# Instrumentation Tubing

## STAINLESS STEEL INSTRUMENTATION TUBING

- Meets ASTM A213 and ASTM A269
- Grade TP 316/316L (dual certified)
- Seamless, Cold Finished
- 20 foot lengths

| Outside Diameter (in) | Part Number | Wall Thickness (in) |
|---|---|---|
| 1/4 | 4-T-035-S-316L | 0.035 |
| | 4-T-049-S-316L | 0.049 |
| | 4-T-065-S-316L | 0.065 |
| 3/8 | 6-T-035-S-316L | 0.035 |
| | 6-T-049-S-316L | 0.049 |
| | 6-T-065-S-316L | 0.065 |
| 1/2 | 8-T-035-S-316L | 0.035 |
| | 8-T-049-S-316L | 0.049 |
| | 8-T-065-S-316L | 0.065 |
| | 8-T-083-S-316L | 0.083 |
| 5/8 | 10-T-049-S-316L | 0.049 |
| | 10-T-065-S-316L | 0.065 |
| | 10-T-083-S-316L | 0.083 |
| | 10-T-095-S-316L | 0.095 |
| 3/4 | 12-T-049-S-316L | 0.049 |
| | 12-T-065-S-316L | 0.065 |
| | 12-T-083-S-316L | 0.083 |
| | 12-T-095-S-316L | 0.095 |
| | 12-T-109-S-316L | 0.109 |
| 1 | 16-T-065-S-316L | 0.065 |
| | 16-T-083-S-316L | 0.083 |
| | 16-T-095-S-316L | 0.095 |
| | 16-T-109-S-316L | 0.109 |
| | 16-T-120-S-316L | 0.120 |

Values in the black cells with white text are not recommended for gas services. Maximum suggested working pressures are based on ASME B31.3 equations using the following values:

| | Stress Value (psi) | Fractional Tube Specifications | Metric Tube Specifications |
|---|---|---|---|
| Stainless Steel | 20,000 | ASTM A269 | ISO 1127 — 3 to 12 mm O.D: D4 T4 tolerance; 14 mm O.D and larger: D4 T3 tolerance |
| Carbon Steel | 15,700 | ASTM A179 | - |
| Copper | 6,000 | ASTM B75 | - |

Stainless Steel Welded Tube De-rating factors:

| | |
|---|---|
| Double-Welded | 0.85 |
| Single-Welded | 0.80 |

## FRACTIONAL TUBE (psig)

**Stainless Steel**

| Tube Size O.D. | Tube Wall Thickness (inches) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | .010 | .012 | .014 | .016 | .020 | .028 | .035 | .049 | .065 | .083 | .095 | .109 | .120 | .134 | .156 | .188 |
| 1/16" | 5600 | 6800 | 8100 | 9400 | 12000 | | | | | | | | | | | |
| 1/8" | | | | | | 8500 | 10900 | | | | | | | | | |
| 3/16" | | | | | | 5400 | 7000 | 10200 | | | | | | | | |
| 1/4" | | | | | | 4000 | 5100 | 7500 | 10200 | | | | | | | |
| 5/16" | | | | | | | 4000 | 5800 | 8000 | | | | | | | |
| 3/8" | | | | | | | 3300 | 4800 | 6500 | | | | | | | |
| 1/2" | | | | | | | 2600 | 3700 | 5100 | 6700 | | | | | | |
| 5/8" | | | | | | | | 2900 | 4000 | 5200 | 6000 | | | | | |
| 3/4" | | | | | | | | 2400 | 3300 | 4200 | 4900 | 5800 | | | | |
| 7/8" | | | | | | | | 2000 | 2800 | 3600 | 4200 | 4800 | | | | |
| 1" | | | | | | | | | 2400 | 3100 | 3600 | 4200 | 4700 | | | |
| 1-1/4" | | | | | | | | | | 2400 | 2800 | 3300 | 3600 | 4100 | 4900 | |
| 1-1/2" | | | | | | | | | | | 2300 | 2700 | 3000 | 3400 | 4000 | 4900 |
| 2" | | | | | | | | | | | | 2000 | 2200 | 2500 | 2900 | 3600 |

