Heat Exchanger – Condenser Expanders

Airetool

The world standard in tube expanders

Airetool heat exchanger and condenser expanders have long been recognized as the standard to which all other brands are measured. The extra time spent manufacturing our expanders results in consistent performance and incredible durability that OEM Heat Exchanger Manufacturers expect.

900 SERIES
1/4" (6.3 mm) - 3/8" (9.5 mm) O.D.

1300 SERIES
3/8" (9.5 mm) O.D.

800 SERIES
1/2" (12.7 mm) - 1 1/2" (38.1 mm) O.D.

Tube Expanders

Tube expanding is the art of cold working the ends of tubes into intimate contact with the metal of the containing tube holes to form a leak proof mechanical seal and/or joint. In other words, it is a mechanical method of establishing a mechanical joint between a tube and a tube hole. Airetool manufactures condensed/ heat exchanger expanders, boiler expanders, furnace expanders and many special application expanders.

1200 SERIES
1/2" (12.7 mm) - 1 1/2" (38.1 mm) O.D.

8012 SERIES
1 3/4" (44.4 mm) - 3" (76.2 mm) O.D.

Tube expanders consist of:

Mandrel – A tapered pin through the center of the expander to which the power is attached and when advanced pushes the rolls against the tubes.

Rolls – A set of (3 or more) of tapered cylindrical parts which are driven by mandrel and contact the tube wall to be expanded. The taper on the rolls is in the reverse direction and one-half the taper of the mandel if it is a parallel roll expander.

Cage – This is the expander body (or housing) that holds the mandrel and rolls in place. The slots which contain the rolls also provide a feed angle which helps pull the mandrel in to provide expansion of the rolls

Mandrel, **Rolls** and **Cage** are the three things common to all expanders. Other parts added further classify the type of expander.

Thrust Assemby – This assembly attaches to the cage and allows adjustment of the expanding depth. The thrust collar will remain stationary against the tube sheet or tube end while the cage, mandrel and rolls expand the tube. A thrust assembly is used on condenser/heat exchanger expanders, some furnace expanders and special boiler expanders.

Condenser/Heat Exchanger Expanders

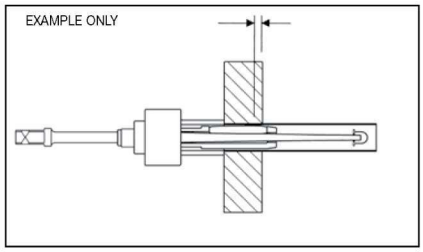
Airetool Condenser Heat Exchanger Expanders are self-feeding, parallel rolling, ball bearing thrust expanders. They are available in standard sizes for 1/4" O.D. through 3" O.D. for tube sheets up to 6-3/4" thick. Other sizes and lengths are available upon request. We supply most of the air conditioning manufacturers with expanders up to sixteen feet in length.

To select the correct tube expander, the following information is required:

- **Tube OD**
- **Tube wall thickness or BWG**
- **Tube sheet thickness**
- **Tube material**
- **Longer reach expanders are available upon request**
- **Special Conditions, i.e. enhanced tubing, thick tube sheets, double tube sheet, baffle sheets, tubes close to tube sheet channel or other tubes, protrusions, welded tubes, and tube bends close to the tube sheet.**

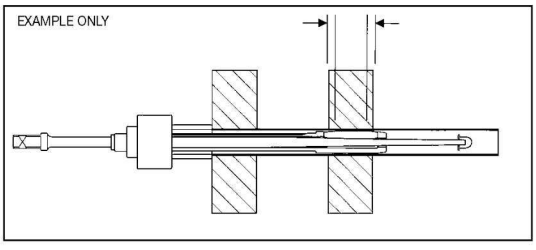
Setting the tube expander's collar on Primary Tube Sheets

It is very important to set the tube expander's collar in the correct position inside the tube sheet. The expander's roll high point should be positioned ~1/8" (3mm) from the inner side of the tube sheet as shown in the figure below. The purpose for setting the expander's collar this way is to allow for thermal expansion and contraction of the tube while it is in service. If the tube is expanded beyond the tube sheet, thermal expansion and contraction of the tube will cause stress on the tube, which may cause the tube to crack or rupture at the inner tube sheet location. When tightening the set screw on the expander's collar, be sure it is aligned with the cage grove.



Double Tube Sheet Applications

In a double tube sheet application additional information is required. The thickness of the outer tube sheet (primary tube sheet) and inner tube sheet (secondary tube sheet) and the distance between the two must be known. When expanding the tube in the primary tube sheet the expanders collar is positioned as in the figure above with an 800 series tube expander. For the secondary tube sheet a 1200 series expander is required with "S" type (double radius) rolls. The "S" type rolls are required to allow the expander to have clearance on each side of the secondary tube sheet as shown in the figure below. The purpose of using "S" type rolls on an inner tube sheet and setting the expander's collar this way is to reduce stresses in the tube due to thermal expansion and contraction of the tube while it is in service.



