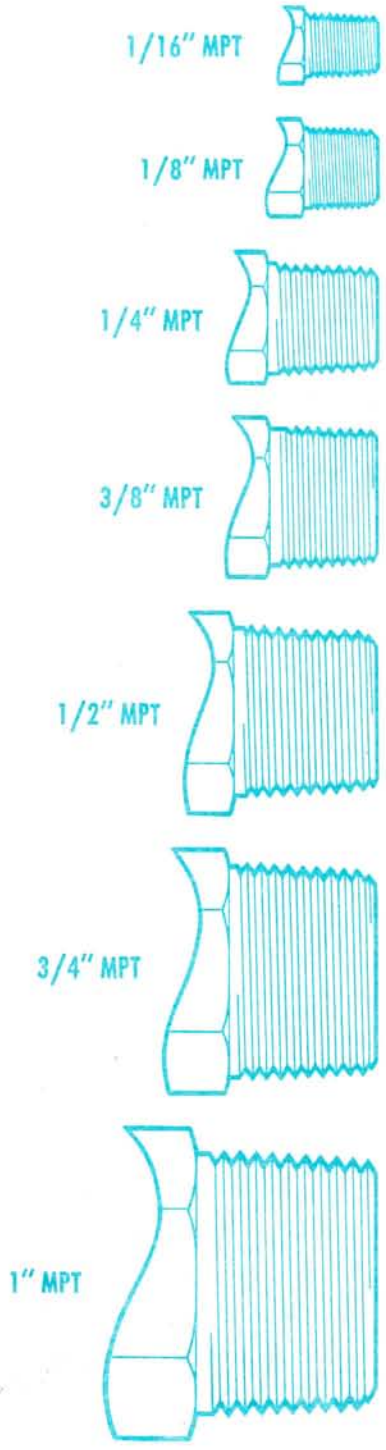
Tube Fittings
(1" & under)

PIPE AND TUBE END SIZE CHART

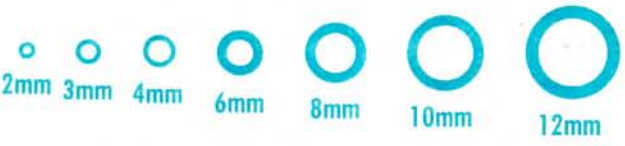
PIPE THREAD SIZE NPT



For pipe thread and tubing O.D. sizes over 1", see reverse side of tab, Tube Fittings (over 1").

TUBING O.D. SIZE	SWAGELOK FITTING SIZE
1/16"	100
1/8"	200
3/16"	300
1/4"	400
5/16"	500
3/8"	600
1/2"	810
5/8"	1010
3/4"	1210
7/8"	1410
1"	1610

METRIC TUBING O.D. SIZE

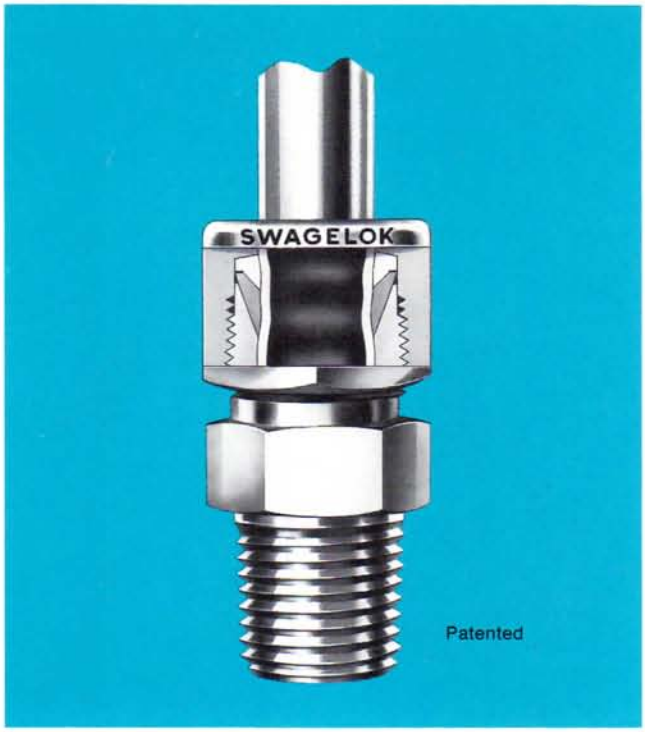


C-1072

Swagelok®

Tube Fittings (1″ & under)

Here's How The SWAGELOK FITTING Functions



SWAGELOK Tube Fittings provide a leak-proof, torque-free seal at all tubing connections and eliminate costly, hazardous leaks in instrumentation and process tubing.

In the illustration, notice that the tubing is supported ahead of the ferrules by the fitting body. Two ferrules grasp tightly around the tube with no damage to the tube wall. There is virtually no constriction of the inner wall insuring minimum flow restriction. Exhaustive tests have proven that the tubing will yield before a SWAGELOK Tube Fitting will leak.

The secret of the SWAGELOK Tube Fitting is that all the action in the fitting moves along the tube axially instead of with a rotary motion. Since no torque is transmitted from the fitting to the tubing, there is no initial strain which might weaken the tubing.

The SWAGELOK patented sequential action overcomes variations in tube materials, wall thickness and hardness by its double ferrule inter-action. Ferrule inter-action thus overcomes most of the variables which cause other fittings to fail.

SWAGELOK Tube Fittings are easily installed with no special tools. See the installation instructions on page 27.

CHECKLIST FOR EXCELLENCE IN TUBE FITTINGS

Design

A Tube Fitting Should . . .

- Be **self-aligning.**
- Work on **thick or thin** wall tubing.
- Have **tube support** ahead of the seal to resist vibration.
- Work on **any tube** material.
- Have all components made of the **same material** as the fitting body for thermal compatibility and corrosion resistance.
- Have a **residual spring** condition so that temperature cycling will not cause leakage.
- Seal on **machined surfaces.**
- Seal between ferrule and body at a point **different from where the heavy work** is performed.
- **Compensate** for the normal variables encountered in tubing materials.
- **Not** create torque or leave a **residual strain** on the tubing.
- **Not weaken** the tube wall.
- **Not** significantly **reduce** flow area.

Performance

A Tube Fitting Should . . .

- Contain any pressure up to the burst point of the tubing **without leakage.**
- Work on **vacuum** as well as **low** or **high** pressures.
- Seal **consistently at cryogenic** temperatures.
- Seal **consistently at elevated** temperatures up to the maximum tubing temperature rating.
- Seal **consistently over a wide range of** temperature cycling.
- Seal repeatedly under **make-and-break** conditions.

Assembly

A Tube Fitting Should . . .

- Use **geometry rather than torque** for uniformity of make-up (1-¼ turns).
- **Not** require **disassembly and inspection** before or after initial make-up.
- **Not require special tools** for assembly.

Service

A Tube Fitting Should . . .

- Be **readily available** in all sizes, materials, end connections and configurations from local distributor stocks, with substantial back-up stocks to support distributor inventories.
- Be designed, manufactured, sold, and serviced by experienced **tube fitting specialists** who understand and respect the need for reliable performance.

Swagelok®

Tube Fittings

Use SWAGELOK TUBE FITTINGS for all industrial applications requiring trouble-free and leak-proof operations

CAUTION
Do not mix or interchange parts of tube fittings made by other manufacturers.

SWAGELOK Tube Fittings are manufactured to exacting tolerances. The critical inter-action of precision parts as designed is essential to reliability and safety. Using parts of fittings made by other manufacturers with SWAGELOK Tube Fitting parts will not provide reliable connections. Damage or injuries may result from interchanging or mixing parts of tube fittings made by other manufacturers with SWAGELOK Tube Fitting parts.

SWAGELOK Tube Fittings are the subject of pending and issued U. S. and foreign patents.

For Quick-Connects, Flexible Metal Hose, Tube Fittings over 1", Lubricants/Sealants, and Technical Information, see appropriate subsections of Master Catalog Binder.

Swagelok®

Tube Fittings

AVAILABLE IN ALL MACHINEABLE METALS AND PLASTICS FOR PRESSURE AND VACUUM SERVICE

Component parts of SWAGELOK Tube Fittings are all made of the same material

TABLE OF CONTENTS

For Quick-Connects, Flexible Metal Hose, Tube Fittings over 1", Lubricants/Sealants, and Technical Information, see appropriate subsections of Master Catalog Binder.

Swagelok® Tube Fittings

AVAILABLE IN ALL MACHINEABLE METALS AND PLASTICS FOR PRESSURE AND VACUUM SERVICE

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FITTING LOCATER

All SWAGELOK Tube Fittings in this catalog are grouped by function.

TO CONNECT TUBING TO A FEMALE PIPE PORT USE:


MALE CONNECTOR
Page 7


BULKHEAD MALE CONNECTOR
Page 7


MALE ELBOW
Page 8


MALE ADAPTER TUBE TO PIPE
Page 8


MALE RUN TEE
Page 9


MALE BRANCH TEE
Page 9

TO CONNECT TUBING TO A MALE PIPE STUB USE:


FEMALE CONNECTOR
Page 10


BULKHEAD FEMALE CONNECTOR
Page 10


FEMALE ELBOW
Page 11


FEMALE ADAPTER TUBE TO PIPE
Page 11


FEMALE RUN TEE
Page 12


FEMALE BRANCH TEE
Page 12

TO CONNECT TWO OR MORE TUBES TOGETHER USE:


UNION
Page 14


BULKHEAD UNION
Page 14


REDUCING UNION
Page 15


UNION ELBOW
Page 15


UNION TEE
Page 16


UNION CROSS
Page 16


SWAGELOK TO AN UNION
page 17


SWAGELOK TO AN BULKHEAD UNION
Page 17

TO CONNECT TWO OR MORE TUBE FITTINGS TOGETHER USE:


BULKHEAD ADAPTER
Page 18


REDUCER
Page 18


SWAGELOK TO AN ADAPTER
Page 19


PORT CONNECTOR
Page 19

TO CAP A TUBE OR PLUG A FITTING USE:


CAP
Page 20


PLUG
Page 20

TO CONNECT TUBING TO AN ALL WELDED SYSTEM USE:


SWAGELOK TO MALE PIPE WELD CONNECTOR
Page 21


SWAGELOK TO MALE PIPE WELD ELBOW
Page 21


SWAGELOK TO TUBE SOCKET WELD UNION
Page 21


SWAGELOK TO TUBE SOCKET WELD ELBOW
Page 21

TO CONNECT TUBING TO PIPE OR STRAIGHT THREAD PORTS USING AN O-RING SEAL USE:


O-SEAL MALE CONNECTOR PIPE THREAD
Page 22


O-SEAL MALE ADAPTER PIPE THREAD
Page 23


O-SEAL STRAIGHT THREAD CONNECTOR
Page 23


O-SEAL STRAIGHT THREAD ADAPTER
Page 23

FOR SPECIAL CONNECTIONS SUCH AS GAS CHROMATOGRAPHS, HEAT EXCHANGERS OR THERMOCOUPLES USE:


GC FITTING
Page 24


HEAT EXCHANGER TEE
Page 24


THERMOCOUPLE MALE CONNECTOR
Page 24

AS SPARE PARTS USE:


NUT
Page 25


BACK FERRULE
Page 25


FRONT FERRULE
Page 25


KNURLED NUT
Page 25


INSERT
Page 26


FERRULE PAK
Page 26

When ordering be sure to specify material. See page 28 for complete ordering information.

