

LET-LOK® TUBE FITTINGS DESCRIPTION

The HAM-LET GROUP has produced high quality tube and pipe fittings in various materials for high pressure applications since its establishment in 1950.

As a result of tremendous efforts in research and development during the last five decades, HAM-LET has gained an excellent reputation as a leading manufacturer of high pressure instrumentation products. The LET-LOK® range of connectors has been developed to fill the rapidly increasing demand for tube fittings suitable for high pressure use in environments such as petrochemical, fluid, power, nuclear, electronic, as well as other major industrial settings.

LET-LOK® tube fittings have been carefully manufactured to withstand the persistent demands for high-performance tube fittings. Each one has passed a stringent tolerance test for high pressure, impulse, vibration, vacuum and temperature. These precision machined fittings are manufactured to exacting standards, employing the most modern state-of-the-art computerized automation. All LET-LOK® fittings are backed by HAM-LET's commitment to the highest quality-control standards and skilled craftsmanship.

LET-LOK®
HOW DOES IT WORK?

The LET-LOK® tube fitting is a mechanism used both to seal and to grip tubing. The mechanical advantage and geometry of this kind of fitting produces a leak-tight assembly.

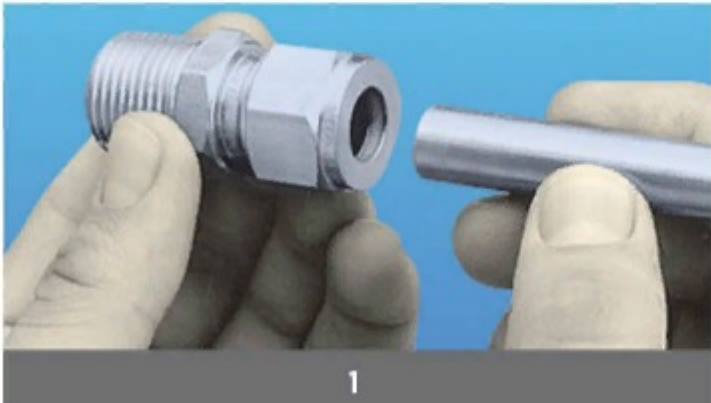
To assemble, simply insert the tube into the complete assembly until the tube bottoms-out against the shoulder of the fitting body(1). The two ferrules are driven forward between the nut (4) and fitting body using the mechanical force created by rotating the nut clockwise. The back ferrule (3) is driven against the tapered rear of the front ferrule (2) and the front ferrule is driven by force into the tapered mouth of the body.

The rear ferrule is swaged radially inwards on the tube while lifting the front ferrule out to form a full-faced seal on the tapered surface of the body.

The 11/4 turn of the nut from the hand tight position assures consistent drive of the sealing members. This ensures an effective seal against high pressure as well as ultra high vacuum conditions.

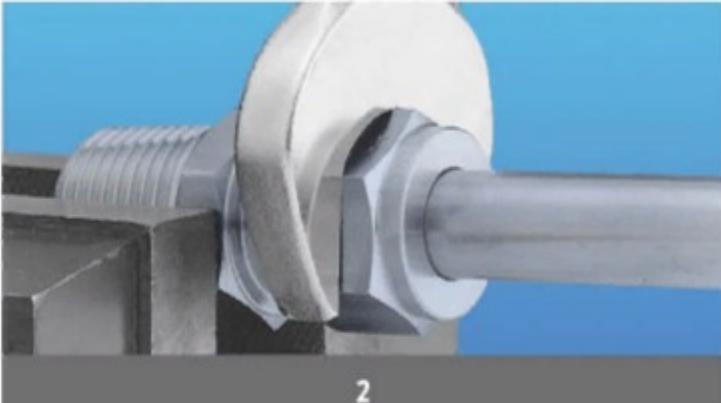
LET-LOK® FITTINGS INSTALLATION INSTRUCTIONS

LET-LOK® fittings are supplied, assembled and finger tight. Disassembly before use can allow the entry of dirt or other particles.



