

## **MANUFACTURING METHODS FOR BRASS FITTINGS**

### ***Bar Stock and Extruded Fittings and Nuts***

A solid round billet of brass is heated to the pliable state and forced through a die of the appropriate configuration. The resulting continuous length is cooled, then drawn to size through another set of dies. After straightening, the bars are ready for machining. This process produces a dense, nonporous product with a longitudinal grain and large wrench flats that allow for easier installation. All of Versa Fittings straight (screw machine ) and extruded shaped bodies are produced from either CA360 or CA345 brass.

### ***Forged Fittings and Nuts***

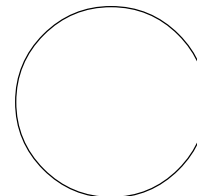
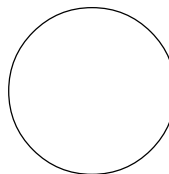
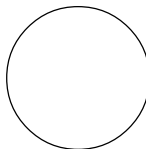
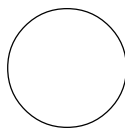
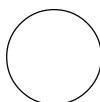
The initial process to produce material for forging is much the same as for extruded bars differing only in temper and chemistry. The bars are then cut into short lengths, reheated and machine pressed between forging dies at approximately 25,000 p.s.i., the flashing is then trimmed and the blank is ready to be machined. This process produces a uniformly dense material with a grain that follows the contours of the fitting and has a high impact resistance. All of Versa Fittings forgings are produced from CA377 brass.

### ***ACTUAL OUTSIDE DIAMETER OF TUBING***

FRACTION	1/16 "	1/8 "	5/32 "	3/16 "	1/4 "	5/16 "	3/8 "	7/16 "
DECIMAL	( 0.0625 )	( 0.125 )	( 0.1563 )	( 0.1875 )	( 0.250 )	( 0.3125 )	( 0.375 )	( 0.4375 )
SIZE CODE	-1	-2	-5/32	-3	-4	-5	-6	-7

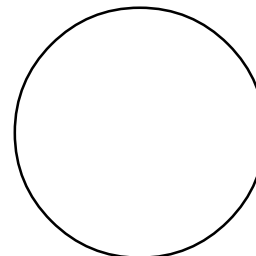
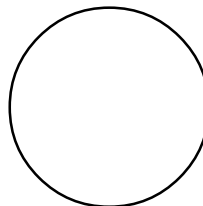
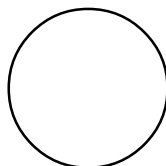
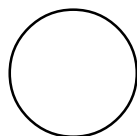
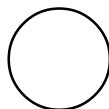


FRACTION	1/2 "	5/8 "	3/4 "	7/8 "	1 "
DECIMAL	( 0.500 )	( 0.625 )	( 0.750 )	( 0.875 )	( 1.000 )
SIZE CODE	-8	-10	-12	-14	-16



### ***ACTUAL OUTSIDE DIAMETER OF PIPE***

1/16-27	1/8-27	1/4-18	3/8-18	1/2-14	3/4-14	1-11½
( 0.3125 )	( 0.405 )	( 0.540 )	( 0.675 )	( 0.840 )	( 1.050 )	( 1.315 )
-1	-A	-B	-C	-D	-E	-F