Swagelok®

Tube Fittings

AVAILABLE IN ALL MACHINEABLE METALS AND PLASTICS FOR PRESSURE AND VACUUM SERVICE

Component parts of SWAGELOK Tube Fittings are all made of the same material

SUMMARY OF SWAGELOK FITTING DESIGNATOR CODES

TUBE SIZE DESIGNATORS	
Designator	**Tube O.D.**
-1	1/16"
-2	1/8"
-3	3/16"
-4	1/4"
-5	5/16"
-6	3/8"
-8	1/2"
-10	5/8"
-12	3/4"
-14	7/8"
-16	1"

FITTING SERIES DESIGNATORS	
Designator	**Design Sizes**
0	1/16" to 3/8" 1-1/4" to 2"
1	over 3/8" to 1-1/8"
M	millimeter tube sizes (see Metric Tube Fitting Catalog C-M373)
F	Female SWAGELOK

COMPONENT DESIGNATORS		See Catalog Page No.
Designator	**Designates**	
0	Complete Fitting Assembly	7
1	Body only (such as Adapter or Port Connector)	8,11,19,23
2	Nut	25
3	Front Ferrule	25
4	Back Ferrule	25
5	Insert	26

TYPE OF FITTING DESIGNATORS		See Catalog Page No.
Designator	**Type of Fitting**	
-1-	Male Connector	7
-2-	Male Elbow	8
-3-	Tee, Union	16
-3TTF	Tee, Female Branch	12
-3TFT	Tee, Female Run	12
-3TTM	Tee, Male Branch	9
-3TMT	Tee, Male Run	9
-4	Cross, Union	16
-5-	45° Male Elbow	8
-6	Union	14
-6-	Reducing Union	15
-7-	Female Connector	10
-8-	Female Elbow	11
-9	Elbow, Union	15
-11-	Bulkhead Male Connector	7
-61	Bulkhead Union	14
-71-	Bulkhead Female Connector	10
-A-	Adapter (Male if no suffix)	8
-A1-	Bulkhead Adapter	18
-C	Cap	20
-P	Plug	20
-R-	Reducer	18

End Connection Designator Suffix	End Designators (if needed)	See Catalog Page No.
-AN	37° Male AN Flare	17
-ANF	37° Female AN Flare	19
-BT	Bored-through Fitting	24
-GC	Low Volume Chromatograph Fitting	24
-F	Female Thread	11
-K	Knurled Nut	25
-KN	Knurled Nut, Nylon Ferrules	25
-KT	Knurled Nut, TFE Ferrules	25
-M	Metric Tube End	See Metric Tube Fitting Catalog C-M373
-MPW	Male Pipe Weld	21
-OR	O-Seal Connection	22,23
-ST	Straight Thread with O-Ring (for SAE Ports)	See Tube Fittings (over 1") D.S. 15B
-TSW	Tube Socket Weld	21
-NUMERAL	Size of second end connection	

For standard materials list and MATERIAL DESIGNATOR Codes, see page 28.
For a complete list of fitting materials and Material Designator Codes, see reverse side of "FITTINGS" divider in Master Catalog Binder.
For complete ordering instructions see page 28.

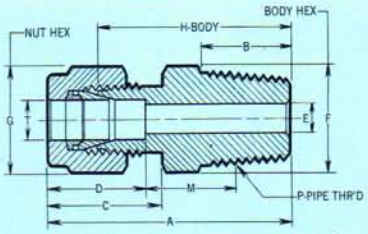
Swagelok® Tube Fittings

AVAILABLE IN ALL MACHINEABLE METALS AND PLASTICS FOR PRESSURE AND VACUUM SERVICE

Component parts of SWAGELOK Tube Fittings are all made of the same material

MALE CONNECTOR

NOTE—A-C-D dimensions are finger tight/ G-F dimensions are across hex flats



T Tube O.D.	P Male Pipe Size	CATALOG NUMBER	A	B	C	D	E Minimum Opening	F	G	H	M
1/16	1/16	-100-1-1	15/16	3/8	7/16	11/32	.052 *	5/16	5/16	25/32	11/32
1/16	1/8	-100-1-2	1	3/8	7/16	11/32	.052 *	7/16	5/16	27/32	13/32
1/8	1/16	-200-1-1	1 3/16	3/8	5/8	17/32	3/32 *	7/16	7/16	29/32	13/32
1/8	1/8	-200-1-2	1 3/16	3/8	5/8	17/32	3/32 *	7/16	7/16	29/32	13/32
1/8	1/4	-200-1-4	1 13/32	9/16	5/8	17/32	3/32 *	9/16	7/16	1 1/8	1/2
3/16	1/8	-300-1-2	1 15/64	3/8	21/32	9/16	1/8	7/16	1/2	61/64	27/64
3/16	1/4	-300-1-4	1 7/16	9/16	21/32	9/16	1/8	9/16	1/2	1 5/32	5/8
1/4	1/16	-400-1-1	1 5/16	3/8	23/32	5/8	1/8	1/2	9/16	1	7/16
1/4	1/8	-400-1-2	1 5/16	3/8	23/32	5/8	3/16	1/2	9/16	1	7/16
1/4	1/4	-400-1-4	1 1/2	9/16	23/32	5/8	3/16	9/16	9/16	1 3/16	1/2
1/4	3/8	-400-1-6	1 17/32	9/16	23/32	5/8	3/16	11/16	9/16	1 7/32	17/32
1/4	1/2	-400-1-8	1 3/4	3/4	23/32	5/8	3/16	7/8	9/16	1 7/16	5/8
5/16	1/8	-500-1-2	1 23/64	3/8	3/4	21/32	3/16	9/16	5/8	1 3/64	29/64
5/16	1/4	-500-1-4	1 35/64	9/16	3/4	21/32	1/4	9/16	5/8	1 15/64	33/64
3/8	1/8	-600-1-2	1 13/32	3/8	25/32	11/16	3/16	5/8	11/16	1 3/32	15/32
3/8	1/4	-600-1-4	1 19/32	9/16	25/32	11/16	9/32	5/8	11/16	1 9/32	17/32
3/8	3/8	-600-1-6	1 19/32	9/16	25/32	11/16	9/32	11/16	11/16	1 9/32	17/32
3/8	1/2	-600-1-8	1 13/16	3/4	25/32	11/16	9/32	7/8	11/16	1 1/2	5/8
3/8	3/4	-600-1-12	1 27/32	3/4	25/32	11/16	9/32	1 1/16	11/16	1 17/32	19/32
1/2	1/4	-810-1-4	1 23/32	9/16	7/8	29/32	9/32	13/16	7/8	1 5/16	7/16
1/2	3/8	-810-1-6	1 23/32	9/16	7/8	29/32	13/32	13/16	7/8	1 5/16	7/16
1/2	1/2	-810-1-8	1 29/32	3/4	7/8	29/32	13/32	7/8	7/8	1 1/2	1/2
1/2	3/4	-810-1-12	1 15/16	3/4	7/8	29/32	13/32	1 1/16	7/8	1 17/32	15/32
5/8	3/8	-1010-1-6	1 3/4	9/16	7/8	31/32	13/32	15/16	1	1 11/32	13/32
5/8	1/2	-1010-1-8	1 15/16	3/4	7/8	31/32	1/2	15/16	1	1 17/32	15/32
5/8	3/4	-1010-1-12	1 15/16	3/4	7/8	31/32	1/2	1 1/16	1	1 17/32	13/32
3/4	1/2	-1210-1-8	2	3/4	7/8	31/32	1/2	1 1/16	1 1/8	1 19/32	17/32
3/4	3/4	-1210-1-12	2	3/4	7/8	31/32	5/8	1 1/16	1 1/8	1 19/32	13/32
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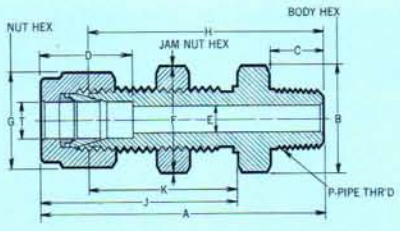
7/8	3/4	-1410-1-12	2	3/4	7/8	1 1/32	23/32	1 3/16	1 1/4	1 19/32	13/32
7/8	1	-1410-1-16	2 9/32	15/16	7/8	1 1/32	23/32	1 3/8	1 1/4	1 7/8	9/16
1	3/4	-1610-1-12	2 1/4	3/4	1 1/32	1 7/32	23/32	1 3/8	1 1/2	1 25/32	15/32
1	1	-1610-1-16	2 7/16	15/16	1 1/32	1 7/32	7/8	1 3/8	1 1/2	1 31/32	17/32

"M" is approximate distance from point where tube bottoms to face of female component after average pipe thread engagement.

*"E" dimension is minimum opening. Fittings of this group are back-drilled to larger bore I.D. at pipe thread end.

BULKHEAD MALE CONNECTOR

NOTE—A-D-J dimensions are finger tight/ G-F-B dimensions are across hex flats



T Tube O.D.	P Male Pipe Size	CATALOG NUMBER	A	B	C	D	E Minimum Opening	F	G	H	J	K	Panel Hole Drill Size	Max. Panel Thick-ness
1/8	1/8	-200-11-2	1 27/32	1/2	3/8	17/32	3/32	1/2	7/16	1 9/16	1 1/4	31/32	21/64	1/2
3/16	1/8	-300-11-2	1 7/8	9/16	3/8	9/16	1/8	9/16	1/2	1 9/32	1 9/32	1	25/64	1/2
1/4	1/8	-400-11-2	1 31/32	5/8	3/8	5/8	3/16	5/8	9/16	1 21/32	1 11/32	1 1/32	29/64	17/32
1/4	1/4	-400-11-4	2 1/8	5/8	9/16	5/8	3/16	5/8	9/16	1 13/16	1 11/32	1 1/32	29/64	17/32
3/8	1/4	-600-11-4	2 9/32	3/4	9/16	11/16	9/32	3/4	11/16	1 31/32	1 15/32	1 5/32	37/64	9/16
1/2	3/8	-810-11-6	2 1/2	15/16	9/16	29/32	13/32	15/16	7/8	2 3/32	1 21/32	1 1/4	49/64	19/32
1/2	1/2	-810-11-8	2 11/16	15/16	3/4	29/32	13/32	15/16	7/8	2 9/32	1 21/32	1 1/4	49/64	19/32

All dimensions in inches. Dimensions for reference only . . . subject to change

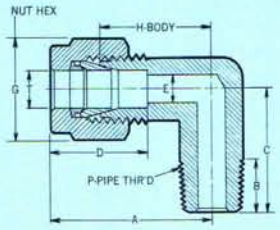
Swagelok® Tube Fittings

AVAILABLE IN ALL MACHINEABLE METALS AND PLASTICS FOR PRESSURE AND VACUUM SERVICE

Component parts of SWAGELOK Tube Fittings are all made of the same material

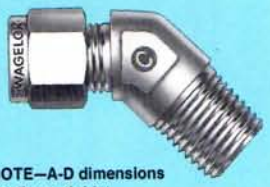
MALE ELBOW

NOTE—A-D dimensions are finger tight /F = across flats of wrench pads / G dimension is across hex flats