**Carbon Steel**

| Tube Size O.D. | Tube Wall Thickness (inches) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | .028 | .035 | .049 | .065 | .083 | .095 | .109 | .120 |
| 1/8" | 8000 | 10200 | | | | | | |
| 3/16" | 5100 | 6600 | 9600 | | | | | |
| 1/4" | 3700 | 4800 | 7000 | 9600 | | | | |
| 5/16" | | 3700 | 5500 | 7500 | | | | |
| 3/8" | | 3100 | 4500 | 6200 | | | | |
| 1/2" | | 2300 | 3200 | 4500 | 5900 | | | |
| 5/8" | | | 2600 | 3500 | 4600 | 5300 | | |
| 3/4" | | | 2100 | 2900 | 3700 | 4300 | 5100 | |
| 7/8" | | | 1800 | 2400 | 3200 | 3700 | 4300 | |
| 1" | | | 1500 | 2100 | 2700 | 3200 | 3700 | 4100 |

**Copper**

| Tube Size O.D. | Tube Wall Thickness (inches) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | .028 | .035 | .049 | .065 | .083 | .095 | .109 | .120 |
| 1/8" | 2700 | 3600 | | | | | | |
| 3/16" | 1800 | 2300 | 3400 | | | | | |
| 1/4" | 1300 | 1600 | 2500 | 3500 | | | | |
| 5/16" | | 1300 | 1900 | 2700 | | | | |
| 3/8" | | 1000 | 1600 | 2200 | | | | |
| 1/2" | | 800 | 1100 | 1600 | 2100 | | | |
| 5/8" | | | 900 | 1200 | 1600 | 1900 | | |
| 3/4" | | | 700 | 1000 | 1300 | 1500 | 1800 | |
| 7/8" | | | 600 | 800 | 1100 | 1300 | 1500 | |
| 1" | | | 500 | 700 | 900 | 1100 | 1300 | 1500 |

## METRIC TUBE (bar)

**Stainless Steel**

| Tube Size O.D. | Tube Wall Thickness (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0.8 | 1.0 | 1.2 | 1.5 | 1.8 | 2.0 | 2.2 | 2.5 | 2.8 | 3.0 |
| 3 | 670 | | | | | | | | | |
| 6 | 310 | 420 | 540 | 710 | | | | | | |
| 8 | | 310 | 390 | 520 | | | | | | |
| 10 | | 240 | 300 | 400 | 510 | 580 | | | | |
| 12 | | 200 | 250 | 330 | 410 | 470 | | | | |
| 14 | | 160 | 200 | 270 | 340 | 380 | 430 | | | |
| 15 | | 150 | 190 | 250 | 310 | 360 | 400 | | | |
| 16 | | | 170 | 230 | 290 | 330 | 370 | | | |
| 18 | | | 150 | 200 | 260 | 290 | 320 | 370 | | |
| 20 | | | 140 | 180 | 230 | 260 | 290 | 330 | 380 | |
| 22 | | | 120 | 160 | 200 | 230 | 260 | 300 | 340 | |
| 25 | | | | | 180 | 200 | 230 | 260 | 290 | 320 |

## TUBE PRESSURE DE-RATING FACTORS ELEVATED TEMPERATURES

| Temperatures | | Tubing Material | | | |
|---|---|---|---|---|---|
| °F | °C | Carbon | 304 SS | 316 SS | Copper |
| 100 | 38 | | | | 1.00 |
| 150 | 66 | | | | 0.85 |
| 200 | 93 | 0.95 | 1.00 | 1.00 | 0.80 |
| 250 | 121 | | | | 0.80 |
| 300 | 149 | 0.90 | 1.00 | 1.00 | 0.78 |
| 350 | 177 | | | | 0.66 |
| 400 | 204 | 0.87* | 0.93 | 0.96 | 0.50 |
| 500 | 260 | | 0.87 | 0.89 | |
| 600 | 316 | | 0.82 | 0.85 | |
| 700 | 371 | | 0.8 | 0.81 | |
| 800 | 427 | | 0.76 | 0.79 | |
| 900 | 482 | | 0.73 | 0.77 | |
| 1000 | 538 | | 0.69 | 0.76 | |

