LET-LOK®

COMPRESSION TUBE FITTINGS

1/16” THROUGH 2”-INCH, 2 MM THROUGH 50 MM-METRIC

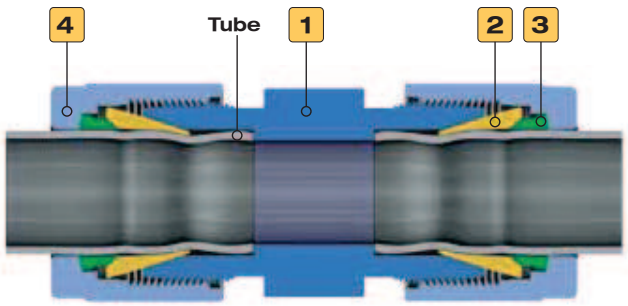
HAM-LET®
ADVANCED CONTROL TECHNOLOGY

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 1¼ 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 TUBE FITTINGS CONSIST OF FOUR PARTS:
1. BODY **2**. FRONT FERRULE **3**. BACK FERRULE **4**. NUT

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 effors 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.

HAM-LET ADVANCED CONTROL TECHNOLOGY

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.

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.

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).

Figure A

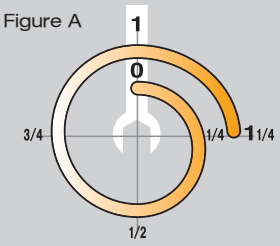
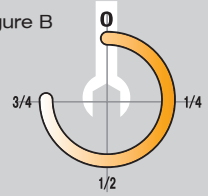


Figure B



REASSEMBLY INSTRUCTIONS

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

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

TUBE CUTTING

Two differnet methods can be used to cut tubes

1. Tube Cutter
2. 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

1. Tubes must not be dragged on the floor.
2. Tubes must not be dragged out of a tubing rack, especially in case of large OD tubes.

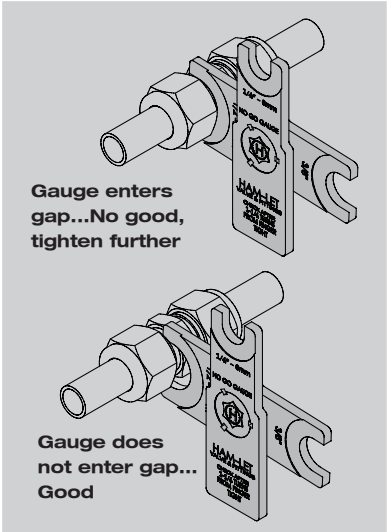
COPPER TUBING

If using copper tubing from a roll, hold the end of the tube and roll the roll outwards allowing the tubing to lie on a flat surface.

INSPECTION GAUGE

Use: This is a "No-Go" gauge and should be used as follows:

1. Make up the fitting according to the following instructions: 1/4 inch (6mm), 3/8 inch, 1/2 inch (12mm) make up 1-1/4 turns from finger tight.
2. Check gap between nut and body, using the appropriate sized gauge. If the gauge slides easily into the gap, tighten the nut further until gauge cannot enter the gap.



For Gauge Ordering Information: See page 88.

LET-LOK® FITTINGS INSTALLATION INSTRUCTIONS

PHYSICAL DIFFERENCES AND MARKINGS

LET–LOK® METRIC FITTINGS:

Tee & Elbow (see Fig. 1)
Body marked: MM
Straight Connectors: (see Fig. 2)
Body: Stepped shoulder
Marked: LET–LOK 316 AV1(2)
Nut: (see Figs.1 & 2) Stepped shoulder
Marked: LET–LOK 316 6M(1) SD8(2)

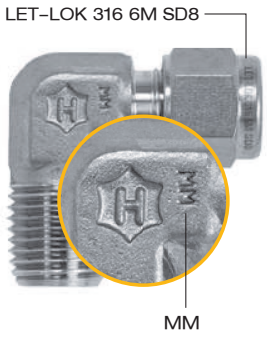


Fig. **1**
Back side

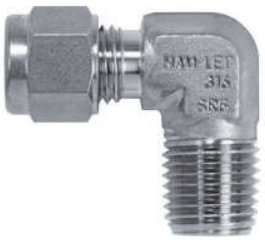


Fig. **1**
Front side

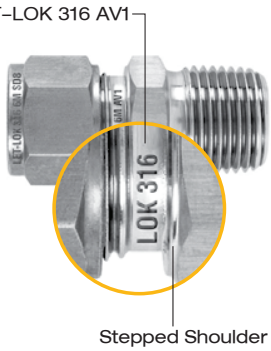


Fig. **2**
Stepped Shoulder

(1) Tube O.D. (2) Material Batch

LET–LOK® INCH FITTINGS:

Tee & Elbow: (See Fig. 3)
Straight Fittings: (see Fig. 4)
Body: Shoulder marked:
LET–LOK 316 AV2(2)
Nut: (See Fig. 3 & 4): Shoulder marked
LET–LOK 316 1/2(1) BU2(2)