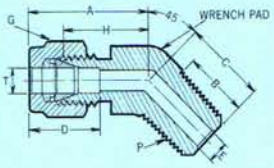


T Tube O.D.	P Male Pipe Size	CATALOG NUMBER	A	B	C	D	E Min. Opening	F	G	H
1/16	1/16	-100-2-1	23/32	3/8	11/16	11/32	.052	3/8	5/16	9/16
1/16	1/8	-100-2-2	23/32	3/8	23/32	11/32	.052	7/16	5/16	9/16
1/8	1/8	-200-2-2	15/16	3/8	23/32	17/32	3/32	7/16	7/16	21/32
1/8	1/4	-200-2-4	31/32	9/16	15/16	17/32	9/32	1/2	7/16	11/16
3/16	1/8	-300-2-2	31/32	3/8	3/4	9/16	1/8	7/16	1/2	11/16
1/4	1/8	-400-2-2	1 1/32	3/8	25/32	5/8	3/16	7/16	9/16	23/32
1/4	1/4	-400-2-4	1 3/32	9/16	15/16	5/8	3/16	1/2	9/16	25/32
1/4	3/8	-400-2-6	1 3/16	9/16	1 1/8	5/8	3/16	11/16	9/16	7/8
1/4	1/2	-400-2-8	1 9/32	3/4	1 5/16	5/8	3/16	13/16	9/16	31/32
5/16	1/8	-500-2-2	1 1/8	3/8	13/16	21/32	3/16	1/2	5/8	13/16
5/16	1/4	-500-2-4	1 1/8	9/16	1	21/32	1/4	1/2	5/8	13/16
3/8	1/8	-600-2-2	1 5/32	3/8	7/8	11/16	3/16	1/2	11/16	27/32
3/8	1/4	-600-2-4	1 5/32	9/16	1	11/16	9/32	1/2	11/16	27/32
3/8	3/8	-600-2-6	1 1/4	9/16	1 1/8	11/16	9/32	11/16	11/16	15/16
3/8	1/2	-600-2-8	1 11/32	3/4	1 1/4	11/16	9/32	13/16	11/16	1 1/32
1/2	1/4	-810-2-4	1 3/8	9/16	1 1/8	29/32	9/32	11/16	7/8	31/32
1/2	3/8	-810-2-6	1 3/8	9/16	1 1/8	29/32	13/32	11/16	7/8	31/32
1/2	1/2	-810-2-8	1 7/16	3/4	1 5/16	29/32	13/32	13/16	7/8	1 1/32
5/8	3/8	-1010-2-6	1 7/16	9/16	1 1/4	31/32	13/32	13/16	1	1 1/32
5/8	1/2	-1010-2-8	1 7/16	3/4	1 3/8	31/32	1/2	13/16	1	1 1/32
3/4	1/2	-1210-2-8	1 9/16	3/4	1 1/2	31/32	1/2	1	1 1/8	1 5/32
3/4	3/4	-1210-2-12	1 9/16	3/4	1 1/2	31/32	5/8	1	1 1/8	1 5/32
7/8	3/4	-1410-2-12	1 11/16	15/16	1 21/32	1 1/32	23/32	1 1/4	1 1/4	1 9/32
1	3/4	-1610-2-12	1 25/32	15/16	1 21/32	1 7/32	23/32	1 1/4	1 1/2	1 5/16
1	1	-1610-2-16	1 25/32	15/16	1 27/32	1 7/32	7/8	1 1/4	1 1/2	1 5/16

45° MALE ELBOW



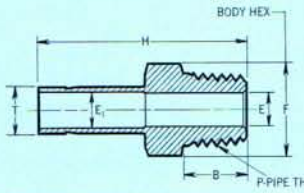
NOTE—A-D dimensions are finger tight / F = across flats of wrench pads / G dimension is across hex flats



T Tube O.D.	P Male Pipe Size	CATALOG NUMBER	A	B	C	D	E Min. Opening	F	G	H
1/4	1/8	-400-5-2	1 1/32	3/8	25/32	5/8	3/16	7/16	9/16	23/32
1/4	1/4	-400-5-4	1 3/32	9/16	15/16	5/8	3/16	1/2	9/16	25/32
3/8	1/8	-600-5-2	1 5/32	3/8	7/8	11/16	3/16	1/2	11/16	27/32
3/8	1/4	-600-5-4	1 5/32	9/16	1	11/16	9/32	1/2	11/16	27/32
3/8	3/8	-600-5-6	1 1/4	9/16	1 1/8	11/16	9/32	11/16	11/16	15/16
1/2	1/4	-810-5-4	1 3/8	9/16	1 1/8	29/32	9/32	11/16	7/8	31/32
1/2	3/8	-810-5-6	1 3/8	9/16	1 1/8	29/32	13/32	11/16	7/8	31/32

MALE ADAPTER TUBE TO PIPE

NOTE—F dimension is across hex flats.



T Tube O.D.	P Male Pipe Size	CATALOG NUMBER	B	F	H	E	E1
1/16	1/16	-101-A-1	3/8	5/16	27/32	1/8	1/32
1/16	1/8	-101-A-2	3/8	7/16	29/32	3/16	1/32
1/8	1/8	-201-A-2	3/8	7/16	1 1/8	3/16	3/32
1/8	1/4	-201-A-4	9/16	9/16	1 5/16	9/32	3/32
3/16	1/8	-301-A-2	3/8	7/16	1 5/32	3/16	1/8
3/16	1/4	-301-A-4	9/16	9/16	1 11/32	9/32	1/8
1/4	1/8	-401-A-2	3/8	7/16	1 7/32	.193	.193
1/4	1/4	-401-A-4	9/16	9/16	1 13/32	.193	.193
1/4	3/8	-401-A-6	9/16	11/16	1 7/16	.193	.193
1/4	1/2	-401-A-8	3/4	7/8	1 21/32	.193	.193
5/16	1/8	-501-A-2	3/8	7/16	1 1/4	3/16	1/4
5/16	1/4	-501-A-4	9/16	9/16	1 15/32	1/4	1/4
5/16	3/8	-501-A-6	9/16	11/16	1 15/32	13/32	1/4
5/16	1/2	-501-A-8	3/4	7/8	1 11/16	1/2	1/4
3/8	1/8	-601-A-2	3/8	7/16	1 5/16	3/16	9/32

T Tube O.D.	P Male Pipe Size	CATALOG NUMBER	B	F	H	E	E1
3/8	1/4	-601-A-4	9/16	9/16	1 1/2	9/32	9/32
3/8	3/8	-601-A-6	9/16	11/16	1 1/2	9/32	9/32
3/8	1/2	-601-A-8	3/4	7/8	1 23/32	9/32	9/32
1/2	1/4	-811-A-4	9/16	9/16	1 23/32	9/32	25/64
1/2	3/8	-811-A-6	9/16	11/16	1 3/4	25/64	25/64
1/2	1/2	-811-A-8	3/4	7/8	1 15/16	25/64	25/64
5/8	3/8	-1011-A-6	9/16	11/16	1 13/16	13/32	1/2
5/8	1/2	-1011-A-8	3/4	7/8	2	1/2	1/2
5/8	3/4	-1011-A-12	3/4	1 1/16	2 1/32	5/8	1/2
3/4	1/2	-1211-A-8	3/4	7/8	2	1/2	19/32
3/4	3/4	-1211-A-12	3/4	1 1/16	2 1/32	19/32	19/32
3/4	1	-1211-A-16	15/16	1 3/8	2 9/32	7/8	19/32
7/8	3/4	-1411-A-12	3/4	1 1/16	2 3/32	11/16	11/16
1	3/4	-1611-A-12	3/4	1 1/16	2 9/32	23/32	51/64
1	1	-1611-A-16	15/16	1 3/8	2 9/16	51/64	51/64

For additional information on adapters, see page 13.

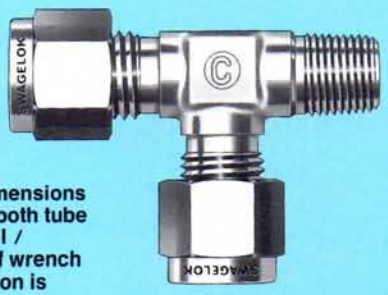
All dimensions in inches. Dimensions for reference only . . . subject to change

Swagelok® Tube Fittings

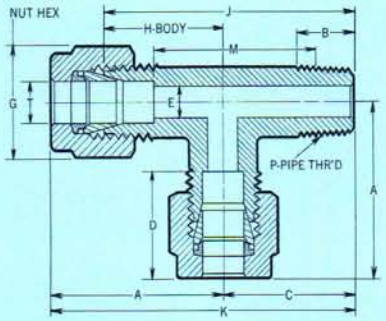
AVAILABLE IN ALL MACHINEABLE METALS AND PLASTICS FOR PRESSURE AND VACUUM SERVICE

Component parts of SWAGELOK Tube Fittings are all made of the same material

MALE RUN TEE



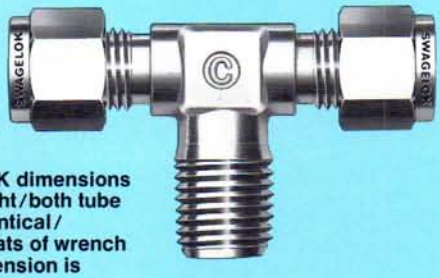
NOTE—A-D-K dimensions are finger tight / both tube ports are identical / F = across flats of wrench pads / G dimension is across hex flats



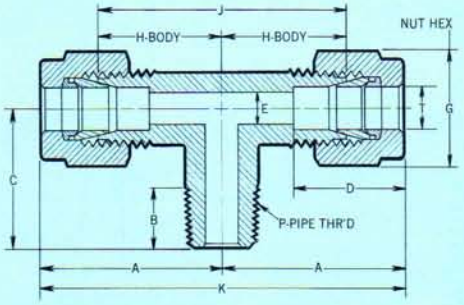
T Tube O.D.	P Male Pipe Size	CATALOG NUMBER	A	B	C	D	E Minimum Opening	F	G	H	J	K	M
1/16	1/16	-100-3TMT	23/32	3/8	11/16	11/32	.052	3/8	5/16	9/16	1 1/4	1 13/32	13/16
1/8	1/8	-200-3TMT	15/16	3/8	23/32	17/32	3/32	7/16	7/16	21/32	1 3/8	1 21/32	7/8
1/8	1/4	-200-3-4TMT	31/32	9/16	15/16	17/32	3/32	1/2	7/16	11/16	1 5/8	1 29/32	1
3/16	1/8	-300-3TMT	31/32	3/8	3/4	9/16	1/8	7/16	1/2	11/16	1 7/16	1 23/32	29/32
1/4	1/8	-400-3TMT	1 1/32	3/8	25/32	5/8	3/16	7/16	9/16	23/32	1 1/2	1 13/16	15/16
1/4	1/4	-400-3-4TMT	1 3/32	9/16	15/16	5/8	3/16	1/2	9/16	25/32	1 23/32	2 1/32	1 1/32
5/16	1/8	-500-3TMT	1 1/8	3/8	13/16	21/32	3/16	1/2	5/8	13/16	1 5/8	1 15/16	1 1/32
3/8	1/4	-600-3TMT	1 5/32	9/16	1	11/16	9/32	1/2	11/16	27/32	1 27/32	2 5/32	1 3/32
1/2	3/8	-810-3TMT	1 3/8	9/16	1 1/8	29/32	13/32	11/16	7/8	31/32	2 3/32	2 1/2	1 7/32
1/2	1/2	-810-3-8TMT	1 7/16	3/4	1 5/16	29/32	13/32	13/16	7/8	1 1/32	2 11/32	2 3/4	1 11/32
5/8	1/2	-1010-3TMT	1 7/16	3/4	1 3/8	31/32	1/2	13/16	1	1 1/32	2 13/32	2 13/16	1 11/32
3/4	3/4	-1210-3TMT	1 9/16	3/4	1 1/2	31/32	5/8	1	1 1/8	1 5/32	2 21/32	3 1/16	1 17/32
7/8	3/4	-1410-3TMT	1 11/16	3/4	1 1/2	1 1/32	23/32	1 1/4	1 1/4	1 9/32	2 25/32	3 3/16	1 19/32
1	1	-1610-3TMT	1 25/32	15/16	1 27/32	1 7/32	7/8	1 1/4	1 1/2	1 5/16	3 5/32	3 5/8	1 23/32
1	3/4	-1610-3-12TMT	1 25/32	15/16	1 21/32	1 7/32	23/32	1 1/4	1 1/2	1 5/16	2 31/32	3 7/16	1 21/32

"M" is approximate distance from point where tube bottoms to face of female component after average pipe thread engagement.