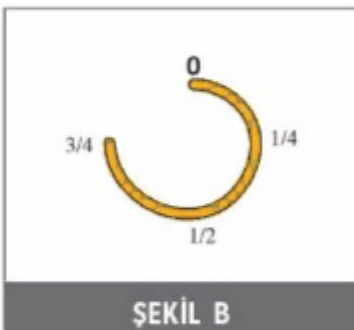
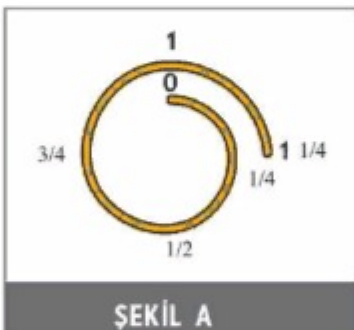
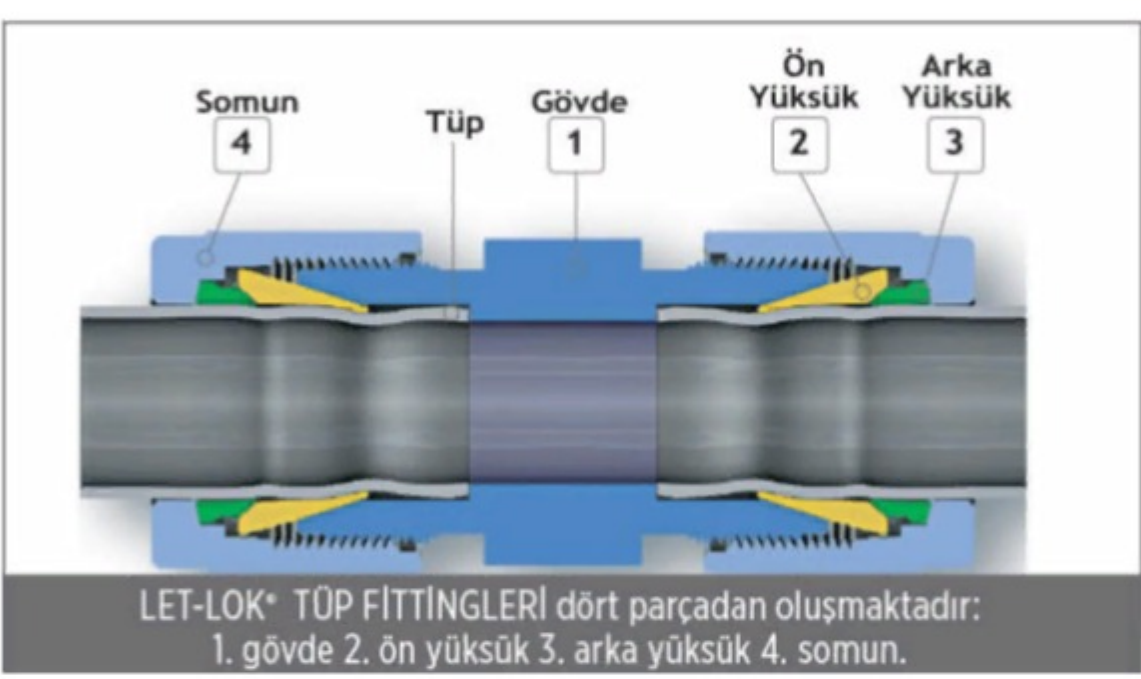
1. Insert the tubing into the LET-LOK® fitting.

Check that the tube rests firmly on the fitting shoulder and that the nut is finger tight. At this point it is recommended that a scribe mark be drawn on the hex of the nut extending onto the fitting body. This mark will serve as an indicator for the starting point and proper pull-up.



2. Tighten the nut.

1-1/4 turns of the nut are required for 1/4" (6 mm) and higher (see Fig. A). 3/4 turn of the nut is required for 3/16" (4 mm) and lower (see Fig. B).



REASSEMBLY INSTRUCTIONS

LET-LOK® connections may be disconnected and remade repeatedly, without the loss of the leaktight seal.

- Before disconnecting, mark the position of the nut in relation to the fitting body.
- To reassemble, use a wrench to tighten the nut to the original position.
- Tighten slightly with a wrench until a slight rise in torque is felt.

