

Flarelock® II Tube Fitting

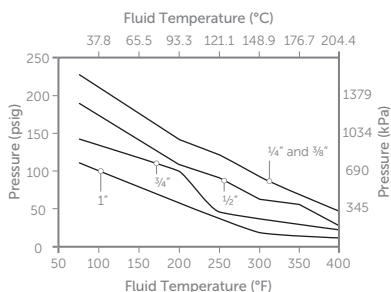
Assembly procedures

PRODUCT SPECIFICATIONS

FlareLock® II PFA nut maximum pressure rating chart

TEMPERATURE	1/4" (FL4II-3)	3/8" (FL6II-3)	1/2" (FL8II-3)	3/4" (FL12II-3)	1" (FL16II-3)
24°C (75°F)	1551 kPa (225 psi)	1551 kPa (225 psi)	1310 kPa (190 psi)	965 kPa (140 psi)	620 kPa (90 psi)
93°C (200°F)	993 kPa (144 psi)	993 kPa (144 psi)	724 kPa (105 psi)	689 kPa (100 psi)	345 kPa (50 psi)
121°C (250°F)	827 kPa (120 psi)	827 kPa (120 psi)	565 kPa (82 psi)	324 kPa (47 psi)	234 kPa (34 psi)
150°C (300°F)	655 kPa (95 psi)	655 kPa (95 psi)	400 kPa (58 psi)	276 kPa (40 psi)	138 kPa (20 psi)
175°C (350°F)	483 kPa (70 psi)	483 kPa (70 psi)	379 kPa (55 psi)	234 kPa (34 psi)	117 kPa (17 psi)
200°C (400°F)	310 kPa (45 psi)	310 kPa (45 psi)	241 kPa (35 psi)	186 kPa (27 psi)	103 kPa (15 psi)

Pressure vs. Temperature



Ratings determined using a safety factor of 1.5

Chemical Compatibility

Refer to Entegris' *Fluid Handling Systems* catalog for chemical compatibility information.

FLARELOCK II FITTING CONNECTION

Assembling the FlareLock II fitting consists of grooving, flaring and final assembly. Grooving the tubing outside diameter (OD) provides a groove in which the FlareLock II nut firmly connects. The flaring process provides a permanent expansion (flare) of the tubing end, allowing insertion of the Flaretek® fitting body. Proper grooving, flaring, and fitting assembly result in a secure tubing connection.

Entegris recommends the following procedures for use only with Entegris groove tools, heat sources, and standard wall PFA tubing (0.062" wall thickness for 3/8", 1/2", 3/4", and 1" OD, 0.047" wall thickness for 1/4").

NOTE: The FlareLock II nut is assembled at the factory with the split locking ring properly in place. If disassembled in the field, proper reassembly is crucial to ensure a good connection that functions properly.

TUBING PREPARATION

1. Cut the tubing end squarely (0.070" maximum squareness tolerance) using a Galtek® tubing cutter.

GROOVING INSTRUCTIONS

1. Obtain the proper FlareLock II groove tool designed to groove the tubing OD.
2. While maintaining slight force between the tube end and groove tool, rotate groove tool in direction of arrow, four complete revolutions.
3. Depress thumb rest. Remove tube and inspect groove to be certain that the depth is uniform and free from burrs.

4. Insert the grooved end of the tubing through the nonthreaded end of the nut.

WARNING! If you do not put the nut on the tube now you will not be able to put it on after you complete the flare.

HEAT FLARING INSTRUCTIONS

WARNING! For your safety, do not attempt to heat flare tubing that has been exposed to chemical. Tubing cools rapidly so please read and understand all instructions before flaring your tubing.

1. When using an Entegris hot air gun, set the hot air gun (see Figure 1) on "high." Hold 1/2" to 3/4" of the PFA tubing 1/2" to 3/4" above the heater and continually rotate the tubing 360° for the approximate time specified in Table 1 or until a fine, clear line appears around the tubing.