MALE BRANCH TEE



NOTE—A-D-K dimensions are finger tight/both tube ports are identical/ F = across flats of wrench pads/G dimension is across hex flats



T Tube O.D.	P Male Pipe Size	CATALOG NUMBER	A	B	C	D	E Minimum Opening	F	G	H	J	K
1/16	1/16	-100-3TTM	23/32	3/8	11/16	11/32	.052	3/8	5/16	9/16	1 1/8	1 7/16
1/8	1/8	-200-3TTM	15/16	3/8	23/32	17/32	3/32	7/16	7/16	21/32	1 5/16	1 7/8
1/8	1/4	-200-3-4TTM	31/32	9/16	15/16	17/32	3/32	1/2	7/16	11/16	1 3/8	1 15/16
3/16	1/8	-300-3TTM	31/32	3/8	3/4	9/16	1/8	7/16	1/2	11/16	1 3/8	1 15/16
1/4	1/8	-400-3TTM	1 1/32	3/8	25/32	5/8	3/16	7/16	9/16	23/32	1 7/16	2 1/16
1/4	1/4	-400-3-4TTM	1 3/32	9/16	15/16	5/8	3/16	1/2	9/16	25/32	1 9/16	2 3/16
5/16	1/8	-500-3TTM	1 1/8	3/8	13/16	21/32	3/16	1/2	5/8	13/16	1 5/8	2 1/4
3/8	1/4	-600-3TTM	1 5/32	9/16	1	11/16	9/32	1/2	11/16	27/32	1 11/16	2 5/16
1/2	3/8	-810-3TTM	1 3/8	9/16	1 1/8	29/32	13/32	11/16	7/8	31/32	1 15/16	2 3/4
1/2	1/2	-810-3-8TTM	1 7/16	3/4	1 5/16	29/32	13/32	13/16	7/8	1 1/32	2 1/16	2 7/8
5/8	1/2	-1010-3TTM	1 7/16	3/4	1 3/8	31/32	1/2	13/16	1	1 1/32	2 1/16	2 7/8
3/4	3/4	-1210-3TTM	1 9/16	3/4	1 1/2	31/32	5/8	1	1 1/8	1 5/32	2 5/16	3 1/8
7/8	3/4	-1410-3TTM	1 11/16	3/4	1 1/2	1 1/32	23/32	1 1/4	1 1/4	1 9/32	2 9/16	3 3/8
1	1	-1610-3TTM	1 25/32	15/16	1 27/32	1 7/32	7/8	1 1/4	1 1/2	1 5/16	2 5/8	3 9/16
1	3/4	-1610-3-12TTM	1 25/32	15/16	1 21/32	1 7/32	23/32	1 1/4	1 1/2	1 5/16	2 5/8	3 9/16

When ordering be sure to specify material. See page 28 for complete ordering information.

Swagelok® Tube Fittings

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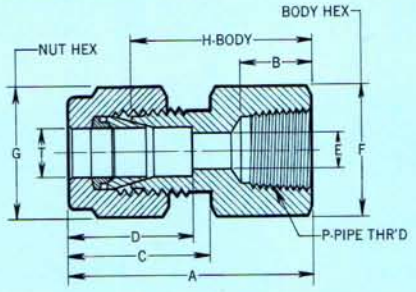
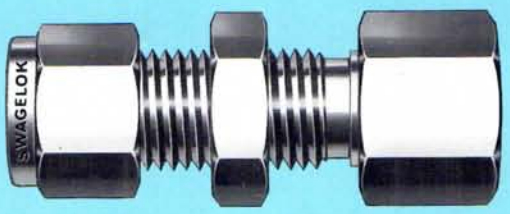
FEMALE CONNECTOR

NOTE—A-C-D dimensions are finger tight / G-F dimensions are across hex flats

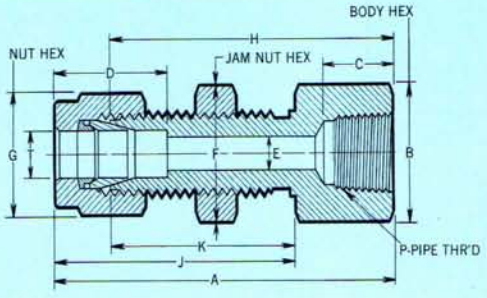


T Tube O.D.	P Female Pipe Size	CATALOG NUMBER	A	B	C	D	E Minimum Opening	F	G	H
1/16	1/16	-100-7-1	15/16	25/64	7/16	11/32	.052	7/16	5/16	25/32
1/8	1/8	-200-7-2	1 5/32	25/64	5/8	17/32	3/32	9/16	7/16	7/8
1/8	1/4	-200-7-4	1 11/32	19/32	5/8	17/32	3/32	3/4	7/16	1 1/16
3/16	1/8	-300-7-2	1 3/16	25/64	21/32	9/16	1/8	9/16	1/2	29/32
1/4	1/8	-400-7-2	1 1/4	25/64	23/32	5/8	3/16	9/16	9/16	15/16
1/4	1/4	-400-7-4	1 7/16	19/32	23/32	5/8	3/16	3/4	9/16	1 1/8
1/4	3/8	-400-7-6	1 13/16	19/32	23/32	5/8	3/16	7/8	9/16	1 3/16
1/4	1/2	-400-7-8	1 23/32	25/32	23/32	5/8	3/16	1 1/16	9/16	1 13/32
5/16	1/8	-500-7-2	1 9/32	25/64	3/4	21/32	1/4	9/16	5/8	31/32
5/16	1/4	-500-7-4	1 15/32	19/32	3/4	21/32	1/4	3/4	5/8	1 5/32
3/8	1/8	-600-7-2	1 5/16	25/64	25/32	11/16	9/32	5/8	11/16	1
3/8	1/4	-600-7-4	1 1/2	19/32	25/32	11/16	9/32	3/4	11/16	1 3/16
3/8	3/8	-600-7-6	1 9/16	19/32	25/32	11/16	9/32	7/8	11/16	1 1/4
3/8	1/2	-600-7-8	1 3/4	25/32	25/32	11/16	9/32	1 1/16	11/16	1 7/16
1/2	1/4	-810-7-4	1 21/32	19/32	7/8	29/32	13/32	13/16	7/8	1 1/4
1/2	3/8	-810-7-6	1 21/32	19/32	7/8	29/32	13/32	7/8	7/8	1 1/4
1/2	1/2	-810-7-8	1 27/32	25/32	7/8	29/32	13/32	1 1/16	7/8	1 7/16
1/2	3/4	-810-7-12	1 29/32	25/32	7/8	29/32	13/32	1 1/4	7/8	1 1/2
5/8	3/8	-1010-7-6	1 21/32	19/32	7/8	31/32	1/2	15/16	1	1 1/4
5/8	1/2	-1010-7-8	1 27/32	25/32	7/8	31/32	1/2	1 1/16	1	1 7/16
3/4	1/2	-1210-7-8	1 27/32	25/32	7/8	31/32	5/8	1 1/16	1 1/8	1 7/16
3/4	3/4	-1210-7-12	1 29/32	25/32	7/8	31/32	5/8	1 1/4	1 1/8	1 1/2
7/8	3/4	-1410-7-12	1 31/32	25/32	7/8	1 1/32	23/32	1 1/4	1 1/4	1 9/16
1	3/4	-1610-7-12	2 3/32	25/32	1 1/32	1 7/32	7/8	1 3/8	1 1/2	1 5/8
1	1	-1610-7-16	2 7/16	1	1 1/32	1 7/32	7/8	1 5/8	1 1/2	1 31/32

BULKHEAD FEMALE CONNECTOR



NOTE—A-D-J dimensions are finger tight / G-F-B dimensions are across hex flats



T Tube O.D.	P Female Pipe Size	CATALOG NUMBER	A	B	C	D	E Minimum Opening	F	G	H	J	K	Panel Hole Drill Size	Max. Panel Thick-ness
1/8	1/8	-200-71-2	1 25/32	9/16	25/64	17/32	3/32	1/2	7/16	1 1/2	1 1/4	31/32	21/64	1/2
1/4	1/8	-400-71-2	1 7/8	5/8	25/64	5/8	3/16	5/8	9/16	1 9/16	1 11/32	1 1/32	29/64	17/32
1/4	1/4	-400-71-4	2 1/16	3/4	19/32	5/8	3/16	5/8	9/16	1 3/4	1 11/32	1 1/32	29/64	17/32
3/8	1/4	-600-71-4	2 3/16	3/4	19/32	11/16	9/32	3/4	11/16	1 7/8	1 15/32	1 5/32	37/64	9/16
1/2	3/8	-810-71-6	2 7/16	15/16	19/32	29/32	13/32	15/16	7/8	2 1/32	1 21/32	1 1/4	49/64	19/32
1/2	1/2	-810-71-8	2 7/8	1 1/16	25/32	29/32	13/32	15/16	7/8	2 7/32	1 21/32	1 1/4	49/64	19/32

All dimensions in inches. Dimensions for reference only . . . subject to change

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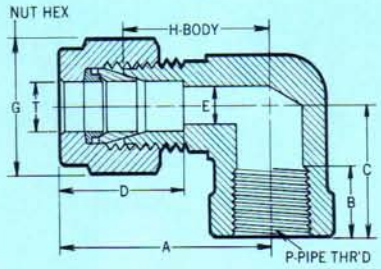
FEMALE ELBOW

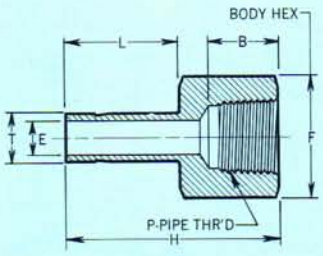
NOTE—A-D dimensions are finger tight / F = across flats of wrench pads/G dimensions is across hex flats