## STRAIGHT THREAD SIZE CHART

Versa Fittings Inc.		Outside Diameter of Tubing											
		1/8	3/16	1/4	5/16	3/8	7/16	1/2	5/8	3/4	7/8	1	
SAE 45° Flare		5/16 -24	3/8 -24	7/16 -20	1/2 -20	5/8 -18	11/16 -18	3/4 -16	7/8 -14	1-1/16 -14	1-1/4 -12	1-3/8 -12	
Inverted Flare		5/16 -28	3/8 -24	7/16 -24	1/2 -20	5/8 -18	11/16 -18	3/4 -18	7/8 -18	1-1/16 -16			
Standard Compression		5/16 -24	3/8 -24	7/16 -24	1/2 -24	9/16 -24	5/8 -24	11/16 -20	13/16 -18	1 -18	1-1/8 -18		
Versa-Flo		5/16 -24	3/8 -24	3/8 -24	7/16 -24	1/2 -24		11/16 -20					
Air Brake Compression				7/16 -24		17/32 -24		11/16 -20	13/16 -18	1 -18			
JIC 37° Flare		5/16 -24	3/8 -24	7/16 -20	1/2 -20	9/16 -18		3/4 -16	7/8 -14	1-1/16 -12	1-3/16 -12	1-5/16 -12	
Threaded Sleeve		5/16 -24	3/8 -24	7/16 -24	1/2 -20	9/16 -20	5/8 -18	11/16 -16	7/8 -18	1 -20			
FRACTIONAL SIZE CODES FOR HOSE AND TUBING													
TUBE SIZE	1/8	5/32	3/16	1/4	5/16	3/8	7/16	1/2	5/8	3/4	7/8	1	
CODE	-2	-5/32	-3	-4	-5	-6	-7	-8	-10	-12	-14	-16	
FRACTIONAL SIZE CODES FOR PIPE													
PIPE SIZE	1/16 -27	1/8 -27	1/4 -18	3/8 -18	1/2 -14	3/4 -14	1 -11½	1¼ -11½	1½ -11½	2 -11½	2½ -8	3 -8	4 -8
CODE	-1	-A	-B	-C	-D	-E	F	-G	-H	-I	-J	-K	-L

## ***S.A.E. 45° FLARE FOR TUBING***

The following procedures and specifications should be met in order to properly flare hard wall tubing such as copper and aluminum, for use with Versa Fittings 45° flare fittings.

### ***FLARING PROCEDURES***

#### ***1) Cut tubing with proper tube cutter***

To minimize workhardening and burr, use a light feed and make several revolutions.

#### ***2) Ream the tubing carefully***

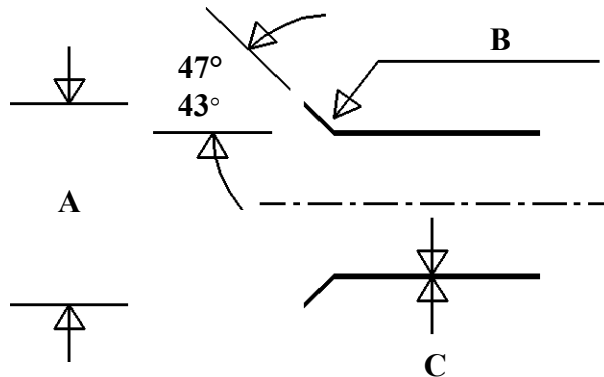
Any burr must be removed to obtain maximum sealing surface. Remove only the burr, not material from the original wall thickness.

#### ***3) Flare tubing***

Using a compression or generating type flaring tool, follow tool manufacturers instructions.

#### ***4) Inspect flare***

The flare seat (the inside of the cone) must be smooth. The outside diameter of the flare cone at the largest point, when measured with micrometers should be sized according to the chart below ( dimension " A " ).



<i>Tube Outside Diameter</i>	<i>"A" Single Flare Diameter</i>		<i>"B" Single Flare Radius</i>	<i>"C" Single Flare Wall Thickness</i>
<i>inches</i>	<i>inches</i>		<i>inches</i>	<i>inches</i>
	<i>Max.</i>	<i>Min.</i>	<i>±0.01</i>	<i>Max.</i>
<i>1/8</i>	<i>0.181</i>	<i>0.171</i>	<i>0.02</i>	<i>0.035</i>
<i>3/16</i>	<i>0.249</i>	<i>0.239</i>	<i>0.02</i>	<i>0.035</i>
<i>1/4</i>	<i>0.325</i>	<i>0.315</i>	<i>0.02</i>	<i>0.049</i>
<i>5/16</i>	<i>0.404</i>	<i>0.388</i>	<i>0.02</i>	<i>0.049</i>
<i>3/8</i>	<i>0.487</i>	<i>0.471</i>	<i>0.02</i>	<i>0.065</i>
<i>7/16</i>	<i>0.561</i>	<i>0.545</i>	<i>0.02</i>	<i>0.065</i>
<i>1/2</i>	<i>0.623</i>	<i>0.607</i>	<i>0.02</i>	<i>0.083</i>
<i>5/8</i>	<i>0.748</i>	<i>0.732</i>	<i>0.02</i>	<i>0.095</i>
<i>3/4</i>	<i>0.916</i>	<i>0.900</i>	<i>0.02</i>	<i>0.109</i>
<i>7/8</i>	<i>1.041</i>	<i>1.025</i>	<i>0.02</i>	<i>0.109</i>

