the resulting joint should be located evenly between the setting and the adjustable rings.

Slide the setting ring of the clamp (the one attached to the fixed end of the adjustable link) about 1/8” from the edge of the first tube. Spin it around until the adjustable ring follows approximately the curvature of the second tube.

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Slide the second tube into the adjustable ring of the clamp. Loosen the 5/16" tightening nut on the adjustable link if necessary to open up the ring circumference further for the tube to fit through.

The **icengineworks**<sup>®</sup> tack-welding clamps are designed to grip tubes that may not hold their diameter specification anymore due to material drawing due to bending.

Bring the tubes together based on their planned relative location. Close the gap between them. If you prefer, you may also prescribe a given gap by sliding a feeler gage between the tubes.

A quick way to find the optimum location of the **icengineworks**<sup>®</sup> tack-welding clamps between the tubes is to keep in mind that the adjustable link must always run in between the top centers of the bent tubes forming the joint. With a little experience, finding this ideal position will become second nature.

Hold the position of the tubes with one hand while you tighten the **icengineworks**<sup>®</sup> tack-welding clamp with the other using a wrench or a socket driver. Tighten the 5/16" locking nut on the setting ring first. Then tighten the nut on the adjustable ring with the tubes against each other.



If an unwanted gap develops, it probably means that either the adjustable ring has not been swung properly over the second tube, or a better location needs to be found for the setting ring around the first tube.

In the first case, you may open up the arc drawn by the adjustable ring further before trying to set it up again. The second case usually involves loosening the setting ring (and the adjustable ring) and spinning it around the first tube until the clamp draws an arc that follows more comfortably the direction the second tube is pointing to. In case of interference with surrounding obstacles, it is possible to switch the ends of the adjustable link to have its adjustable side pointing in another direction. Simply remove the locking nuts and the adjustable link swapping ends. The setting ring before now becomes the adjustable ring.



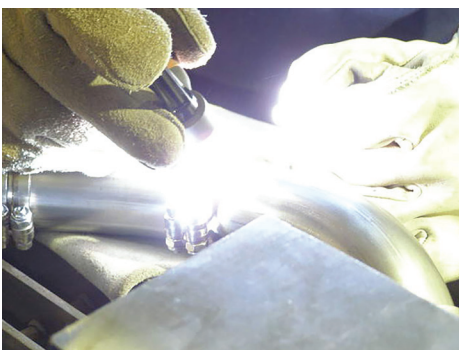
The natural concentricity of the joint created by the **icengineworks**<sup>®</sup> tack-welding clamps is gradually achieved as the setting and adjustable rings are tightened. Thus, it is important to have tube ends as round as possible. You may also need to touch up the hinge location relative to the rings for the tube circles to align.

For assemblies with multiple joints, install an **icengineworks**<sup>®</sup> tack-welding clamp for each joint following the above procedure.

Once all tubing sections have been clamped together, proceed to fine tune each one by starting gradual adjustments at one end of the assembly and working your way down while you verify fitment.

Slightly loosen the nuts clamping the adjustable link location enough to allow the setting ring, or the adjustable ring (or both) to spin around with some friction so that the original location is not easily lost. Make small changes holding the tubes with both hands.

Repeat the previous step until the assembly feels and fits correctly. Verify that all joints created are tight and do not move. Make sure that all the joints also have the required gap (or no gap at all) according to your specifications.



Proceed to place small tack welds in at least 2 locations opposite to each other around each joint. Find the most comfortable place around the joint to tack weld the tubes in place to avoid welding the clamp to the tube.

When all the joints have been tacked together, loosen the ring nuts for each of the **icengineworks**<sup>®</sup> tack-welding clamps installed and carefully slide them out of the tube. Rotate them until they make it over and past the tack welds.

In the rare event that the clamps end up trapped in the assembly, you can always take them apart using a 5/16" and 3/8" wrench.

With the clamps removed, proceed to complete the welds around each joint following standard welding procedure. Thank you for choosing **icengineworks**<sup>®</sup>.