T Tube O.D.	P Female Pipe Size	CATALOG NUMBER	A	B	C	D	E Minimum Opening	F	G	H
1/16	1/16	-100-8-1	23/32	25/64	3/4	11/32	.052	7/16	5/16	9/16
1/16	1/8	-100-8-2	25/32	25/64	3/4	11/32	.052	1/2	5/16	5/8
1/8	1/8	-200-8-2	31/32	25/64	3/4	17/32	3/32	1/2	7/16	11/16
1/8	1/4	-200-8-4	1 3/32	19/32	27/32	17/32	3/32	11/16	7/16	13/16
3/16	1/8	-300-8-2	1	25/64	3/4	9/16	1/8	1/2	1/2	23/32
1/4	1/8	-400-8-2	1 1/16	25/64	3/4	5/8	3/16	1/2	9/16	3/4
1/4	1/4	-400-8-4	1 3/16	19/32	27/32	5/8	3/16	11/16	9/16	7/8
5/16	1/8	-500-8-2	1 1/8	25/64	3/4	21/32	1/4	1/2	5/8	13/16
5/16	1/4	-500-8-4	1 7/32	19/32	7/8	21/32	1/4	11/16	5/8	29/32
3/8	1/8	-600-8-2	1 5/32	25/64	3/4	11/16	9/32	1/2	11/16	27/32
3/8	1/4	-600-8-4	1 1/4	19/32	27/32	11/16	9/32	11/16	11/16	15/16
3/8	3/8	-600-8-6	1 11/32	19/32	27/32	11/16	9/32	13/16	11/16	1 1/32
1/2	1/4	-810-8-4	1 3/8	19/32	29/32	29/32	13/32	11/16	7/8	31/32
1/2	3/8	-810-8-6	1 7/16	19/32	29/32	29/32	13/32	13/16	7/8	1 1/32
1/2	1/2	-810-8-8	1 17/32	25/32	1 1/8	29/32	13/32	1	7/8	1 1/8
5/8	3/8	-1010-8-6	1 7/16	19/32	29/32	31/32	1/2	13/16	1	1 1/32
5/8	1/2	-1010-8-8	1 17/32	25/32	1 1/8	31/32	1/2	1	1	1 1/8
3/4	1/2	-1210-8-8	1 9/16	25/32	1 1/8	31/32	5/8	1	1 1/8	1 5/32
3/4	3/4	-1210-8-12	1 21/32	25/32	1 1/4	31/32	5/8	1 1/4	1 1/8	1 1/4
7/8	3/4	-1410-8-12	1 11/16	25/32	1 1/4	1 1/32	23/32	1 1/4	1 1/4	1 9/32
1	3/4	-1610-8-12	1 25/32	25/32	1 1/4	1 7/32	7/8	1 1/4	1 1/2	1 5/16
1	1	-1610-8-16	1 31/32	1	1 1/2	1 7/32	7/8	1 11/16	1 1/2	1 1/2

FEMALE ADAPTER TUBE TO PIPE

NOTE—F dimension is across hex flats.



T Tube O.D.	P Female Pipe Size	CATALOG NUMBER	B	L	E	F	H
1/8	1/8	-201-A-2F	25/64	17/32	3/32	9/16	1 1/16
1/8	1/4	-201-A-4F	19/32	17/32	3/32	3/4	1 1/4
3/16	1/8	-301-A-2F	25/64	9/16	1/8	9/16	1 3/32
3/16	1/4	-301-A-4F	19/32	9/16	1/8	3/4	1 9/32
1/4	1/8	-401-A-2F	25/64	5/8	.193	9/16	1 5/32
1/4	1/4	-401-A-4F	19/32	5/8	.193	3/4	1 11/32
1/4	3/8	-401-A-6F	19/32	5/8	.193	7/8	1 13/32
1/4	1/2	-401-A-8F	25/32	5/8	.193	1 1/16	1 19/32
5/16	1/8	-501-A-2F	25/64	21/32	1/4	9/16	1 3/16
5/16	1/4	-501-A-4F	19/32	21/32	1/4	3/4	1 3/8
5/16	3/8	-501-A-6F	19/32	21/32	1/4	7/8	1 7/16
5/16	1/2	-501-A-8F	25/32	21/32	1/4	1 1/16	1 5/8
3/8	1/8	-601-A-2F	25/64	1 1/16	9/32	9/16	1 7/32
3/8	1/4	-601-A-4F	19/32	1 1/16	9/32	3/4	1 13/32

T Tube O.D.	P Female Pipe Size	CATALOG NUMBER	B	L	E	F	H
3/8	3/8	-601-A-6F	13/32	1 1/16	9/32	7/8	1 15/32
3/8	1/2	-601-A-8F	25/32	1 1/16	9/32	1 1/16	1 21/32
1/2	1/4	-811-A-4F	19/32	29/32	25/64	3/4	1 5/8
1/2	3/8	-811-A-6F	19/32	29/32	25/64	7/8	1 11/16
1/2	1/2	-811-A-8F	25/32	29/32	25/64	1 1/16	1 7/8
5/8	3/8	-1011-A-6F	19/32	31/32	1/2	7/8	1 3/4
5/8	1/2	-1011-A-8F	25/32	31/32	1/2	1 1/16	1 15/16
5/8	3/4	-1011-A-12F	25/32	31/32	1/2	1 1/4	2
3/4	1/2	-1211-A-8F	25/32	31/32	19/32	1 1/16	1 15/16
3/4	3/4	-1211-A-12F	25/32	31/32	19/32	1 1/4	2
3/4	1	-1211-A-16F	1	31/32	19/32	1 5/8	2 3/8
7/8	3/4	-1411-A-12F	25/32	1 1/32	11/16	1 1/4	2 1/16
1	3/4	-1611-A-12F	25/32	1 7/32	51/64	1 1/4	2 1/4
1	1	-1611-A-16F	1	1 7/32	51/64	1 5/8	2 5/8

For additional information on adapters, see page 13.

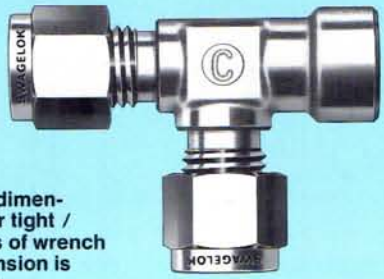
When ordering be sure to specify material. See page 28 for complete ordering information.

Swagelok® Tube Fittings

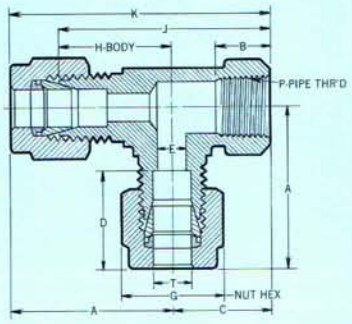
AVAILABLE IN ALL MACHINEABLE METALS AND PLASTICS FOR PRESSURE AND VACUUM SERVICE

Component parts of SWAGELOK Tube Fittings are all made of the same material

FEMALE RUN TEE



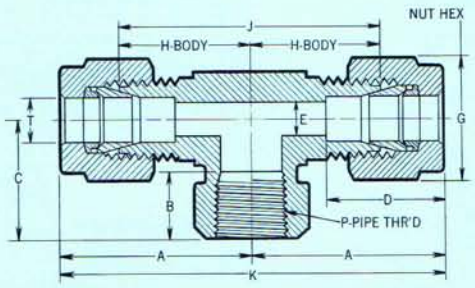
NOTE—A-D-K dimensions are finger tight / F = across flats of wrench pads / G dimension is across hex flats



T Tube O.D.	P Female Pipe Size	CATALOG NUMBER	A	B	C	D	E Minimum Opening	F	G	H	J	K
1/16	1/16	-100-3TFT	23/32	25/64	3/4	11/32	.052	7/16	5/16	9/16	15/16	1 15/32
1/8	1/8	-200-3TFT	31/32	25/64	3/4	17/32	3/32	1/2	7/16	11/16	1 7/16	1 23/32
3/16	1/8	-300-3TFT	1	25/64	3/4	9/16	1/8	1/2	1/2	23/32	1 15/32	1 3/4
1/4	1/8	-400-3TFT	1 1/16	25/64	3/4	5/8	3/16	1/2	9/16	3/4	1 1/2	1 13/16
1/4	1/4	-400-3-4TFT	1 3/16	19/32	27/32	5/8	3/16	11/16	9/16	7/8	1 23/32	2 1/32
5/16	1/8	-500-3TFT	1 1/8	25/64	3/4	21/32	1/4	1/2	5/8	13/16	1 9/16	1 7/8
3/8	1/4	-600-3TFT	1 1/4	19/32	27/32	11/16	9/32	11/16	11/16	15/16	1 25/32	2 3/32
1/2	3/8	-810-3TFT	1 7/16	19/32	29/32	29/32	13/32	13/16	7/8	1 1/32	1 15/16	2 11/32
1/2	1/2	-810-3-8TFT	1 17/32	25/32	1 1/16	29/32	13/32	1	7/8	1 1/8	2 3/16	2 19/32
5/8	1/2	-1010-3TFT	1 17/32	25/32	1 1/8	31/32	1/2	1	1	1 1/8	2 1/4	2 21/32
3/4	3/4	-1210-3TFT	1 21/32	25/32	1 1/4	31/32	5/8	1 1/4	1 1/8	1 1/4	2 1/2	2 29/32
7/8	3/4	-1410-3TFT	1 11/16	25/32	1 1/4	1 1/32	23/32	1 1/4	1 1/4	1 9/32	2 17/32	2 15/16
1	1	-1610-3TFT	1 31/32	1	1 1/2	1 7/32	7/8	1 11/16	1 1/2	1 1/2	3	3 15/32
1	3/4	-1610-3-12TFT	1 25/32	25/32	1 1/4	1 7/32	7/8	1 1/4	1 1/2	1 5/16	2 9/16	3 1/32

FEMALE BRANCH TEE

NOTE—A-D-K dimensions are finger tight / F = across flats of wrench pads / G dimension is across hex flats



T Tube O.D.	P Female Pipe Size	CATALOG NUMBER	A	B	C	D	E Minimum Opening	F	G	H	J	K
1/16	1/16	-100-3TTF	23/32	25/64	3/4	11/32	.052	7/16	5/16	9/16	1 1/8	1 7/16
1/8	1/8	-200-3TTF	31/32	25/64	3/4	17/32	3/32	1/2	7/16	11/16	1 3/8	1 15/16
3/16	1/8	-300-3TTF	1	25/64	3/4	9/16	1/8	1/2	1/2	23/32	1 7/16	2
1/4	1/8	-400-3TTF	1 1/16	25/64	3/4	5/8	3/16	1/2	9/16	3/4	1 1/2	2 1/8
1/4	1/4	-400-3-4TTF	1 3/16	19/32	27/32	5/8	3/16	11/16	9/16	7/8	1 3/4	2 3/8
5/16	1/8	-500-3TTF	1 1/8	25/64	3/4	21/32	1/4	1/2	5/8	13/16	1 5/8	2 1/4
3/8	1/4	-600-3TTF	1 1/4	19/32	27/32	11/16	9/32	11/16	11/16	15/16	1 7/8	2 1/2
1/2	3/8	-810-3TTF	1 7/16	19/32	29/32	29/32	13/32	13/16	7/8	1 1/32	2 1/16	2 7/8
1/2	1/4	-810-3-4TTF	1 3/8	19/32	29/32	29/32	13/32	11/16	7/8	1 3/32	1 15/16	2 3/4
1/2	1/2	-810-3-8TTF	1 17/32	25/32	1 1/16	29/32	13/32	1	7/8	1 1/8	2 1/4	3 1/16
5/8	1/2	-1010-3TTF	1 17/32	25/32	1 1/8	31/32	1/2	1	1	1 1/8	2 1/4	3 1/16
3/4	3/4	-1210-3TTF	1 21/32	25/32	1 1/4	31/32	5/8	1 1/4	1 1/8	1 1/4	2 1/2	3 5/16
7/8	3/4	-1410-3TTF	1 11/16	25/32	1 1/4	1 1/32	23/32	1 1/4	1 1/4	1 9/32	2 9/16	3 3/8
1	1	-1610-3TTF	1 31/32	1	1 1/2	1 7/32	7/8	1 11/16	1 1/2	1 1/2	3	3 15/16
1	3/4	-1610-3-12TTF	1 25/32	25/32	1 1/4	1 7/32	7/8	1 1/4	1 1/2	1 5/16	2 5/8	3 9/16