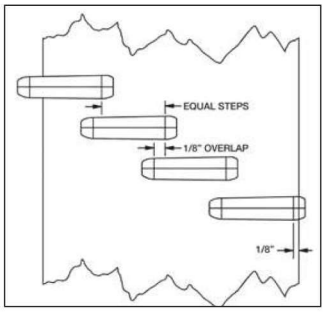
Heat Exchanger – Condenser Expanders

Five roll expander vs. Three roll expander

Many manufacturers prefer the five-roll expander for applications using tube materials that work harden quickly such as stainless steel and titanium. The five-roll expander inherently has more contact area with the tube than the three-roll which reduces the amount of work hardening and spring back effect that is common with these tube materials. They are also used in applications with closely spaced tubes having triangular pitch. The thinner the tube walls, 18 BWG (.049"/1.25mm) and thinner, the more apt work hardening is to occur.

Step Rolling

Step rolling is required when expanding tubes in thick tube sheets. Typically the first expansion is made at the innermost location, away from the inner side of the tube sheet. This is extremely important when rolling the opposite end of the vessel. This allows the tube material to grow in the proper direction towards the operator and keeps the tube from being stressed. After all the tubes have been expanded in this location, adjust the expander's collar to overlap the previously rolled area. Repeat as necessary until the complete thickness of the tube sheet has been expanded. "S" type rolls (double radius) are recommended for step rolling to provide a smooth transition on the I.D. of the tube.



Care and Maintenance of Tube Expanders

Tube expanders are precision tools and should be treated as such. The service demanded of them is severe. Therefore, they must be given a reasonable amount of care to insure satisfactory operation and long life.

All Tube Rolling Applications

1. Before using, clean the expander thoroughly to remove any dirt or foreign matter.
2. Check thrust bearing and grease if needed. This should be done daily.
3. Proper lubrication of the expander during the rolling operation is a must in order to keep the rolls and mandrel cool, to extend their life, and to insure uniform tube to tube sheet joints.
4. Inspect rolls and mandrels for scarring or chips regularly and if found, replace them immediately. One small chip in a roll can cause the complete set of rolls and the mandrel to be damaged in a single rolling cycle. Always replace rolls and mandrels at the same time.
5. When the rolling job is complete, wash the expander thoroughly and then oil and grease generously to prevent rusting during storage.

Lubrication & Cleaning

Hand-Held Rolling Applications

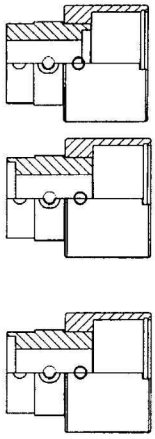
Depending on the severity of the rolling application, the expander should be washed periodically (every 25-100 tubes) in any commercial solvent. For best expander life, the expander should be left in solvent to cool while a second expander is used to continue rolling.

DAS Automated Tube Rolling Applications

An optional automatic lubrication system is offered for the automatic tube rolling systems. Hand cleaning is virtually eliminated with the use of the automatic lubricating system as the air pressure that blows the lubrication into the expander to cool it also blows away dirt or foreign matter during each cycle.

Flip Collars

All G-800 and G-1200 Series tube expanders are supplied with a flip collar with a 10-32 UNF auto-lube port. The flip collar allows for flush and recessed tube rolling. The standard expander is supplied with a recess of 1/8" (3 mm). Other recess lengths are available. Contact technical service for details.

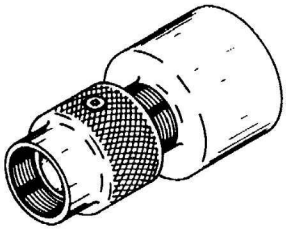


Fixed Recess Thrust Collars

Fixed recess collars are available for tube projections between 3/16" (4.7mm) to 7/8" (22.2 mm) from the tube sheet for special applications and require a quote from technical service.

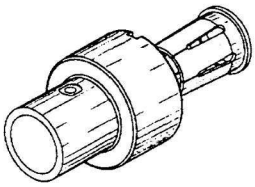
Full Recess Thrust Collars

The full recess collar accommodates tube projections up to 7/8" (22.2 mm) from the tube sheet.



Adjustable Recess Thrust Collars

The adjustable recess collar accommodates tube projections up to 1/2" (12.7 mm) from the tube sheet.

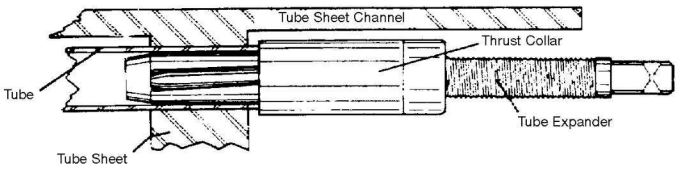


Thin Wall Thrust Collars

Thin wall thrust collars are recommended when expanding 20 BWG .035" (0.9 mm) or lighter wall tubes. This design limits the possibility of the tube being drawn up inside the thrust collar. Removing the collar's collet allows the expander to be used as a full recess style compensating for various length tube projections from the tube sheet. These collars are application specific and require a quote from technical service.

Small Diameter Thrust Collars

Small diameter thrust collars are recommended for rolling tubes in confined areas, close to tube sheet channels, or if there is interference from adjacent tubes.



Tube Expander Lubricant "LUBE-A-TUBE"

- A water soluble lubricant especially compounded for use with tube expanders. It prevents rust and acts as a coolant providing longer life and smoother rolling.
- 5-gallon container: LAT-5 (order number 2981695)