

Introduction:

REPUTE tube fittings are manufactured to stringent quality control program and internal standards which assure the highest quality available in the industry. Two ferrule tube fittings are designed and manufactured to provide effective gas sealing in variety of industrial applications comprising tubing connections. REPUTE tube fittings are commonly used in various industries like oil and gas, petro-chemical/chemical processing, research laboratories, Instrumentation process and control systems, aerospace and defense, chemical processing, power generation, cryogenic, shipbuilding and heavy industrial industries.

Design and Standard:

Two ferrule compression tube fittings are manufactured under strict quality control program and close tolerances. There is no international / national standard which is followed by tube fitting manufacturers to manufacture these fittings. Every manufacturer have their own design and tolerances which governs the product specifications. Hence for safety purpose, we do not recommend interchange and intermix the components manufactured by different manufacturers.

Basic Tube Fitting Components:

Available in numerous configurations and size up to two inches, REPUTE tube fittings are made up of four parts consisting of a body, front ferrule, back ferrule, and nut. The fitting make up with compression type two ferrule technology is leak tight and consistent as the design compensates for any tolerances in tube outer diameter, wall thickness, and material hardness.



Functioning:

REPUTE tube fittings feature a low torque assembly and leak free seal for easy assembly and reassembly.

Double ferrule tube fitting uses its design features and geometry to make a connection. When nut is tightened

both ferrules moves axially in a controlled manner which does not allow any torque transfer from fitting to the tubing. This ensures there is no stress on the tube and tube do not twist or get distorted.

Front and back ferrules play vital role individually while fitting make up. Front ferrule does the sealing whereas back ferrule performs gripping action. The firm grip of back ferrule on tube surface provides excellent vibration fatigue resistance.

Silver plating on the nut threads act as lubricant and prevents galling. The nut can be backed off easily for dis-assembly and remakes. Usually the fittings are pulled up one and a quarter turn to make leak free assembly. During each re-assembly the nut should be advanced a quarter turn from its previous pulled up position to ensure the adequate tightening and consistent leak free joint. Tube Fittings in smaller sizes less than 6 mm need three quarter to one turn to make up the leak free joint.

Material of Construction:

Tube Fittings are available in MOC 316 stainless steel as a standard. Tube fittings can also be manufactured in Brass, SS 316L, Monel and other exotic alloys upon request. Raw material outsourced meets requirements of one or more following ASTM specifications.

Material	Bar Stock	Forging
Stainless Steel	ASTM A 276 / A479 SS316	ASTM A 182 SS316
	DIN 4401	DIN 4401
	BS970316-S31	BS970316-S31
Brass	ASTM B16 Alloy 360	ASTM B 124 Alloy 377
	CA-360	CA-377
	CA-345	CA-345
	ASTM B 453 Alloy 345	BS 2872 CZ 122
Alloy 400 (Monel)	ASTM B 164 / ASME SB 164	ASTM B 564 / ASME SB 564
Alloy 825 (Inconel)	ASTM B 425	ASTM B 564 / ASME SB 564
Alloy C-276 (Hastelloy)	ASTM B 574	ASTM B 564
SAF 2507 (Super Duplex)	ASTM A 479	ASTM A 182

Thread Specifications:

Specifications/standards given in the following table are followed for threaded end of the tube fittings.

End Connection Thread Type	Reference Specifications
NPT	ASME B1.20.1, SAE AS71051
ISO/BSP Parallel	ISO 228

ISO/BSP Tapered	ISO 7, BS EN 10226-1
SAE (Unified)	ASME B1.1

- Always use thread sealants on pipe threads. Do not apply sealant / PTFE on tube end of fitting.
- Always use O-rings / Gaskets with parallel threads.

Cleaning:

All the Fitting manufactured by us are ultrasonically cleaned and free from oil and other impurities.

Tubing:

Tube selection plays very important role in achieving safe, reliable and leak free installation. Correct installation practices should be followed and care should be taken while selecting and handling the tubes.

Tube Selection:

Some of the important factors and good practices while selecting the tube are as below.

- We recommend to use fully annealed seamless tubing complying ASTM A 269 or equivalent specifications.
- Tubing material shall be compatible with the process fluid and environmental conditions.
- While selecting tube wall thickness due consideration should be given to parameters like temperature, pressure, vibrations and shocks. Extremely thin wall tube may get collapsed by ferrule action and a tube with too heavy wall thickness will not allow desired ferrule action.
- The surface finish should be smooth free from scratches and burrs. Draw marks and dents on tube surface will allow lighter gas particles to escape thereby causing a leakage.
- Tube material shall be softer than that of fitting / ferrule material. Tube shall be fully annealed to make proper gripping and sealing. Typically SS seamless tube shall have Hardness 80 or less on HRB scale.
- Eccentricity and ovality are tube defects and should be avoided for correct installation.