All dimensions in inches. Dimensions for reference only . . . subject to change

Swagelok® Tube Fittings

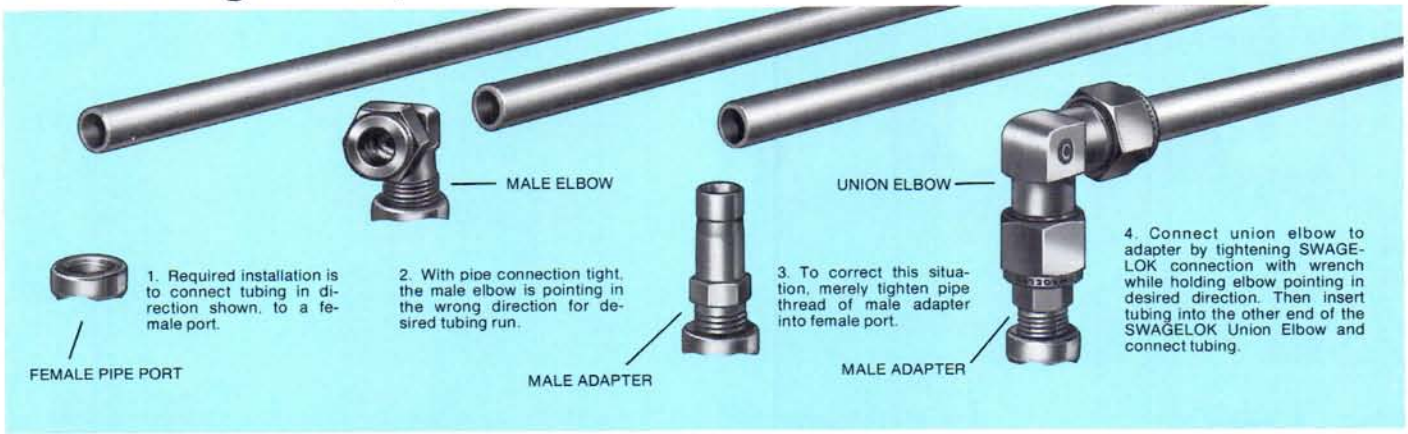
AVAILABLE IN ALL MACHINEABLE METALS AND PLASTICS FOR PRESSURE AND VACUUM SERVICE

Component parts of SWAGELOK Tube Fittings are all made of the same material

SWAGELOK Adapters eliminate costly, unnecessary inventories!

You can save inventory and maintenance costs by using SWAGELOK Adapters with all sizes and materials carried in stock. SWAGELOK Adapters also provide a greater variety of end connections than is possible with standard tees and elbows. Note in the illustration how Union Tees and Union Elbows, and NUPRO and WHITEY valves with SWAGELOK ends, can be installed on close centers, conserving space.

SWAGELOK Adapters eliminate difficult alignment problems!



When installing pipe elbows or tees, it is often difficult to align the fitting with the desired run.

It can be readily seen that when the pipe threads are tightly engaged, an angle fitting is often pointing in the wrong direction for the tubing run. Loosening the pipe connection means leakage at the pipe thread, which is an unsatisfactory solution. Over-tightening can result in damaged threads and/or leaks.

By using SWAGELOK Adapters in conjunction with SWAGELOK Union Elbows or Tees, these difficulties can be totally avoided.

Your local SWAGELOK Sales and Service Representative will be happy to show you how Adapters can save you money while providing greater in-system versatility.

For complete dimensions information on Adapters, see pages 8, 11, 18 and 23

Swagelok® Tube Fittings

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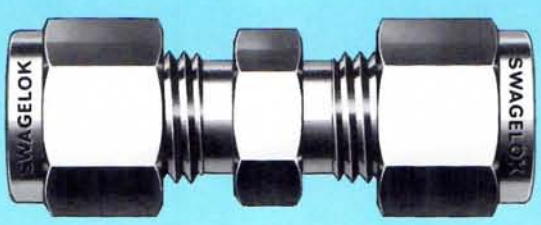
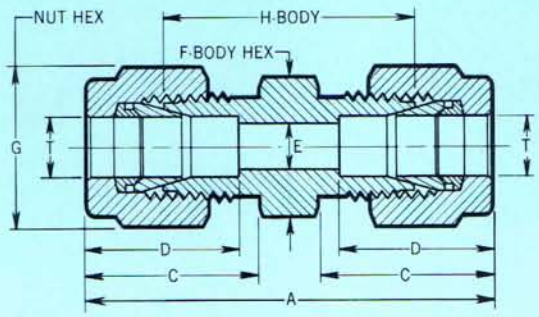
UNION



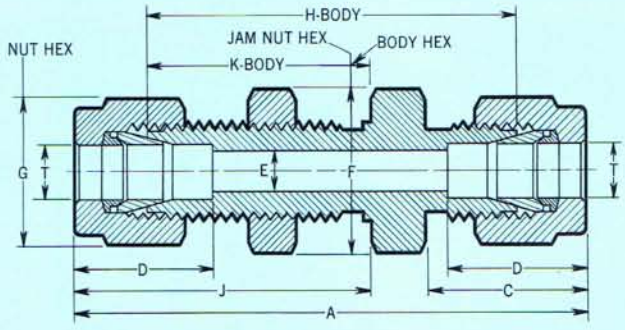
NOTE—A-C-D dimensions are finger tight / G-F dimensions are across hex flats



T Tube O.D.	CATALOG NUMBER	A	C	D	E Minimum Opening	F	G	H
1/16	-100-6	1	7/16	11/32	.052	5/16	5/16	11/16
1/8	-200-6	1 7/16	5/8	17/32	3/32	7/16	7/16	7/8
3/16	-300-6	1 33/64	21/32	9/16	1/8	7/16	1/2	61/64
1/4	-400-6	1 21/32	23/32	5/8	3/16	1/2	9/16	1 1/32
5/16	-500-6	1 47/64	3/4	21/32	1/4	9/16	5/8	1 7/64
3/8	-600-6	1 13/16	25/32	11/16	9/32	5/8	11/16	1 3/16
1/2	-810-6	2 1/32	7/8	29/32	13/32	13/16	7/8	1 7/32
5/8	-1010-6	2 1/16	7/8	31/32	1/2	15/16	1	1 1/4
3/4	-1210-6	2 1/8	7/8	31/32	5/8	1 1/16	1 1/8	1 5/16
7/8	-1410-6	2 3/16	7/8	1 1/32	23/32	1 3/16	1 1/4	1 3/8
1	-1610-6	2 17/32	1 1/32	1 7/32	7/8	1 3/8	1 1/2	1 19/32

BULKHEAD UNION

NOTE—A-C-D-J dimensions are finger tight / G-F dimensions are across hex flats



T Tube O.D.	CATALOG NUMBER	A	C	D	E Minimum Opening	F	G	H	J	K	Panel Hole Drill Size	Max. Panel Thickness
1/8	-200-61	2 1/16	5/8	17/32	3/32	1/2	7/16	1 1/2	1 1/4	31/32	21/64	1/2
3/16	-300-61	2 5/32	21/32	9/16	1/8	9/16	1/2	1 19/32	1 9/32	1	25/64	1/2
1/4	-400-61	2 5/16	23/32	5/8	3/16	5/8	9/16	1 11/16	1 11/32	1 1/32	29/64	17/32
5/16	-500-61	2 7/16	3/4	21/32	1/4	11/16	5/8	1 13/16	1 7/16	1 1/8	33/64	9/16
3/8	-600-61	2 1/2	25/32	11/16	9/32	3/4	11/16	1 7/8	1 15/32	1 5/32	37/64	9/16
1/2	-810-61	2 13/16	7/8	29/32	13/32	15/16	7/8	2	1 21/32	1 1/4	49/64	19/32
5/8	-1010-61	2 7/8	7/8	31/32	1/2	1 1/16	1	2 1/16	1 11/16	1 9/32	57/64	19/32
3/4	-1210-61	3 1/8	7/8	31/32	5/8	1 3/16	1 1/8	2 5/16	1 7/8	1 15/32	1 1/64	25/32
7/8	-1410-61	3 11/32	7/8	1 1/32	23/32	1 5/16	1 1/4	2 17/32	2 3/32	1 11/16	1 9/64	15/16
1	-1610-61	3 3/4	1 1/32	1 7/32	7/8	1 5/8	1 1/2	2 13/16	2 1/4	1 25/32	1 21/64	7/8

All dimensions in inches. Dimensions for reference only . . . subject to change

Swagelok® Tube Fittings

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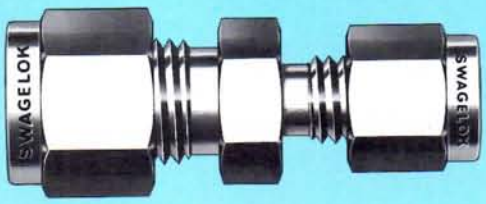
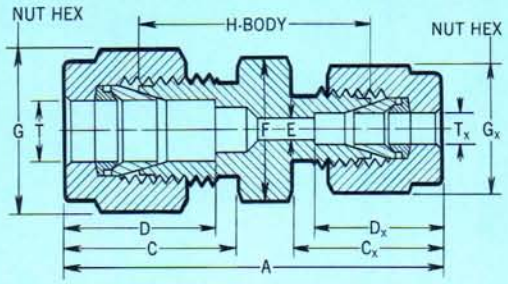
REDUCING UNION



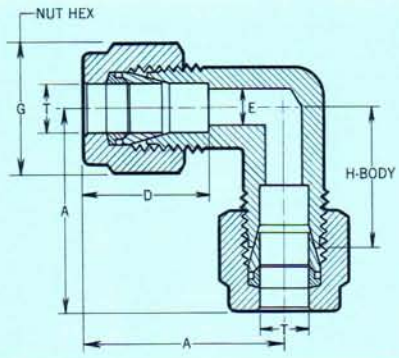
NOTE—A-Cx-Dx-D dimensions are finger tight/ G-F-Gx dimensions are across hex flats