TUBE CUTTING

Two different methods can be used to cut tubes

- Tube Cutter
- Hacksaw

TUBE CUTTER

To attain a leak free connection, the tubing must be cut squarely. A good quality tube cutter with an appropriate blade for tubing material is recommended. Do not try to reduce the time of cutting by taking deep cuts with each turn of the cutter. This will work harden the tube. The end of the tube must be deburred to avoid damage to the fitting and to ensure that the tube reaches the bottom of the fitting.

HACKSAW CUTTING

In order to cut the tube with a hacksaw and get square ends, the tube must be cut with guide blocks. This method of cutting necessitates deburring of the tube ends.

Warning

Do not hold the tube in a vise in the place where it will be inserted into the fitting (the vise will leave a mark on the tube that may cause leaks, and might cause ovality).

TUBE HANDLING

Scratches on the tube might cause leaks. It is, therefore, important to handle the tube carefully to reduce the risk of leaks.

SOME PRECAUTIONS TO BE TAKEN

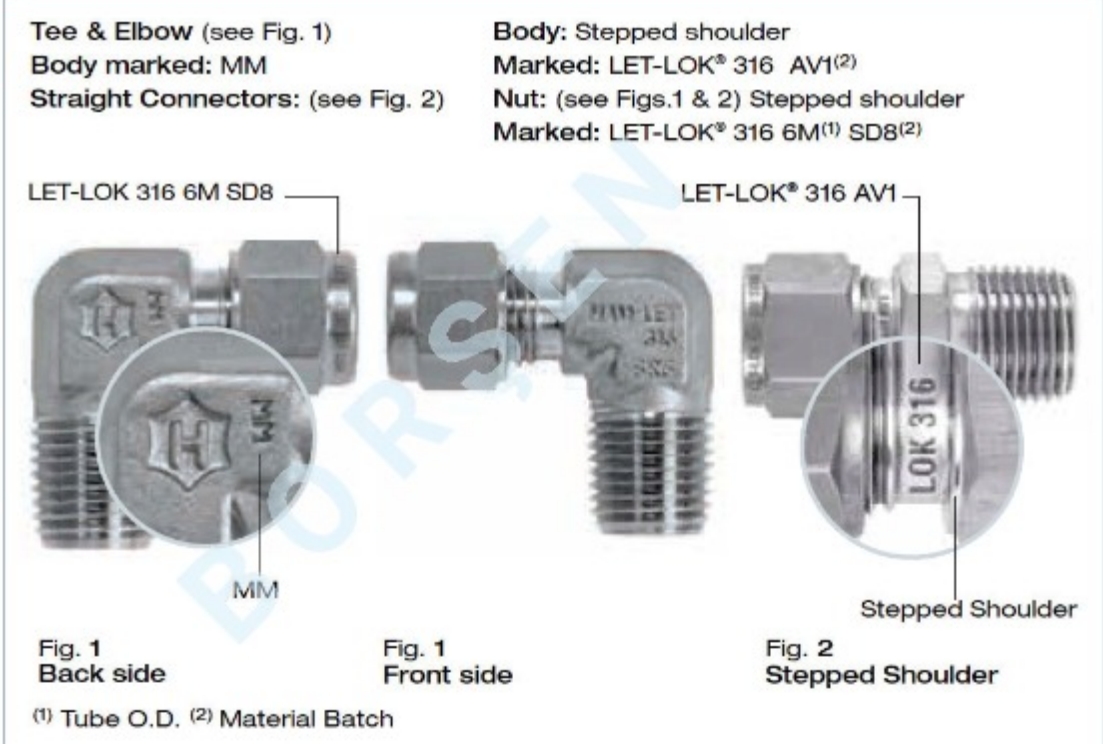
- Tubes must not be dragged on the floor.
- Tubes must not be dragged out of a tubing rack, especially in cases of large O.D. tubes.