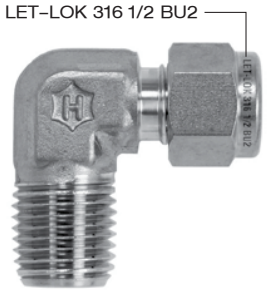


Fig. **3**
Back side

Fig. **3**
Front side

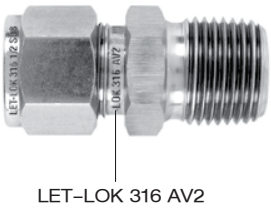


Fig. **4**

(1) Tube O.D. (2) Material Batch

HIGH SAFETY

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

1. Check that the nut is finger tight.
2. Insert the tube (up to the shoulder).
3. Rotate the nut with a wrench until the tube does not rotate freely.
4. Mark position of the nut.
5. 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:

1. Material
2. Tube wall thickness
3. Tube surface finish
4. 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 OD TOLERANCES

1/16" – 1/8" 2mm – 3 mm	±	**0.003"** **0.076 mm**
3/16" – 1 1/4" 4mm – 25 mm	±	**0.005"** **0.127 mm**
1 1/2" – 2" 38mm – 50 mm	±	**0.006"** **0.152 mm**

Ovality of twice OD 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).

HAM-LET ADVANCED CONTROL TECHNOLOGY

TUBING DATA

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	12080											
1/8						8550	10950									
3/16						5500	7100	10300								
1/4						4100	5200	7600	10300							
5/16							4100	5900	8100							
3/8							3350	4850	6550							
1/2							2650	3750	5150	6750						
5/8								2950	4050	5250	6050					
3/4								2450	3350	4250	4950	5850				
7/8								2050	2850	3650	4250	4850				
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

Working pressure (psig) for seamless tubing;
Multiply pressure rating by .80 for single welded tubing.
Multiply pressure rating by .85 for double welded tubing.

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: STAINLESS STEEL METRIC TUBING

Tubing O.D.	WALL THICKNESS OF TUBE IN MM													
mm	0.8	1.0	1.2	1.5	1.8	2.0	2.2	2.5	2.8	3.0	3.5	4.0	4.5	5.0
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	400						
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				
38							140	160	190	200	240	270	310	
50										150	180	210	240	270

Working pressure (bar) for seamless tubing;
Multiply pressure rating by .80 for single welded tubing.
Multiply pressure rating by .85 for double welded tubing.

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.

WARNING! For Your Safety The system designer and user have the sole responsibility to select products suitable for their special application requirements and to ensure the proper installation, operation and maintenance of the product. Please consider application details, material compatibility and product ratings when making your selection. Improper selection or use of products can cause property damage or personal injury.

TUBING DATA

TABLE 3: COPPER TUBING WALL THICKNESS OF TUBE IN INCHES

Tubing O.D.		0.028	0.035	0.049	0.065	0.083	0.095	0.109	0.120
mm	inch								
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	1500

TABLE 4: 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 5: 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"	0.095"	25 mm	2.2 mm
1 1/2"	0.120"	38 mm	3.0 mm
2"	0.156"	50 mm	4.5 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.

WARNING! For Your Safety The system designer and user have the sole responsibility to select products suitable for their special application requirements and to ensure the proper installation, operation and maintenance of the product. Please consider application details, material compatibility and product ratings when making your selection. Improper selection or use of products can cause property damage or personal injury.

PRESSURE RATINGS

Pressure Ratings for HAM-LET Tube Fittings

To ensure leak-tight systems, it is important to select carefully high-quality tubing (see page 9 - Allowable working pressure).

Pipe End Thread (NPT and ISO 7) Pressure Ratings

Allowable pressure for male and female tapered pipe thread ends, Stainless Steel 316 and Brass.

TABLE 6: PRESSURE RATINGS

NPT / ISO Pipe Size	Stainless Steel 316		Brass	
	Male	Female	Male	Female
inch	psi			
1/16	11000	6700	5500	3300
1/8	10000	6500	5000	3200
1/4	8000	6600	4000	3300
3/8	7800	5300	3900	2600
1/2	7700	4900	3800	2400
3/4	7300	4600	3600	2300
1	5300	4400	2600	2200
1 1/4	6000	5000	3000	2500
1 1/2	5000	4600	2500	2300
2	3900	3900	1900	1900

Note: If pressure on LET-LOK end is higher, than the pipe side, then pipe side needs heavier wall thickness of tapered pipe thread side.

Pressure Ratings for End Fittings per SAE J1926 (LOB) Surrounding Temperature

Pressure ratings are based on SAE J1926 at surrounding temperature.

TABLE 7: PRESSURE RATINGS

(LOB) SAE J1926 Thread Size	Stainless Steel 316	
	Nonpositionable	Positionable
inch	psi	
5/16 - 24	4568	4568
7/16 - 20	4568	4568
1/2 - 20	4568	4568
9/16 - 18	4568	3626
3/4 - 16	4568	3626
7/8 - 14	3626	2900
1 1/16 - 12	3626	2900
1 3/16 - 12	2900	2320
1 5/16 - 12	2900	2320
1 5/8 - 12	2320	1813
1 7/8 - 12	2320	1813
2 1/2 - 12	1813	1450

Note: 37° FLARE (AN) and LO ends can have lower pressure

O-Seal Pressure Ratings (page 45)

Stainless steel 316 O-seal fittings up to 1" and 25 mm are rated to 3000 psi.

Positionable, ISO/BSP Parallel Thread (G) Pressure Ratings

Pressure ratings are at surrounding temperature.

TABLE 8: PRESSURE RATINGS

(G) ISO / BSPP Male Pipe size	Stainless Steel 316
inch	psi
1/8	4568
1/4	4568
3/8	4568
1/2	2320