T Tube O.D.	Tx Tube O.D.	CATALOG NUMBER	A	C	Cx	D	Dx	E Minimum Opening	F	G	Gx	H
1/8	1/16	-200-6-1	1 1/4	5/8	7/16	17/32	11/32	.052	7/16	7/16	5/16	13/16
3/16	1/8	-300-6-2	1 31/64	21/32	5/8	9/16	17/32	3/32	7/16	1/2	7/16	59/64
1/4	1/16	-400-6-1	1 3/8	23/32	7/16	5/8	11/32	.052	1/2	9/16	5/16	29/32
1/4	1/8	-400-6-2	1 9/16	23/32	5/8	5/8	17/32	3/32	1/2	9/16	7/16	31/32
1/4	3/16	-400-6-3	1 19/32	23/32	21/32	5/8	9/16	1/8	1/2	9/16	1/2	1
5/16	1/4	-500-6-4	1 45/64	3/4	23/32	21/32	5/8	3/16	9/16	5/8	9/16	1 5/64
3/8	1/4	-600-6-4	1 3/4	25/32	23/32	1 1/16	5/8	3/16	5/8	11/16	9/16	1 1/8
3/8	5/16	-600-6-5	1 25/32	25/32	3/4	1 1/16	21/32	1/4	5/8	11/16	5/8	1 5/32
1/2	1/4	-810-6-4	1 7/8	7/8	23/32	29/32	5/8	3/16	13/16	7/8	9/16	1 5/32
1/2	3/8	-810-6-6	1 15/16	7/8	25/32	29/32	11/16	9/32	13/16	7/8	11/16	1 7/32
5/8	3/8	-1010-6-6	1 31/32	7/8	25/32	31/32	11/16	9/32	15/16	1	11/16	1 1/4
5/8	1/2	-1010-6-8	2 1/16	7/8	7/8	31/32	29/32	13/32	15/16	1	7/8	1 1/4
3/4	1/2	-1210-6-8	2 1/8	7/8	7/8	31/32	29/32	13/32	1 1/16	1 1/8	7/8	1 5/16
3/4	5/8	-1210-6-10	2 1/8	7/8	7/8	31/32	31/32	1/2	1 1/16	1 1/8	1	1 5/16
7/8	3/4	-1410-6-12	2 3/16	7/8	7/8	1 1/32	31/32	5/8	1 3/16	1 1/4	1 1/8	1 3/8
1	3/4	-1610-6-12	2 3/8	1 1/32	7/8	1 7/32	31/32	5/8	1 3/8	1 1/2	1 1/8	1 1/2
1	7/8	-1610-6-14	2 3/8	1 1/32	7/8	1 7/32	1 1/32	23/32	1 3/8	1 1/2	1 1/4	1 1/2

UNION ELBOW

NOTE—A-D dimensions are finger tight / both ports are identical/ F = across flats of wrench pads / G dimension is across hex flats



T Tube O.D.	CATALOG NUMBER	A	D	E Minimum Opening	F	G	H
1/16	-100-9	23/32	11/32	.052	7/16	5/16	9/16
1/8	-200-9	15/16	17/32	3/32	7/16	7/16	21/32
3/16	-300-9	31/32	9/16	1/8	7/16	1/2	11/16
1/4	-400-9	1 1/32	5/8	3/16	7/16	9/16	23/32
5/16	-500-9	1 1/8	21/32	1/4	1/2	5/8	13/16
3/8	-600-9	1 5/32	11/16	9/32	1/2	11/16	27/32
1/2	-810-9	1 3/8	29/32	13/32	11/16	7/8	31/32
5/8	-1010-9	1 7/16	31/32	1/2	13/16	1	1 1/32
3/4	-1210-9	1 9/16	31/32	5/8	1	1 1/8	1 5/32
7/8	-1410-9	1 11/16	1 1/32	23/32	1 1/4	1 1/4	1 9/32
1	-1610-9	1 25/32	1 7/32	7/8	1 1/4	1 1/2	1 5/16

When ordering be sure to specify material. See page 28 for complete ordering information.

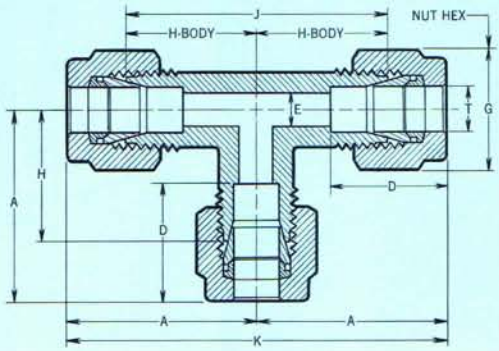
Swagelok® Tube Fittings

AVAILABLE IN ALL MACHINEABLE METALS AND PLASTICS FOR PRESSURE AND VACUUM SERVICE

Component parts of SWAGELOK Tube Fittings are all made of the same material

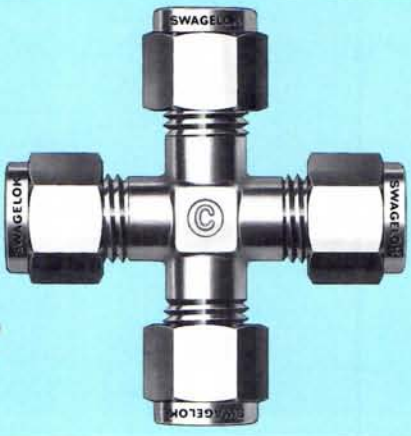
UNION TEE

NOTE—A-D-K dimensions are finger tight / All ports are identical /F = across flats of wrench pads / G dimension is across hex flats

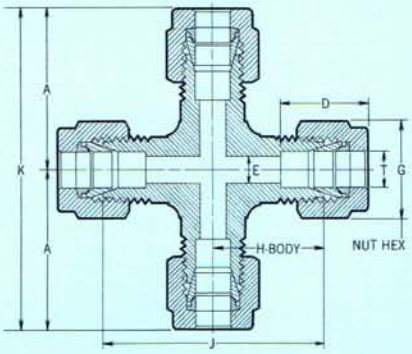


T Tube O.D.	CATALOG NUMBER	A	D	E Minimum Opening	F	G	H	J	K
1/16	-100-3	23/32	11/32	.052	7/16	5/16	9/16	1 1/8	1 7/16
1/8	-200-3	15/16	17/32	3/32	7/16	7/16	21/32	1 5/16	1 7/8
3/16	-300-3	31/32	9/16	1/8	7/16	1/2	11/16	1 3/8	1 15/16
1/4	-400-3	1 1/32	5/8	3/16	7/16	9/16	23/32	1 7/16	2 1/16
5/16	-500-3	1 1/8	21/32	1/4	1/2	5/8	13/16	1 5/8	2 1/4
3/8	-600-3	1 5/32	11/16	9/32	1/2	11/16	27/32	1 11/16	2 5/16
1/2	-810-3	1 3/8	29/32	13/32	11/16	7/8	31/32	1 15/16	2 3/4
5/8	-1010-3	1 7/16	31/32	1/2	13/16	1	1 1/32	2 1/16	2 7/8
3/4	-1210-3	1 9/16	31/32	5/8	1	1 1/8	1 5/32	2 5/16	3 1/8
7/8	-1410-3	1 11/16	1 1/32	23/32	1 1/4	1 1/4	1 9/32	2 9/16	3 3/8
1	-1610-3	1 25/32	1 7/32	7/8	1 1/4	1 1/2	1 5/16	2 5/8	3 9/16

UNION CROSS



NOTE—A-D-K dimensions are finger tight / All ports are identical /F = across flats of wrench pads / G dimension is across hex flats



T Tube O.D.	CATALOG NUMBER	A	D	E Minimum Opening	F	G	H	J	K
1/8	-200-4	15/16	17/32	3/32	7/16	7/16	21/32	1 5/16	1 7/8
3/16	-300-4	31/32	9/16	1/8	7/16	1/2	11/16	1 3/8	1 15/16
1/4	-400-4	1 1/32	5/8	3/16	7/16	9/16	23/32	1 7/16	2 1/16
5/16	-500-4	1 1/8	21/32	1/4	1/2	5/8	13/16	1 5/8	2 1/4
3/8	-600-4	1 5/32	11/16	9/32	1/2	11/16	27/32	1 11/16	2 5/16
1/2	-810-4	1 3/8	29/32	13/32	11/16	7/8	31/32	1 15/16	2 3/4
5/8	-1010-4	1 7/16	31/32	1/2	13/16	1	1 1/32	2 1/16	2 7/8
3/4	-1210-4	1 9/16	31/32	5/8	1	1 1/8	1 5/32	2 5/16	3 1/8
7/8	-1410-4	1 11/16	1 1/32	23/32	1 1/4	1 1/4	1 9/32	2 9/16	3 3/8
1	-1610-4	1 13/16	1 7/32	7/8	1 1/2	1 1/2	1 11/32	2 11/16	3 5/8

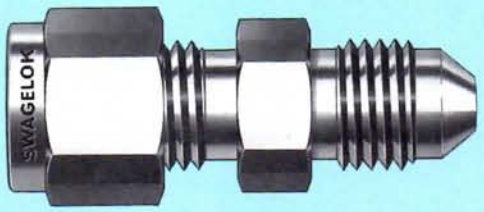
All dimensions in inches. Dimensions for reference only . . . subject to change

Swagelok® Tube Fittings

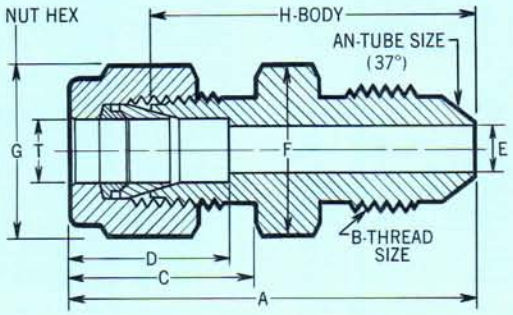
AVAILABLE IN ALL MACHINEABLE METALS AND PLASTICS FOR PRESSURE AND VACUUM SERVICE

Component parts of SWAGELOK Tube Fittings are all made of the same material

SWAGELOK TO AN UNION



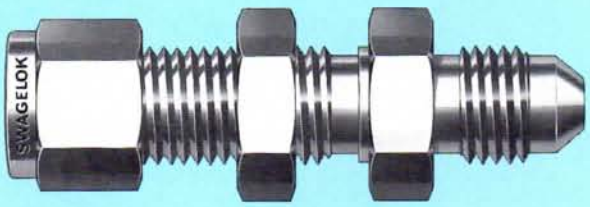
NOTE—A-C-D dimensions are finger tight/ G-F dimensions are across hex flats



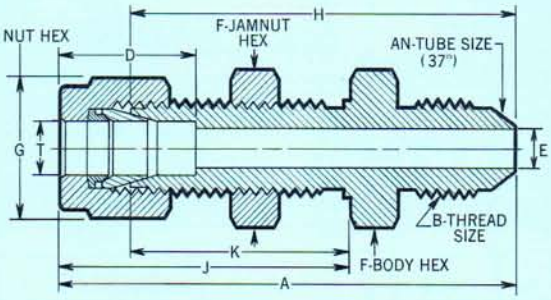
T Tube O.D.	AN Tube Flare Size	CATALOG NUMBER	A	B	C	D	E Minimum Opening	F	G	H
1/16	1/8	-100-6-2AN	1 1/16	5/16-24 NF-3	7/16	11/32	.052	7/16	5/16	29/32
1/8	1/8	-200-6-2AN	1 1/4	5/16-24 NF-3	5/8	17/32	.062	7/16	7/16	31/32
1/8	1/4	-200-6-4AN	1 13/32	7/16-20 NF-3	5/8	17/32	3/32	1/2	7/16	1 1/8
3/16	3/16	-300-6-3AN	1 11/32	3/8 -24 NF-3	21/32	9/16	.125	7/16	1/2	1 1/16
1/4	1/4	-400-6-4AN	1 1/2	7/16-20 NF-3	23/32	5/8	.172	1/2	9/16	1 3/16
5/16	5/16	-500-6-5AN	1 17/32	1/2 -20 NF-3	3/4	21/32	.234	9/16	5/8	1 7/32
3/8	1/4	-600-6-4AN	1 37/64	7/16-20 NF-3	25/32	11/16	.172	5/8	11/16	1 17/64
3/8	3/8	-600-6-6AN	1 19/32	9/16-18 NF-3	25/32	11/16	.297	5/8	11/16	1 9/32
1/2	1/2	-810-6-8AN	1 13/16	3/4 -16 NF-3	7/8	29/32	.391	13/16	7/8	1 13/32
5/8	5/8	-1010-6-10AN	1 15/16	7/8 -14 NF-3	7/8	31/32	.484	15/16	1	1 17/32
3/4	3/4	-1210-6-12AN	2 1/8	1 1/16-12 N-3	7/8	31/32	.609	1 1/8	1 1/8	1 23/32
1	1	-1610-6-16AN	2 13/32	1 5/16-12 N-3	1 1/32	1 7/32	.844	1 3/8	1 1/2	1 15/16

NOTE: Larger hex size ("F" dimension) required for AND port connection, are available upon request.