Bakır Tüp

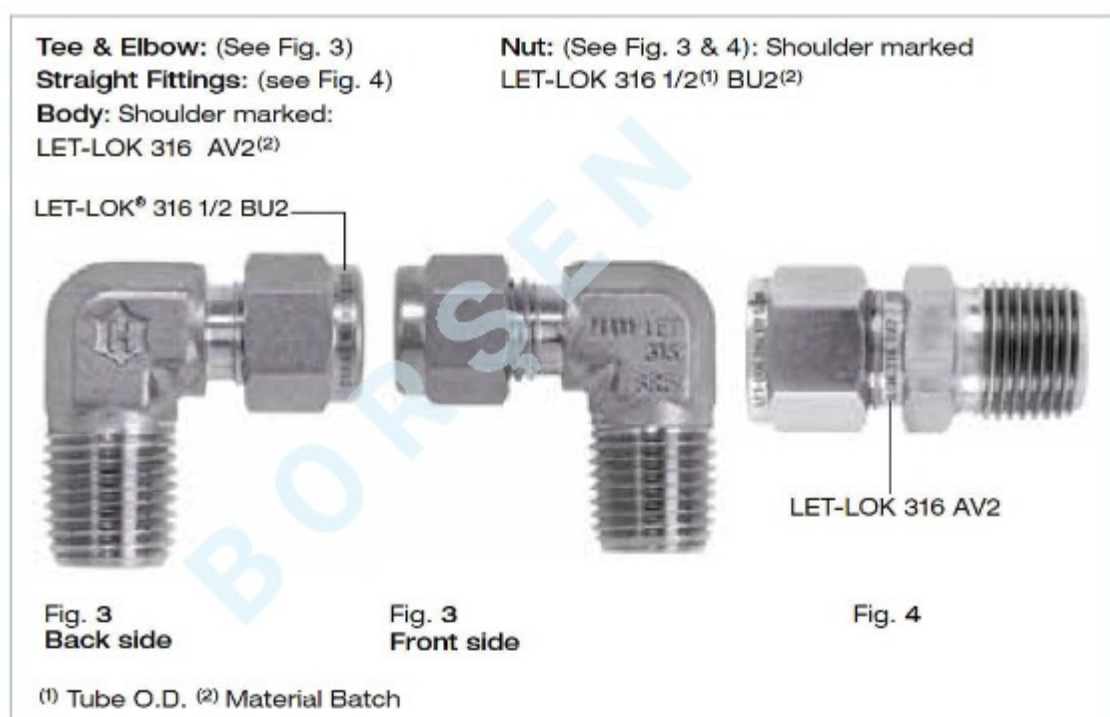
Bir rulodan bakır tüp kullanılıyorsa, tüpün ucundan tutmalı ve rulo, tüp düz bir yüzey üzerinde olacak şekilde çıkarılmalıdır.

PHYSICAL DIFFERENCES AND MARKINGS

LET-LOK® METRIC FITTINGS:



LET-LOK® INCH FITTINGS:



HIGH SAFETY

In applications where severe conditions and high pressure exist, we recommend the following installation procedures:

- Check that the nut is finger tight.
- Insert the tube (up to the shoulder).
- Rotate the nut with a wrench until the tube does not rotate freely.
- Mark the position of the nut.
- Rotate the nut 1-1/4 turns.

This method ensures that even if the tube O.D. is at the minimum tolerance, the ferrules will be in contact with the tube for the full 1-1/4 rotation.

TUBING DATA FOR LET-LOK® FITTINGS

In order to assure maximum fitting reliability and performance, great care should be given when selecting the tubing for each application.

TUBE SELECTION

Four variables must be considered when ordering tube for use with LET-LOK® fittings:

- Material
- Tube wall thickness
- Tube surface finish
- Tube hardness

Tubing should comply with standard ASTM A213 or ASTM A269, be seamless, and fully annealed. The tube must be free of scratches and suitable for bending and flaring.

TUBE O.D. TOLERANCES

1/16" - 1/8"	± 0.003"
2 mm - 3 mm	0.127 mm
3/16" - 1"	± 0.005"
4 mm - 25 mm	0.152 mm

The ovality of twice the O.D. tolerance is not suitable for LET-LOK® fittings. The tube must be reasonably round. The ends of the tube must be free of burrs. Tubing hardness: The hardness of the tube must be lower than the hardness of the fitting material. The hardness must not exceed Rockwell 90 HRB (200HV).