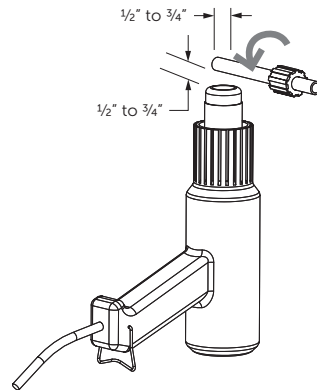


Figure 1. 213-79.

NOTE: It is very important to fully rotate the tubing over the heat source so all surface areas receive an equal amount of heat. Uniform heating is essential to making a good flare.

When using an Entegris infrared heating tool, turn on heating tool (see Figure 2). Center $\frac{1}{2}$ " to $\frac{3}{4}$ " of the PFA tubing between the heat rings. While slowly rotating the PFA tubing back and forth between your forefinger and thumb, heat for the approximate time specified in Table 1 or until a fine, clear line appears around the tubing.

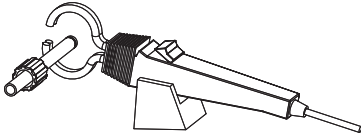


Figure 2. 213-74 115, 213-76 240V.

NOTE: To flare 1" tubing with an Entegris infrared heating tool, a 1" heat ring is needed. See part number on back page.

NOTE: It is very important to rotate the tubing within the heat source so all surface areas receive an equal amount of heat. Uniform heating is essential to making a good flare.

- Remove the PFA tubing from the heat source. Immediately push the flaring mandrel (see Figure 3) into the tubing until the end of the tubing reaches the tube stop.

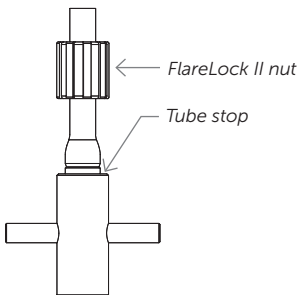


Figure 3.

NOTE: Flaring $\frac{1}{4}$ " tubing is challenging because of its small size. To get a firm grip on the small tube diameter, we recommend using the grip pad that is included in the mandrel kit.

- Firmly hold the tubing onto the mandrel for the time specified in Table 1.

NOTE: To ensure that the FlareLock II fitting functions properly, it is crucial that the tubing is held firmly against the tube stop for the time specified in Table 1.

- Let the flared tubing continue to cool on the mandrel the time specified in Table 1.
- The flaring process is now complete and the tubing may be removed from the mandrel.

NOTE: An automatic bench top flaring tool is also available from Entegris.

FLARELOCK II FITTING ASSEMBLY INSTRUCTIONS

- Push the flared tubing end onto the Flaretek fitting body until the end of the fitting body contacts the flare transition of the tube (see Figure 4). The maximum gap between the tube end and fitting shoulder should be 0.08" to 0.15".

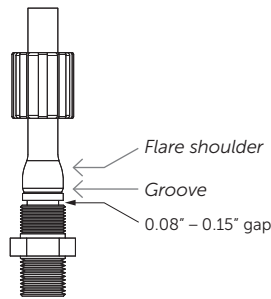


Figure 4.

- Tighten the nut onto the fitting body until hand tight (see Table 1 for recommended minimum torque values).

RETIGHTENING

All fitting connections assembled using the Room Temperature flaring technique should be retightened to the minimum nut torque values identified in Table 1.

Additionally, after initial exposure to elevated temperatures, all fitting connections, including Flaretek, Flaretek "SpaceSaver", and FlareLock II, exposed to temperatures $\geq 165^\circ\text{F}$ must be retightened to the minimum torque values identified in Table 1 (fitting must be returned to room temperature before retightening).