Tube Handling and Safety Instructions:

- Cap the tubing ends to avoid contamination and foreign particles inside tube.
- Store the tubes in racks and cover them to avoid dust collection on the tube surface.
- Never drag tubing out of tubing rack or on floor surface.
- Always use tube cutter for smaller tube sizes. Do not cut deep while using tube cutter. It may damage the tube.
- Tube ends must be cut squarely and deburred to achieve desired leak proof performance.

- Do not try to force the tubing in the fitting body, it will damage either fitting components or tube end.
- It is suggested to use good quality tools like tube cutter, tube benders, deburring tools etc. to prepare the tube for consistent performance and best results.
- For tubes above 1"OD size use of guided blocks or tube saw guide is recommended. Cut the tube with fine teeth hacksaw blade and de-burring is very crucial when hacksaw is used to cut the tube.
- Never lean on or foot step onto the tubing.
- Use tube supports at recommended intervals to support tubing.
- Do not pull up tube fittings when system is pressurized or bleed the system by loosening nut or body.
- Always use compatible thread sealants or lubricants on pipe threads.
- Always use right sized spanners to turn fitting nut by holding fitting body firm.
- We do not recommend intermixing and interchanging of tube fitting components.

Pressure Ratings:

Repute two ferrule compression tube fittings are rated to maximum working pressure of tubing recommended to use with tube fittings. Calculations are based on maximum OD and minimum wall thickness as per ASTM A269. No allowance is made for corrosion or erosion. The indicative maximum working pressure of Tubing calculated from equations in ASME B31.3. Ratings mentioned in all the charts and tables given below are for reference only. Verification of all the related parameters along with their ratings and correct selection of tubes and fittings is the responsibility of system designer / user / buyer.

Recommended allowable working pressure for Fractional Seamless Stainless Steel Tube

Tube OD Inch	Tube Wall Thickness, in.															
	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
	Working Pressure, psig															
1/16	5600	6800	8100	9400	12 000											
1/8						8500	10 900									
3/16						5400	7 000	10200								
1/4						4000	5 100	7500	10200							
5/16							4 000	5 800	8 000							
3/8							3 300	4 800	6 500	7500						
1/2							2 600	3 700	5 100	6700						
5/8								2 900	4 000	5200	6000					
3/4								2 400	3 300	4200	4900	5800				
7/8								2 000	2 800	3600	4200	4800				
1									2 400	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

Important Notes :

- Allowable working pressure loads are calculated from S value, 20000 PSI (137800 kPa) for ASTM A 269 tubing at -20 to 100° F as listed in ASME B31.3 code, except as noted.
- Multiply above stainless steel rating by 0.94 for working pressure according to ASME B 31.1
- For Welded and drawn tubing, a derating factor must be applied for weld integrity.
 For Double welded tubing multiply pressure rating by 0.85
 For Single welded tubing multiply pressure rating by 0.8
- Calculations are based on Maximum DD and minimum wall thickness as allowable in ASTM A 269
- Allowances for erosion and corrosion are not considered.
- Safety factor is 3.75:1, considering ultimate tensile strength 75000 PSI.
- Tube Hardness shall be maximum 80 HRB.

Recommended allowable working pressure for Metric seamless Stainless steel tube

Tube OD in mm	Tube Wall Thickness in 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
	Working pressure in psig													
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				
28						180	200	230	260	280	330			
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

Notes :

- 1 Allowable working pressure based on equations from ASME B31.3 code for EN ISO 1127 tubing (D4, T4 tolerance for 3 to 12 mm; D4, T3 tolerance 14 to 50 mm), using S value of 1 370 bar (20 000 psi) and tensile strength of 5 170 bar (75 000 psi), except as noted.
- 2 Multiply stainless steel rating by 0.94 for working pressure according to ASME B31.1
- 3 For welded and drawn tubing, a derating factor must be applied for weld integrity
for double welded tubing multiply pressure rating by 0.85
for single welded tubing multiply pressure rating by 0.80
- 4 Calculations are based on Maximum OD and Minimum wall thickness as allowable in ASTM A 269
- 5 Allowance for corrosion and erosion is not considered.
- 6 Safety factor is 3.75:1 considering ultimate tensile strength 75000 PSI.
- 7 Hardness 80 HRB Max.

Recommended allowable working pressure for Fractional Alloy 400 tube

Tube OD in INCH	Tube Wall Thickness in inches							
	0.028	0.035	0.049	0.065	0.083	0.095	0.109	0.120
	Working pressure in psig							
1/8"	7900	10100						
1/4"	3700	4800	7000	9500				
3/8"		3100	4400	6100				
1/2"		2300	3200	4400				
3/4"			2200	3000	4000	4600		
1"				2200	2900	3400	3900	4300

Notes :

- 1 Allowable working pressure loads calculated from S value of 18700 (128800 kPa) for ASTM B 165 at -20 to 100°F (-28 to 37°C) as listed in ASME B31.3 code.
- 2 Multiply Alloy 400 rating by 0.93 for working pressure according to ASME B31.1
- 3 Hardness 75 HRB max.