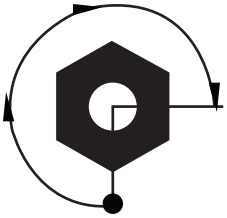
* Based on 375°F (190°C) max

## CBC-LOK®/CS-LOK® INSTALLATION INSTRUCTIONS

CBC-Lok®/CS-Lok® Tube Fittings come completely assembled & ready for use, no disassembly required. Although there are some general guidelines to follow, no special preparation of the tubing is necessary. In overhead applications, Tylok recommends using a Pre-Set Tool.

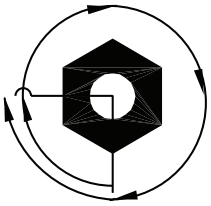
| Size | | Tighten # Turn(s) |
|---|---|---|
| 1 | 1/16" | 3/4 |
| 2 | 1/8" | |
| 3 | 3/16" | |
| 4 | 1/4" | 1-1/4 |
| 5 | 5/16" | |
| 6 | 3/8" | |
| 8 | 1/2" | |
| 10 | 5/8" | |
| 12 | 3/4" | |
| 14 | 7/8" | |
| 16 | 1" | |

SIZE #1 thru #3



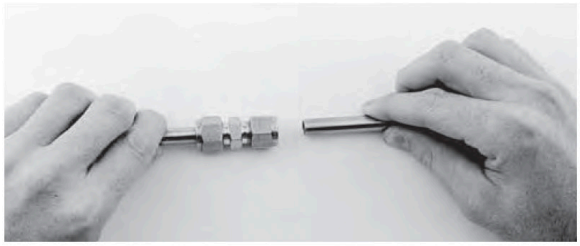
Finger tight plus 3/4 turn

SIZE #4 thru #16



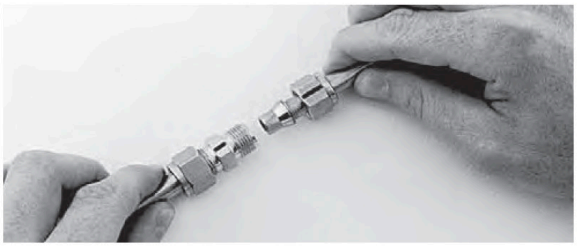
Finger tight plus 1-1/4 turn

NOTE: DF Plugs, -NF (Nut & Ferrule Pre-Assemblies) require only 1/4 turn make-up.



Simply insert the tubing into the assembly, making sure the tubing seats firmly seats against the shoulder of the body and the nut is finger tight. High pressure applications and high saftey-factor systems. Further tighten the nut until the tube will not turn by hand or move axially in the fitting.

Tighten nut with wrench the additional number of turns indicated above, while holding the fitting body with a second wrench.



## TO REMOVE TUBE & RE-CONNECT TUBE FITTING

Mark the location of the nut with reference to the body before disassembly. Back off the nut until it is clear of the body and remove the tubing from the fitting. For assembly, re-insert the tubing into the body until it is seated. With proper size wrench, re-tighten nut to original location by realigning previous marks. A noticeable amount or torque will develop when the nut is turned to original position. Next, rotate the nut slightly past original position to fully re-set the seal.

## TUBING SELECTION GUIDELINES

General

- Free of nicks, scratches, and imperfections
- Suitable for bending and flaring
- Square cut ends

Stainless Steel

- Types 304, 304L, 316, 316L, 317, or 317L per ASTM A213, ASTM A269, or equivalent.
- Fully Annealed, Seamless or Welded Redrawn, Maximum hardness of 80 HRB.

