COMPRESSION TUBE FITTINGS 1/16" THROUGH 2" | 2 MM THROUGH 50 MM











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 one and one quater turn of the nut from the handtight 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 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 fluid system. 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 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[•] TUBE FITTINGS CONSISTS OF FOUR PARTS: 1. BODY 2. FRONT FERRULE 3. BACK FERRULE 4. NUT

1

3

2

Tube

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).



REASSEMBLY INSTRUCTIONS

 $\mbox{LET-LOK}^{\circledcirc}$ connections may be disconnected and remade repeatedly, without the loss of the leak tight seal.

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

TUBE CUTTING

Two different 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 cases of large O.D. 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 the finger tight position.

- 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 97



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LET-LOK[®] FITTINGS INSTALLATION INSTRUCTIONS



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. Fully insert the tube (up to the shoulder).

- 3. Rotate the nut with a wrench until the tube does not rotate freely.
- 4. Mark the 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.

4 **LET-LOK® COMPRESSION TUBE FITTINGS**

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

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

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

1/16" - 1/8" 2mm - 3 mm	$\} \pm$	0.003" 0.076 mm
3/16" - 1 1/4" 4mm - 25 mm	$\} \pm$	0.005" 0.127 mm
1 1/2" - 2" 38mm - 50 mm	} ±	0.006" 0.152 mm

The ovality of twice the O.D. tolerance is not suitable for LET-LOK[®] fittings. The tube must be

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

The hardness must not exceed Rockwell 90

TABLE 1: STAINLESS STEEL INCH TUBING

		WALL THICKNESS OF TUBE IN INCH														
Tubing O.D.	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
inch	Working pressure (psi)															
1/16	5600	6860	8150	9480	11890											
1/8							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: STAINLESS STEEL METRIC TUBING

	WALL THICKNESS OF TUBE IN MM													
Tubing O.D.	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
	Working pressure (bar)													
3	670													
6	310	420	540	710										
8		310	390	520										
10		240	300	400	510									
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				
30					170	180	210	240	260	310				
32					160	170	200	220	240	290	330			
38							140	160	190	200	240	270	310	
50										150	180	210	240	270

Annealed 304 or 316 stainless steel tubing complying with ASTM A213, A269 or equivalent specifications. For metal temp. from -20° F - 100° F (-29 $^{\circ}$ C - 37 $^{\circ}$ 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.

Working pressure for seamless tubing;

Multiply pressure rating by .80 for single welded tubing.

Multiply pressure rating by .85 for double welded tubing.

WARNING! 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.

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TUBING DATA

TABLE 3: COPPER TUBING WALL THICKNESS OF TUBE IN INCH

Tubin	g O.D.	0.028	0.035	0.040	0.065	0.083	0.095	0 1 0 0	0 1 20
mm	inch	0.020	0.000	0.043	0.000	0.000	0.035	0.103	0.120
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

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 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	-

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 $1/2^{\circ}$ 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.	Tubing O.D. Min. Nominal Wall Thickness		Min. Nominal Wall Thickness		
-	-	14 mm	1.2 mm		
-	-	15 mm	1.5 mm		
-	-	16 mm	1.5 mm		
1/2	0.049	18 mm	1.5 mm		
5/8	0.065	20 mm	1.8 mm		
3/4	0.065	22 mm	2.0 mm		
7/8	0.083	25 mm	2.2 mm		
1	0.083	30 mm	2.8 mm		
1 1/4	0.109	32 mm	3.0 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 tubing with greater wall thickness. Table 5 shows the recommended minimum wall thickness to ensure performance

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

MATERIAL

Stainless steel straight fittings: material is stainless steel 316L in accordance with ASTM A479, ASTM A276 and DIN EN10272. Stainless steel shaped fittings: material is stainless steel 316L in accordance with ASTM A182 and DIN EN10122-5.

Pressure Ratings for HAM-LET Tube Fittings

To ensure leak-tight systems, it is important to carefully select high-quality tubing (see page 5 - allowable working pressure).

TABLE 6: PRESSURE RATINGS

NPT / ISO	Stainless	Steel 316	Brass		
PIPE SIZE	Male	Female	Male	Female	
inch		p	si		
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 the pressure on the LET-LOK $^{\otimes}$ end is higher than the pipe side, then the pipe side needs a heavier wall thickness of the tapered pipe thread side.

Pipe End Thread (NPT and ISO 7) Pressure Ratings

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

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

Pressure ratings are based on SAE J1926 at ambient temperature.