Recommended allowable working pressure for Fractional Copper tube

Tube OD in INCH	Tube Wall Thickness in inches									
	0.028	0.035	0.049	0.065	0.083	0.095	0.109	0.12	0.134	
	Working pressure in psig									
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		
1 1/8"				600	800	1000	1100	1300	1400	

Notes :

- 1 Allowable working pressure loads calculated from S value of 6 000 psi (41 300 kPa) for ASTM B75 tubing at -20 to 100°F (-28 to 37°C) as listed in ASME B31.3 code.

Recommended allowable working pressure for Fractional Hastelloy C-276 tube

Tube OD in INCH	Tube Wall Thickness in inches			
	0.028	0.035	0.049	0.065
	Working pressure in psig			
1/4"	4000	5100	7500	10200
3/8"		3300	4800	6500
1/2"		2600	3700	5100

Notes :

- 1 Allowable working pressure loads calculated from S value of 20000 psi (137800 kPa) for ASTM B 622 or equivalent
- 2 Hardness 100 HRB max.

Screwed End Pressure Rating:

Pressure ratings for fittings with both tube fitting and pipe thread ends are determined by the end connection with the lower pressure rating. Pressure ratings listed are for temperature up to 37°C (100°F). Pressure rating is calculated at -28 to 37°C (-20 to 100°F) using allowable stress value of 20000 psi for SS316, 10000 psi for Brass, and 20000 psi for Carbon Steel as per ASME B31.3 Process Piping Code. While determining pressure ratings in accordance with B31.1 power piping, multiply below pressure rating values by a factor 0.94 for MOC stainless steel and by 0.85 for MOC Steel. Brass rating values remains unchanged.

NPT Size	Pressure Rating in PSI (Male Threads)	
	SS 316 / Steel	Brass
1/16"	11000	5000
1/8"	10000	4500
1/4"	8000	4000
3/8"	7500	4000
1/2"	7500	4000
3/4"	7000	3500
1"	5000	3000
1 1/4"	5000	3000
1 1/2"	4500	2500
2"	4000	2000

NPT Size	Pressure Rating in PSI (Female Threads)	
	SS 316 / Steel	Brass
1/16"	6800	3500
1/8"	6800	3500
1/4"	6800	3000
3/8"	5500	3000
1/2"	5000	3000
3/4"	4800	2500
1"	4500	2500
1 1/4"	4500	2200
1 1/2"	4000	2200
2"	4000	2000

Ratings for SAE/MS Fittings:

Pressure ratings are based on SAE J1926/3 at ambient temperature.

SAE MS Thread Size	Designator	SS 316 and Carbon Steel			
		Non Positionable		Positionable	
		psig	Bar	psig	Bar
5/16-24	2ST	4568	315	4568	315
7/16-20	4ST				
1/2-20	5ST				
9/16-18	6ST			3626	250
3/4-16	8ST				
7/8-14	10ST	3626	250	2900	200
1 1/16-12	12ST				
1 3/16-12	14ST				
1 5/16-12	16ST	2900	200	2320	160
1 5/8-12	20ST				
1 7/8-12	24ST				
2 1/2-12	32ST	1813	125	1450	100

Ordering / Part Number De-coding:

A - **B** - **C** - **D** - **E F**

A: Fitting Family

TF : Tube Fitting

B: Material

SS: SS 316

304: SS304

B: Brass

M : Monel 400

HC: Hastelloy C

SD : SAF 2507

C: Fitting Type

1: Male Connector

1B: Bulkhead Male Connector

2: Female Connector

2B: Bulkhead Female Connector

3: Tee

4: Cross

5: Union

5R: Reducing Union

5B: Bulkhead Union

6: Elbow

6R: Reducing Elbow

7: Male Elbow

8: Female Elbow

C: Tube Cap

F: Ferrule Set

N: Nut

NF: Nut and Ferrule Set

OOM: Male Branch Tee

OMO: Male Run Tee

OOF: Female Branch Tee

OFO: Female Run Tee

P: Plug

PC: Port Connector

R: Reducer

RB: Bulkhead Reducer

TA: Tube Adaptor

MTA: Male Tube Adaptor

FTA: Female Tube Adaptor

D: Size

Fractional

1: 1/16"

2: 1/8"

3: 3/16"

4: ¼"

5: 5/16"

6: 3/8"

8: ½"

10: 5/8"

12: ¾"

14: 7/8"