Copper

- Seamless ASTM B75 Soft Annealed, ASTM B88 K or L Temper O, or equivalent.

Carbon Steel

- ASTM A179 or equivalent, maximum hardness of 72 HRB.

## GAS SERVICE

Gases are generally less viscous than liquids allowing them to leak through imperfect seals. Tylok recommends tubing with minimal surface imperfections (nicks, scratches, etc.) and heavier walls for gas service applications. Heavy wall tubing offers more resistance to ferrules during installation which promotes a skiving effect that smooths out surface defects that would otherwise be leak paths. Thin wall tubing offers less resistance which promotes flexing rather than skiving resulting in a seal that may not be suitable for gas service. Refer to tubing pressure tables in this catalog for wall thickness recommended for gas services.

## PRECAUTIONS FOR WELD END

For best results when using Tylok tube fittings with weld ends, certain precautions should be taken:

- Remove the nut & ferrules from the fitting.
- Protect exposed threads & sealing surfaces from spatter.
- Use a heat sink to dissipate heat.
- Tack weld symmetrically to maintain alignment.
- When finishing welding remove weld spatter protection and make sure nuts and ferrules are in the proper orientation before assembling.

## SAFETY GUIDELINES

- Depressurize fluid systems before connecting, disconnecting or remaking a fitting.
- Follow Tylok's guidelines for proper fitting installation.
- Consult the factory before attmpting to interchange Tylok fitting components.
- Don't exceed the recommended pressure ratings of system components.
- Use thread sealants when installing tapered pipe threads.
- Select fitting and tubing materials for best results.
- Never use a fitting to bleed pressure from a system.

## HEAT TRACEABILITY

Tylok Tube Fittings are heat code traceable back to mill heat of the material they were made from. Contact the factory for material certification requests.

## RAW MATERIAL SPECIFICATIONS

| Fitting Material | Bar Stock | Forging |
|---|---|---|
| Brass | ASTM B16<br>ASTM B453 | ASTM B283 |
| Stainless Steel | ASTM A276<br>ASTM A479<br>ASME SA-479<br>Type 316-SS | ASTM A182<br>ASME SA-182<br>Type 316-SS |
| Steel | ASTM A108 | |

* Reference Tubing Selection & Preparation

## NOTICE

In designing a system incorporating tube fittings and valves, it is the designer's or user's obligation & responsibility to determine the appropriate fittings and valves to be used for each application and to insure proper installation and maintenance.

## QUALITY CONTROL

All components are manufactured & inspected to meet strict quality control standards in each phase of production. All employees are thoroughly trained to follow procedures, in accordance with the ISO 9001 Quality Standard, to ensure a quality product from the start of each job through completion.

# End Connections

## Suggested Allowable Working Pressure Tables

### CBC-LOK/CS-LOK TUBE ADAPTERS

| Fractional (PSIG) | | | | Metric (BAR) | |
|---|---|---|---|---|---|
| Size | Tube Size | Stainless Steel & Carbon Steel | Brass | Tube Size | Stainless Steel & Carbon Steel |
| 1 | 1/16 | 7200 | 2600 | 3mm | 370 |
| 2 | 1/8 | 6400 | 3200 | 6mm | 390 |
| 3 | 3/16 | 6000 | 3000 | 8mm | 390 |
| 4 | 1/4 | 5900 | 2900 | 10mm | 390 |
| 5 | 5/16 | 5800 | 2700 | 12mm | 360 |
| 6 | 3/8 | 5800 | 2200 | 15mm | 340 |
| 8 | 1/2 | 4900 | 2100 | 16mm | 340 |
| 10 | 5/8 | 5000 | 1900 | 18mm | 310 |
| 12 | 3/4 | 4600 | 1800 | 20mm | 310 |
| 14 | 7/8 | 4300 | 1500 | 22mm | 340 |
| 16 | 1 | 4100 | 1500 | 25mm | 280 |
| 20 | 1-1/4 | 4900 | - | | |
| 24 | 1-1/2 | 4900 | - | | |
| 32 | 2 | 3600 | - | | |

NOTE: Ratings calculated in accordance with ASME B31.3 (stress values of 10,000 psi for brass and 20,000 psi for stainless and carbon steel).