TABLE	E 7:	PRES	SURE	RATIN	NGS
INDL	- 1.	LUCC		11/2/11	100

(LOB)	Stainless Steel 316					
Thread Size	Nonpositionable	Positionable				
inch	p	si				
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

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
3/4	2320
1	2320

8

FEMALE CONNECTOR 766 LR

22

20

FEMALE CONNECTOR 766 L

19

REDUCING UNION ELBOW 765 LR

18

UNION ELBOW 765 L

16

REDUCING TEE 764 LR

15

UNION TEE 764 L

13

REDUCING UNION 763 L

12

762 L

11 UNION

NUT 761 L

11

760 LI

10

760 LF

10

BACK FERRULE

LET-LOK INDEX

FEMALE CONNECTOR

PORT CONNECTOR

REDUCING PORT

MALE CONNECTOR

MALE PIPE WELD

CONNECTOR

CONNECTOR

766 LG

24

767 LT

25

767 LP

28

767 LM

29

768 L

30

768 LR

33

35

37

38

40

768 LO

40

768 LN

41

LET-LOK® COMPRESSION TUBE FITTINGS

768 LOK

768 LOB

768 LOP

768 LG

REDUCER

TUBE SOCKET

SANITARY FLANGE

WELD UNION

768 LW

768 LSFSS

TRI CLAMPE

MALE ELBOW

MALE ELBOW

MALE ELBOW POS

MALE ELBOW POS

MALE ELBOW POS

FITTINGS

768 LTC

43

769 L

44

769 LR

46

48

50

51

52

769 LG

769 LOB 45°

MALE ELBOW

MALE PIPE WELD

TUBE SOCKET WELD

REDUCING ELBOW

POS °45

769 LG 45°

ELBOW

ELBOW

769 LW

56

769 LT

53

769 LN

52

769 LOB

42

43

FEMALE ELBOW

MALE RUN TEE

770 L

54

771 L

55

MALE RUN

MALE RUN

FEMALE RUN TEE

MALE BRANCH TEE

MALE BRUNCH

MALE BRANCH

FEMALE BRANCH TEE

BULKHEAD UNION

BULKHEAD FEMALE

BULKHEAD REDUCER

CONNECTOR

TEE POS 772 LOB

TEE POS 772 LG

TEE POS

771 LG

56

771 LF

57

772 L

58

59

64

772 LF

61

774 L

62

774 LF 63

774 LT

63

TEE POS

771 LOB 56

FRONT FERRULE

760 LB

TUBE INSERT

CONNECTOR 774 LM	TUBE TO PIPE 739 LM	TUBE TO AN 739 LTFL	COPPER ALLOY 400/405 CONNECTORS
64	73	79	85
BULKHEAD REDUCING UNION 775 L	MALE ADAPTER TUBE TO PIPE 739 LMR	MALE ADAPTER TUBE TO AN 739 LTFL	ALLOY C-276 CONNECTORS
65	75	80	87
BULKHEAD RETAINER 774 LSS	MALE ADAPTER TUBE TO PIPE 739 LMG	PARALLEL THREADS SEALING	SUPER DUPLEX 2507 CONNECTORS
66	76	81	89
UNION CROSS 7102 L	WELD ADAPTER TUBE TO PIPE 739 LN	MALE NUT 961 L	ALLOY 825 CONNECTORS
67	77	83	91
CAP 7108 L	SOCKET WRLD ADAPTER 739 LW	UNION 962 L	ALLOY 254 CONNECTORS
68	77	83	93
PLUG 7121 L	MALE ADAPTER 739 LMOB	REDUCING UNION 963 L	UNION DIELECTRIC 762 L DIELECTRIC
69	78	83	95
PLUG WITH LANYARD 7121 LANYARD	LET-LOK [®] TO AN ADAPTER 761 LFL	UNION TEE 964 L	ACCESSORIES Preassembly tool, Tube hold- ers, Stop collar
70	79	83	97
FEMALE ADAPTED TUBE TO PIPE 739 LF	LET-LOK [®] TO AN UNION 762 LFL	MALE CONNECTOR 768 LC	
71	79	84	

MALE ADAPTER

TUBE TO AN

LET-LOK® MATERIAL DESCRIPTION



MALE ADAPTER TUBE TO PIPE

BULKHEAD MALE

CONNECTOR



material description and ordering information (see product table).



ALLOY 400 NICKEL COPPER ALLOY 400/405