16: 1"

20: 1 1/4"

24: 1 1/2"

32: 2"

Metric

2: 2 mm

3: 3 mm

4: 4 mm

6: 6 mm

8: 8 mm

10: 10 mm

12: 12 mm

14: 14 mm

16: 16 mm

18: 18 mm

20: 20 mm

22: 22 mm

28: 28 mm

32: 32 mm

38: 38 mm

50: 50 mm

E: Second End Connection Size

(Choose and add the size designator from above)

F: Second End Connection Type

(NPT is standard)

AN: Male AN 37⁰

FAN: Female AN 37⁰

BT: Bored Through

M: Metric

P: Parallel Thread

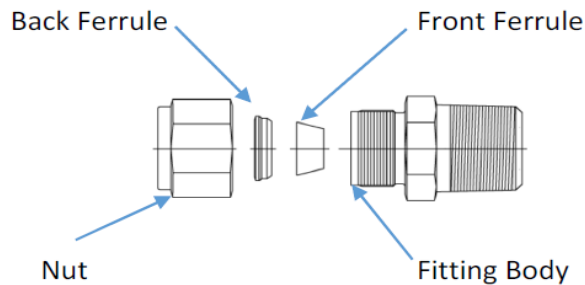
PW: Pipe Weld

SW: Socket Weld

Installation and Operational Instructions:

Repute Instrumentation tube fittings are double ferrule tube fittings which provides leak-proof tubing connections. Tube fittings are supplied completely assembled and ready to use. To make a connection, one will need tube fitting, appropriate tooling, tube and trained personnel.

The basic Double-Ferrule Tube Fitting is a four-piece fitting consisting of the nut, back ferrule, front ferrule and the fitting body as shown below.



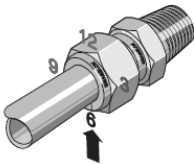
The tube needs to be prepared for making up fittings. Tube ends should be cut at right angle and must be free from burrs, scratches and dent marks for a leak-proof joint. Use of appropriate tools like tube cutter, deburring tools are recommended for preparing tube for connection.

Repute tube fittings can be installed in following three easy steps.

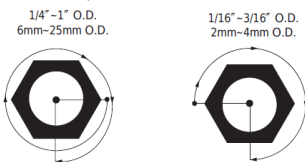
1. Insert the squarely cut and deburred tubing into the fitting and ensure the tubing rests firmly against the fitting body shoulder. Rotate the nut finger-tight until tube does not rotate by hand.



2. Mark the nut at 6 o'clock position.



3. While holding fitting body steady with a spanner, tighten the nut 1 1/4 turns, from the marked position.



- For smaller sizes 1/16, 1/8, and 3/16 in.; 2, 3, and 4 mm tube fittings, only 3/4 turn from finger tight is required.
- For higher sizes above 1" (25 mm), Pre-swage the ferrules on tubing and tighten 1/2 turn.

Reassembly Instructions:

You may disassemble and reassemble Repute tube fittings repeatedly to achieve the same reliable leak-proof connection. We suggest following reassembly steps.

1. Before disassembling mark the position of the nut with respect to fitting body.
2. While making up reassembly, simply insert tube assembly firmly to bottom into fitting body. Hold the body with the spanner and tighten nut to the original position as indicated by the previous mark.
3. Tighten until you feel some resistance (increase in torque) and then give a snug (Approximately $\frac{1}{4}$ turn) to complete reassembly.

Preassembly Instructions:

Installations at overhead locations or in the confined areas makes it difficult to make connections with standard assembly procedure. Pre-swaging tools are available which pre-swages ferrules on the tubing. This pre-swaged assembly can then be used to achieve leak proof joints by following installation instructions.

1. Inspect the pre-swaging tool to confirm it is free from burrs and is in good condition. Assemble ferrules and nut on the Preassembly Tool and tighten the nut to finger tight position.
 2. Insert the prepared tube through nut and ferrules and ensure the tubing rests firmly against the tool shoulder.
 3. From the finger tight position, mark the 6 o' clock position and rotate the nut 1-1/4 turns.
 4. Dis-engage the nut from the preassembly Tool and take out the tube with the ferrules pre- swaged onto the tube with axial force. Do not rotate the tubing.
 5. Insert tube with pre-swaged ferrules into the fitting body where the desired connection is to be made. Tighten the nut to the finger tight position.
 6. To make the final connection, hold the body with the spanner and tighten nut to the original position as indicated by the previous mark. An increase of torque will be felt, from this point give a snug.
- *For smaller sizes 1/16, 1/8, and 3/16 in.; 2, 3, and 4 mm tube fittings, only 3/4 turn from finger tight is required.*

** Metric tube fittings are identified by a stepped machined shoulder on both, the body and threaded side of the nut.

