

PRODUCT INFORMATION**1/16-18 FEMALE PORT FOR 1/4" O.D. HIGH PRESSURE TUBING (AUTOCLAVE F-250-C)**

When selecting the proper fitting for a specific pressure application, the key characteristic to evaluate is the manner in which the "seal" is formed. Although "National Pipe Thread" (NPT) fittings are the most common connections used on pressure instruments, they suffer limitations which render them inadequate for "high pressure" applications. (Although there is no universally accepted definition for "high pressure," the term is usually associated with levels in excess of 10,000 or 20,000 psi.) On NPT fittings, the angle of the thread line (thread pitch) is tapered so that the seal is actually formed by the inter-meshing of the threads. To improve the seal and lubricate the threads, sealants such as "teflon tape" or "pipe dope" are often used. This type of seal is simple and least susceptible to wear; however, it is very limited in its ability to maintain a complete seal at higher pressures.

Since soft tubing or hoses are not rated for high pressure applications, the only available pressure conduit is heavy wall "high pressure" metal tubing (See Figure 1). Therefore, in high pressure gauge applications, the most common and logical choice is a fitting designed to accommodate this type of tubing. To conform to the industry standard, many Heise and Ashcroft pressure instruments are supplied with a "1/16-18 UNF-2B female port for 1/4" O.D. high pressure tubing," also commonly referred to as Autoclave Engineers, Inc., part number F-250-C. This connection is identifiable by dimension and by the presence of a counter-sink at the opening of the pressure passage hole inside (at the bottom of) the female port.

Customers who are unfamiliar with high pressure fittings often contact the factory to ask "...where do I find the mating male fitting?" In fact, with the exception of certain adapters, the mating male fitting actually consists of three separate components; the tubing, the collar (also referred to as the "sleeve") and the gland nut (See Figure 2). On this type of fitting, *the seal is formed by the forced contact of the "coned" tip of the high pressure tubing into the counter-sink inside the female port* (See Figure 3). In order to use the fitting, the tubing must first be prepared and the fitting components must be assembled per the following steps:

- 1) To prepare the tubing, two operations are required:
 - A) **"Coning" the tube tip:** The tip of the high pressure tubing must first be "coned" or "beveled" to a 59 degree angle to produce the sealing surface so that the tip of the tube can properly mate to the countersink inside the female port (See Figure 2). This can be accomplished by the use of a lathe or special coning tools which are available for this operation.
 - B) **Threading the tubing:** A 1/4-28 UNF-2A left hand thread (See Figure 2) must be turned onto the end of the tubing. Special tools and dies are also available specifically for this operation.

- 2) Slide the gland nut over the tubing so that the male threads face the open end of the tube.
- 3) Thread the female collar onto the left hand threads on the tubing.
- 4) Slide the gland nut down over the collar.
- 5) Insert the entire assembly into the female port of the gauge so that the coned end of the tubing seats into the countersink inside the female port.
- 6) Engage the $\frac{1}{16}$ " male threads of the gland nut into the female threads of the gauge port. As the gland nut is tightened, it will exert pressure upon the collar, forcing the coned tip of the tubing into the seat.
- 7) If the tubing appears to be loose inside the assembly, back out the gland nut and remove the assembly from the gauge port. Turn the collar counter-clockwise so that it is positioned further up the tubing (away from the tip) so that the coned end of the tubing protrudes further out (away from) the gland nut. Conversely, if the tube is protruding out so far that the gland nut cannot engage at least 4 complete threads, turn the collar clockwise to shorten the distance that the tubing tip protrudes away from the gland nut. When properly adjusted, return to step 6.

Tubing, gland nuts, collars and tools are manufactured by the following vendors. (Some of these vendors may refer you to a local distributor.) Consult Figure 4 for specific part numbers.

Autoclave Engineers, Inc.

2930 W. 22nd Street
Box 5051
Erie, PA 16512-5051
814/838-2071

Newport Scientific, Inc.

**(Formerly AMINCO),
"Superpressure" Line**
8246-E Sandy Court
Jessup, MD 20794-0189
301/498-6700

Butech Pressure Systems

4928 Pittsburgh Avenue
Erie, PA 16509
814/833-4904

High Pressure Equipment Company (HIP)

1222 Linden Avenue
Erie, PA 16505
814/838-2028

Cajon Fitting Company (Sno-Trik)

9760 Shepard Road
Macedonia, OH 44056
330/467-0200

Figure 1**High Pressure Tubing Specification
316 Stainless Steel**

Maximum Working Pressure @ 72°F	O.D.	I.D.
20,000 psi	¼"	.109"
60,000 psi	¼"	.083"
100,000 psi	¼"	.0625"

Notes:

- 1) Some vendors offer alternate tubing materials. I.D. dimension may vary with material.
- 2) Some manufacturers classify 20,000 psi as "medium" pressure tubing.

Figure 4**Part Number Cross Reference Guide for ¼" High Pressure Tubing Fitting Components and Accessories**

Item	Autoclave	Newport	Butech	HIP	Sno-Trik
Gland Nut	AGL 40	45-11313 or 45-11314	60G4	60-2HM4	-
Collar	ACL 40	45-11316 or 45-11317	60C4	60-2H4	-
Coning Tool	401A	48-15013	60CT4	2-HF4	MS-469-CT
Threading Tool	402A	48-15025	THT4-H	2-MHF4	-
HP Male to ¼ NPT-M Adapter	-	-	MA4H4P	30-21HM4NMB	SS-44M-1-4
HP Male to ¼ NPT-F Adapter	6M44BB	45-16705	10A4H4P	30-21NFBHM4	SS-44M-7-4
Also sells HP Tubing	Yes	Yes	Yes	Yes	Yes

Notes:

- 1) Abbreviation "HP" = High Pressure
- 2) All gland nuts, collars and adapters identified above are 316 SS except:
Newport - Top P/N designates 416 SS (bottom P/N designates 316 SS)
HIP - Standard material for gland nuts and collars is 17-4PH Nickel. 316 SS is optionally available under the same P/N.
- 3) Newport (AMINCO) also offers the gland nut and collar set under a single P/N; 465-11310.
- 4) All coning and threading tools are complete sets which include all necessary dies and cutting bits.
- 5) Autoclave also sells tube bending equipment.
- 6) Autoclave and Butech also sell motorized threading machines.
- 7) When ordering gland nuts, collars, adapters and tubing, be sure to specify your maximum working pressure requirement because maximum allowable working pressure ratings for components may vary among manufacturers.