### STB FITTINGS (PSIG)

| Stainless Steel & Carbon Steel | | | |
|---|---|---|---|
| Size | Thread | Straights | Positionable |
| 2 | 5/16-24 | 5076 | 5076 |
| 3 | 3/8-24 | 5076 | 5076 |
| 4 | 7/16-20 | 5076 | 4568 |
| 5 | 1/2-20 | 5076 | 4568 |
| 6 | 9/16-18 | 5076 | 4061 |
| 8 | 3/4-16 | 4568 | 4061 |
| 10 | 7/8-14 | 3626 | 3045 |
| 12 | 1-1/16-12 | 3626 | 3045 |
| 14 | 1-3/16-12 | 3045 | 2538 |
| 16 | 1-5/16-12 | 3045 | 2538 |
| 20 | 1-5/8-12 | 2538 | 2030 |
| 24 | 1-7/8-12 | 2538 | 2030 |
| 32 | 2-1/2-12 | 2030 | 1522 |

NOTE: Pressure ratings per SAE J1926-3 for light-duty stud ends.

### JIC 37° FLARE (PSIG)

| Stainless Steel & Carbon Steel | | |
|---|---|---|
| Size | Thread | PSIG |
| 2 | 5/16-24 | 5000 |
| 3 | 3/8-24 | 5000 |
| 4 | 7/16-20 | 5000 |
| 5 | 1/2-20 | 5000 |
| 6 | 9/16-18 | 5000 |
| 8 | 3/4-16 | 4500 |
| 10 | 7/8-14 | 3500 |
| 12 | 1-1/16-12 | 3500 |
| 14 | 1-3/16-12 | 3000 |
| 16 | 1-5/16-12 | 3000 |
| 20 | 1-5/8-12 | 2500 |
| 24 | 1-7/8-12 | 2000 |
| 32 | 2-1/2-12 | 1500 |

NOTE: Pressure ratings per SAE J514.

### NPT & BSPT PIPE THREADS

| PSIG | | | | | |
|---|---|---|---|---|---|
| Size | Thread | Stainless Steel & Carbon Steel | | Brass | |
| | | Male | Female | Male | Female |
| 1 | 1/16 | 11000 | 6700 | 5500 | 3300 |
| 2 | 1/8 | 10000 | 6500 | 5000 | 3200 |
| 4 | 1/4 | 8000 | 6600 | 4000 | 3300 |
| 6 | 3/8 | 7800 | 5300 | 3900 | 2600 |
| 8 | 1/2 | 7700 | 4900 | 3800 | 2400 |
| 12 | 3/4 | 7300 | 4600 | 3600 | 2300 |
| 16 | 1 | 5300 | 4400 | 2600 | 2200 |
| 20 | 1-1/4 | 6000 | 5000 | 3000 | 2500 |
| 24 | 1-1/2 | 5000 | 4600 | 2500 | 2300 |
| 32 | 2 | 3900 | 3900 | 1900 | 1900 |

NOTE: Pressure ratings calculated in accordance with ASME B31.3 with NPT threads per ASME B1.20.1 and BSPT threads per ISO 7-1.

| THERMOCOUPLE BORE THROUGH | |
|---|---|
| Sizes | De-Rating Factor |
| 1/2" & Smaller | 0.75 |
| Over 1/2" up to & including 3/4" | 0.50 |
| Larger than 3/4" | 0.25 |

NOTE: Multiply tube pressure rating (see Suggested Allowable Working Pressure tables) by de-rating factor to determine safe working pressure.

| FITTING TEMPERATURE RATINGS | | |
|---|---|---|
| 316 Stainless | Brass | Steel |
| -325°F to 1000°F (-198°C to 648°C) | -40°F to 400°F (-40°C to 204°C) | -65°F to 375°F (-54°C to 190°C) |