## ***CHEMICAL RESISTANCE TABLE***

FLUID	BRASS	POLYETHYLENE	P.V.C.	NYLON 6/6	NYLON 11
Acetaldehyde	-	L	X	L	L
Acetic Acid (Dilute )	X	G	L	L	L
Acetic Acid ( Conc. )	X	X	L	X	X
Acetic Anhydride	X	X	X	-	X
Acetone	G	L	X	G	L
Acetylene	G	-	-	-	G
Air	G	G	G	G	G
Alcohols ( Amyl )	G	X	G	-	L
Alcohols ( Butyl )	G	-	L	L	X
Alcohols ( Ethyl )	G	X	L	G	L
Alcohols ( Isopropyl )	-	X	G	-	L
Alcohols ( Methyl )	G	X	L	G	L
Aluminum Chloride	X	G	G	L	-
Aluminum Fluoride	X	G	L	L	X
Aluminum Hydroxide	G	G	G	-	-
Aluminum Nitrate	X	-	G	L	-
Aluminum Sulfate	X	G	G	L	G
Alums	X	G	G	L	G
Ammonia ( Gas )	X	G	-	-	G
Ammonia ( Liquid )	X	-	X	G	-
Ammonium Chloride	X	G	G	X	G
Ammonium Hydroxide	X	G	G	G	-
Ammonium Nitrate	X	G	G	-	G
Ammonium Phosphate	X	G	G	-	L
Ammonium Sulphate	X	G	G	-	L
Amyl Acetate	L	X	X	X	G
Aniline	L	X	X	-	X
Aromatic Hydrocarbon	-	-	-	-	L
Barium Chloride	X	G	G	X	G
Barium Hydroxide	L	G	G	-	-
Barium Sulfate	G	G	G	G	-
Barium Sulfide	L	G	G	L	-
Beer	G	G	-	-	G
Beet Sugar Liquors	L	-	-	-	-
Benzaldehyde	-	X	X	-	L
Benzene ( Benzol )	G	X	X	X	X
Benzoic Acid	L	G	X	X	L
Boric Acid	X	G	G	X	-
Bromine	L	X	X	X	X
Butane	G	-	-	-	G
Calcium Acetate	-	-	-	-	-
Calcium Bisulfite	X	-	-	-	-
Calcium Chloride	X	G	G	X	G
Calcium Hydroxide	L	G	G	-	-
Calcium Hypochloride	X	L	L	X	X
Carbon Dioxide ( Dry )	G	G	-	-	G
Carbon Dioxide ( Wet )	L	-	-	-	G
Carbon Disulphide	G	-	X	-	L
Carbon Tetrachloride	L	X	X	G	X
Chlorine ( Dry )	G	X	-	X	X
Chlorine ( Wet )	X	X	-	X	X
Chloroform	G	X	X	L	X
Chromic Acid	X	G	X	X	X
Citric Acid	L	G	G	L	L
Copper Chloride	X	G	G	X	L
Copper Cyanide	X	G	G	-	L
Copper Sulfate	X	G	G	-	L
Cresol	-	X	X	X	X
Cyclohexanol	-	X	X	-	L
Ethers	G	X	X	-	G
Ethyl Acetate	L	X	X	G	G
Ethylene Glycol	L	G	G	G	L

LEGEND G= GOOD L= LIMITED ( USE ONLY AFTER TESTING ) X= UNSATISFACTORY - = DATA NOT AVAILABLE

NOTE: all Data is believed to be accurate and reliable, but are presented without guarantee, warranty or responsibility of any kind on our part. These tables are meant as guidelines only. Your chemical manufacturer should be able to provide you with more detailed information for your specific application.