TABLE 1: STAINLESS STEEL INCH TUBING

Tubing O.D.	WALL THICKNESS OF TUBE IN INCH															
inch	0.010	0.012	0.014	0.016	0.020	0.028	0.035	0.049	0.065	0.083	0.095	0.109	0.120	0.134	0.156	0.188
1/16	5600	6860	8150	9480	11890											
1/8						8550	10730									
3/16						5500	7100	10150								
1/4						4100	5200	7600	10150							
5/16							4100	5900	7975							
3/8							3350	4850	6525							
1/2							2650	3750	5150	6525						
5/8								2950	4050	5250	5945					
3/4								2450	3350	4250	4950	5655				
7/8								2050	2850	3650	4250	4843				
1									2100	2700	3200	3700	3987			
1 1/4										2400	2800	3300	3600	4100	4785	
1 1/2											2300	2700	3000	3400	4000	4785
2												2000	2200	2500	2900	3600

Annealed 304 or 316 stainless steel tubing complying with ASTM A213, A269 or equivalent specifications. For metal temp. from -20°F - 100°F (-29°C - 37°C). Suggested ordering information: Fully annealed high quality (Type 304 or 316) stainless steel hydraulic tubing ASTM A269 or A213 or equivalent, seamless or welded and drawn with a hardness of 90HRB (200HV) or less. Tubing should be without scratches and suitable for flaring and bending.

TABLE 2: COPPER TUBING WALL THICKNESS OF TUBE IN INCHES

Tubing O.D.	WALL THICKNESS OF TUBE IN INCHES							
mm	inch	0.028	0.035	0.049	0.065	0.083	0.095	0.109
2	1/8	2700	3600					
3	3/16	1800	2300	3400				
6	1/4	1300	1600	2500	3500			
8	5/16		1300	1900	2700			
10	3/8		1000	1600	2200			
12	1/2		800	1100	1600	2100		
16	5/8			900	1200	1600	1900	
20	3/4			700	1000	1300	1500	1800
22	7/8			600	800	1100	1300	1500
25	1			500	700	900	1100	1300

Annealed copper seamless tubing complying with ASTM B68 and ASTM B75 specified in temper designation 060. Based on ultimate tensile strength of 30,000 psi (2067 bar). For metal temperatures from -20°C to 37°C. Suggested ordering information: High quality soft annealed seamless copper tubing ASTM B75 or equivalent.

TABLE 3: FACTORS USED TO DETERMINE ALLOWABLE PRESSURE AT HIGHER TEMPERATURES

°F	°C	A.I.S.I. 316	Copper
200	93	1	0.80
400	204	0.96	0.50
600	316	0.85	-
800	427	0.79	-
1000	538	0.76	-
1200	649	0.37	-

To determine allowable pressure at higher temperatures, multiply allowable working pressure from Tables 1 & 2 & 3 by factor shown in Table 4. For example: The allowable pressure for Type 316 stainless steel, size 1/2" OD x .049" wall at 800°F (427°C) would be equivalent to 3750 psi x 0.79 = 2962.5 psi.

TABLE 4: GAS APPLICATION TUBING

INCH		METRIC	
Tubing O.D.	Min. Nominal Wall Thickness	Tubing O.D.	Min. Nominal Wall Thickness
1/8"	0.028"	3 mm	0.8 mm
3/16"	0.028"	6 mm	0.8 mm
1/4"	0.028"	8 mm	1.0 mm
5/16"	0.035"	10 mm	1.0 mm
3/8"	0.035"	12 mm	1.0 mm
1/2"	0.049"	14 mm	1.2 mm
5/8"	0.065"	16 mm	1.5 mm
3/4"	0.065"	18 mm	1.5 mm
7/8"	0.083"	20 mm	1.8 mm
1"	0.083"	22 mm	2.0 mm
1 1/4"	0.109"	25 mm	2.2 mm
1 1/2"	0.134"	38 mm	3.5 mm
2"	0.188"	50 mm	5.0 mm

Gases are characterized by small molecules, which can escape through the smallest leak path. For gas applications, we recommend to select tubing with greater wall thickness. Table 5 shows the recommended wall thicknesses for greater safety and efficiency.