TABLE 1

Tubing and fitting size	1/4"	3/8"	1/2"	3/4"	1"
Heating time for PFA					
Air gun	15 sec	25 sec	25 sec	25 sec	25 sec
Infrared heater	40 sec	50 sec	50 sec	50 sec	60 sec
Hold tubing on flare mandrel	20 sec	20 sec	20 sec	20 sec	25 sec
Minimum cooling time on mandrel	2 min	2 min	3 min	3 min	3 min
Minimum nut torque	0.57 N•m (5 inch•lbs)	0.90 N•m (8 inch•lbs)	1.24 N•m (11 inch•lbs)	1.58 N•m (14 inch•lbs)	3.39 N•m (30 inch•lbs)

TROUBLESHOOTING – FLARELOCK II TUBE FITTING ASSEMBLY

PROBLEM	POSSIBLE CAUSE	SOLUTION
After flaring the tubing, one side of the expanded portion of the tubing is wrinkled and shorter than its original length.	The tubing was not heated evenly. The wrinkled areas were overheated.	The wrinkles can be avoided by rotating and moving the tubing through the heat source with more uniformity. Cut off the flared tubing end and reflare.
The tubing kinks when pushing it onto the flaring mandrel.	The tubing was not heated properly before flaring.	$\frac{1}{2}$ " to $\frac{3}{4}$ " of the tubing needs to be heated. Closely follow the recommended heating times in Table 1. Cut off the flared tubing end and reflare.
When the flared tubing is pushed onto the fitting body, the tubing is more than 0.150" away from the threaded area of the fitting body.	The tubing was not pushed onto the flaring mandrel all the way or the tubing was removed from the mandrel before it was cool.	Tubing may need longer heating time or longer cooling time on the flaring mandrel. Cut off the flared tubing end and reflare.
The flared tubing will not fit onto the fitting body.	The tubing was removed from the mandrel before it was cool.	Reheat and reflare the undersized flared tubing end. Allow adequate cooling time prior to removing from the flare mandrel. OR Cut off the flared tubing end and reflare. Be sure the tubing is cool before removing it from the mandrel.

PART NUMBERS

Flaring accessories

PART NUMBER	SIZE	DESCRIPTION
213-14	1/16" to 1/2"	Galtek tubing cutter
213-16	1/16" to 3/4"	
213-30	1/8" to 1 1/2"	
GTII-4F	1/4"	FlareLock II groove tool
GTII-6F	3/8"	
GTII-8F	1/2"	
GTII-12F	3/4"	
GTII-16F	1"	
213-58	1/4"	
213-59	3/8"	
213-60	1/2"	
213-61	3/4"	
213-82	1"	

Flaring tools

PART NUMBER	DESCRIPTION
213-81	Universal tool
213-73	Grip pad
213-79	Entegris hot air gun
213-74	Infrared tube heater 115V
213-76	Infrared tube heater 240V
213-75	Infrared 1/4" to 3/4" heat ring 115V
213-77	Infrared 1/4" to 3/4" heat ring 240V
213-91	Infrared 1" heat ring 115V
213-92	Infrared 1" heat ring 240V
213-95	Automatic bench top flaring tool 100/120V
213-96	Automatic bench top flaring tool 220/240V

TORQUE WRENCH CALCULATION

When using an Entegris flare fitting wrench, the torque reading must be adjusted on the torque wrench to compensate for the wrench extension length.

$$G = (L \times T) \div (L + E)$$

G = Torque wrench reading (in•lbs)

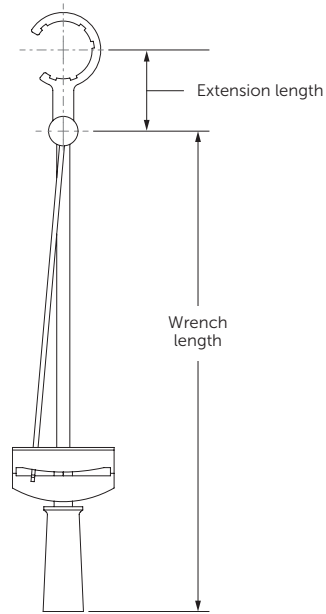
L = Torque wrench length (inches)

T = Torque desired (in•lbs)

E = Extension length (e.g. 3.10")

Example: wrench length = 12.0"
 extension length = 3.10"
 torque desired = 80 in•lbs

$$(12 \times 80) \div (12 + 3.1) = 63.58 \text{ in}\cdot\text{lbs}$$



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