## CHEMICAL RESISTANCE TABLE

FLUID	BRASS	POLYETHYLENE	P.V.C.	NYLON 6/6	NYLON 11
Fatty Acids	-	X	-	-	G
Formaldehyde	L	G	G	G	L
Freons	G	-	-	G	G
Fruit Juices	X	-	-	-	-
Gasoline ( refined )	G	X	-	-	G
Glucose	G	-	-	-	G
Glycerine	G	G	G	-	L
Hydrochloric Acid	X	G	G	X	L
Hydrogen Peroxide	X	L	G	X	L
Iodine	-	X	X	-	-
Kerosene	G	-	-	-	G
Lactic Acid	L	G	L	G	G
Linseed Oil	L	X	-	G	G
Lubricating Oil	G	X	-	-	G
Mercuric Chloride	X	G	X	-	-
Mercury	X	G	-	-	G
Methane	G	X	-	-	G
Methyl Bromide	G	X	X	-	L
Methyl Chloride	G	X	X	-	L
Methyl Ethyl Ketone	L	X	X	-	L
Methyl Isobutyl Ketone	-	X	X	G	L
Methyl Isopropyl Ketone	L	-	-	-	L
Milk	L	-	-	-	-
Mineral Oil	G	X	L	-	G
Naptha	L	L	-	L	L
Napthalene	L	-	X	-	-
Nitric Acid	X	L	L	X	X
Olaic Acid	L	X	G	-	L
Oxalic Acid	L	G	G	-	L
Oxygen	G	G	G	-	G
Ozone	-	X	-	-	X
Paper Mill Liquors	-	G	-	-	-
Petroleum Oils	G	-	-	-	G
Phenol	-	L	X	X	X
Phosphoric Acid	X	L	G	X	L
Potassium Chloride	X	G	G	G	G
Potassium Cyanide	X	-	G	-	-
Potassium Dichromate	X	G	G	-	X
Potassium Hydroxide	L	G	G	L	-
Potassium Permanganate	-	G	G	X	X
Potassium Sulfate	L	G	G	-	G
Propane	G	-	-	-	G
Silver Nitrate	X	G	-	-	G
Soap Solutions	L	-	-	-	G
Sodium Bicarbonate	L	G	G	G	-
Sodium Bisulfate	X	G	G	-	-
Sodium Bisulfite	X	G	G	-	-
Sodium Borate	-	-	G	-	-
Sodium Chloride	X	G	G	G	G
Sodium Hydroxide	L	G	L	L	L
Sodium Nitrate	L	G	G	G	-
Sulfur Dioxide	X	G	L	X	-
Sulfuric Acid	X	L	L	X	L
Tannic Acid	L	G	G	-	-
Trichlorethylene	G	X	X	-	X
Turpentine	L	-	-	-	G
Uric Acid	-	-	-	-	-
Vinegar	X	-	G	-	G
Water	L	G	G	-	G
Xylene	G	-	X	G	L
Zinc Chloride	X	-	G	-	L
Zinc Sulfate	X	-	G	-	-

LEGEND G= GOOD L= LIMITED ( USE ONLY AFTER TESTING ) X= UNSATISFACTORY - = DATA NOT AVAILABLE

NOTE: all Data is believed to be accurate and reliable, but are presented without guarantee, warranty or responsibility of any kind on our part. These tables are meant as guidelines only. Your chemical manufacturer should be able to provide you with more detailed information for your specific application.