SWAGELOK TO AN BULKHEAD UNION



NOTE—A-D-J dimensions are finger tight / G-F dimensions are across hex flats



T Tube O.D.	AN Tube Flare Size	CATALOG NUMBER	A	B	D	E Minimum Opening	F	G	H	J	K	Panel Hole Drill Size	Max. Panel Thick-ness
1/8	1/8	-200-61-2AN	1 57/64	5/16-24 NF-3	17/32	.062	1/2	7/16	1 39/64	1 1/4	31/32	21/64	1/2
1/8	1/4	-200-61-4AN	2 3/64	7/16-20 NF-3	17/32	3/32	1/2	7/16	1 49/64	1 1/4	31/32	21/64	1/2
3/16	3/16	-300-61-3AN	1 63/64	3/8 -24 NF-3	9/16	.125	1/2	1/2	1 45/64	1 9/32	1	25/64	1/2
1/4	1/4	-400-61-4AN	2 3/64	7/16-20 NF-3	5/8	.172	5/8	9/16	1 53/64	1 11/32	1 1/32	29/64	17/32
5/16	5/16	-500-61-5AN	2 15/64	1/2 -20 NF-3	21/32	.234	11/16	5/8	1 59/64	1 7/16	1 1/8	33/64	9/16
3/8	1/4	-600-61-4AN	2 9/32	7/16-20 NF-3	11/16	.172	3/4	11/16	1 31/32	1 15/32	1 5/32	37/64	9/16
3/8	3/8	-600-61-6AN	2 9/32	9/16-18 NF-3	11/16	.297	3/4	11/16	1 31/32	1 15/32	1 5/32	37/64	9/16
1/2	1/2	-810-61-8AN	2 19/32	3/4 -16 NF-3	29/32	.391	15/16	7/8	2 3/16	1 21/32	1 1/4	49/64	19/32
5/8	5/8	-1010-61-10AN	2 49/64	7/8 -14 NF-3	31/32	.484	1 1/16	1	2 23/64	1 11/16	1 9/32	57/64	19/32
3/4	3/4	-1210-61-12AN	3 5/64	1 1/16-12 N-3	31/32	.609	1 3/16	1 1/8	2 45/64	1 7/8	1 15/32	1 1/64	25/32
1	1	-1610-61-16AN	3 5/8	1 5/16-12 N-3	1 7/32	.844	1 9/16	1 1/2	3 5/32	2 1/4	1 25/32	1 21/64	7/8

When ordering be sure to specify material. See page 28 for complete ordering information.

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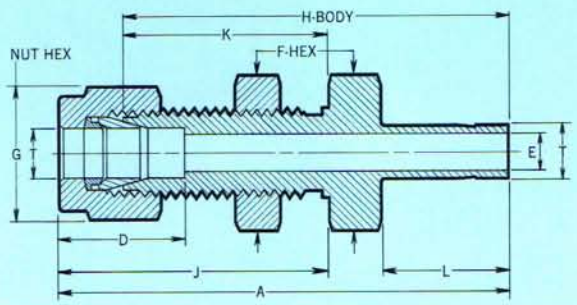
BULKHEAD ADAPTER

NOTE—A-D-J dimensions are for nut in finger tight position / G-F dimensions are across hex flats.

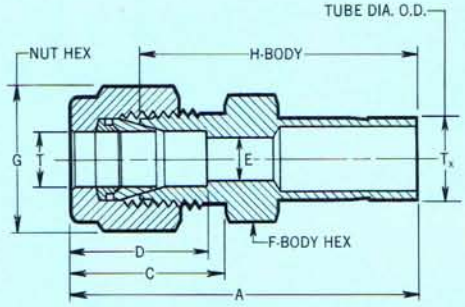


T Tube O.D.	CATALOG NUMBER	A	D	E Minimum Opening	F	G	H	J	K	L	Panel Hole Drill Size	Max. Panel Thick-ness
1/8	-200-A1-2	1 31/32	17/32	3/32	1/2	7/16	1 11/16	1 1/4	31/32	17/32	21/64	1/2
3/16	-300-A1-3	2 3/64	9/16	1/8	9/16	1/2	1 49/64	1 9/32	1	9/16	25/64	1/2
1/4	-400-A1-4	2 7/32	5/8	3/16	5/8	9/16	1 29/32	1 11/32	1 1/32	5/8	29/64	17/32
5/16	-500-A1-5	2 11/32	21/32	1/4	11/16	5/8	2 1/32	1 7/16	1 1/8	21/32	33/64	9/16
3/8	-600-A1-6	2 13/32	11/16	9/32	3/4	11/16	2 3/32	1 15/32	1 5/32	11/16	37/64	9/16
1/2	-810-A1-8	2 27/32	29/32	25/64	15/16	7/8	2 7/16	1 21/32	1 1/4	29/32	49/64	19/32
5/8	-1010-A1-10	3 31/32	31/32	1/2	1 1/16	1	2 9/16	1 11/16	1 9/32	31/32	57/64	19/32
3/4	-1210-A1-12	3 7/32	31/32	19/32	1 3/16	1 1/8	2 13/16	1 7/8	1 15/32	31/32	1 1/64	25/32
7/8	-1410-A1-14	3 1/2	1 1/32	11/16	1 5/16	1 1/4	3 3/32	2 3/32	1 11/16	1 1/32	1 9/64	15/16
1	-1610-A1-16	3 15/16	1 7/32	51/64	1 9/16	1 1/2	3 15/32	2 1/4	1 25/32	1 7/32	1 21/64	15/16

For additional information on adapters, see page 13.

REDUCER

NOTE—A-C-D dimensions are finger tight / G-F dimensions are across hex flats



T Tube O.D.	Tx	CATALOG NUMBER	A	C	D	E Minimum Opening	F	G	H
1/16	1/8	-100-R-2	1 5/32	7/16	11/32	.052	5/16	5/16	1
1/8	1/8	-200-R-2	1 11/32	5/8	17/32	5/64	7/16	7/16	1 1/16
1/8	3/16	-200-R-3	1 3/8	5/8	17/32	3/32	7/16	7/16	1 3/32
1/8	1/4	-200-R-4	1 7/16	5/8	17/32	3/32	7/16	7/16	1 5/32
1/8	5/16	-200-R-5	1 15/32	5/8	17/32	3/32	7/16	7/16	1 3/16
1/8	3/8	-200-R-6	1 1/2	5/8	17/32	3/32	7/16	7/16	1 7/32
3/16	1/4	-300-R-4	1 31/64	21/32	9/16	1/8	7/16	1/2	1 13/64
3/16	5/16	-300-R-5	1 33/64	21/32	9/16	1/8	7/16	1/2	1 15/64
3/16	3/8	-300-R-6	1 35/64	21/32	9/16	1/8	7/16	1/2	1 17/64
3/16	1/2	-300-R-8	1 49/64	21/32	9/16	1/8	9/16	1/2	1 31/64
1/4	1/8	-400-R-2	1 15/32	23/32	5/8	3/32	1/2	9/16	1 5/32
1/4	3/16	-400-R-3	1 1/2	23/32	5/8	1/8	1/2	9/16	1 3/16
1/4	1/4	-400-R-4	1 9/16	23/32	5/8	3/16	1/2	9/16	1 1/4
1/4	5/16	-400-R-5	1 19/32	23/32	5/8	3/16	1/2	9/16	1 9/32
1/4	3/8	-400-R-6	1 5/8	23/32	5/8	3/16	1/2	9/16	1 5/16
1/4	1/2	-400-R-8	1 27/32	23/32	5/8	3/16	9/16	9/16	1 17/32
1/4	5/8	-400-R-10	1 29/32	23/32	5/8	3/16	11/16	9/16	1 19/32
5/16	3/8	-500-R-6	1 43/64	3/4	21/32	1/4	9/16	5/8	1 23/64

T Tube O.D.	Tx	CATALOG NUMBER	A	C	D	E Minimum Opening	F	G	H
5/16	1/2	-500-R-8	1 57/64	3/4	21/32	1/4	9/16	5/8	1 37/64
5/16	5/8	-500-R-10	1 61/64	3/4	21/32	1/4	11/16	5/8	1 41/64
5/16	3/4	-500-R-12	1 61/64	3/4	21/32	1/4	13/16	5/8	1 41/64
3/8	1/4	-600-R-4	1 21/32	25/32	11/16	.193	5/8	11/16	1 11/32
3/8	1/2	-600-R-8	1 15/16	25/32	11/16	9/32	5/8	11/16	1 5/8
3/8	5/8	-600-R-10	2	25/32	11/16	9/32	11/16	11/16	1 11/16
3/8	3/4	-600-R-12	2	25/32	11/16	9/32	13/16	11/16	1 11/16
3/8	7/8	-600-R-14	2 1/16	25/32	11/16	9/32	15/16	11/16	1 3/4
1/2	3/8	-810-R-6	1 27/32	7/8	29/32	9/32	13/16	7/8	1 7/16
1/2	5/8	-810-R-10	2 1/8	7/8	29/32	13/32	13/16	7/8	1 23/32
1/2	3/4	-810-R-12	2 1/8	7/8	29/32	13/32	13/16	7/8	1 23/32
1/2	1	-810-R-16	2 3/8	7/8	29/32	13/32	1 1/16	7/8	1 31/32
5/8	3/4	-1010-R-12	2 5/32	7/8	31/32	1/2	15/16	1	1 3/4
5/8	7/8	-1010-R-14	2 7/32	7/8	31/32	1/2	15/16	1	1 13/16
5/8	1	-1010-R-16	2 13/32	7/8	31/32	1/2	1 1/16	1	2
3/4	7/8	-1210-R-14	2 9/32	7/8	31/32	5/8	1 1/16	1 1/8	1 7/8
3/4	1	-1210-R-16	2 15/32	7/8	31/32	5/8	1 1/16	1 1/8	2 1/16
7/8	1	-1410-R-16	2 15/32	7/8	1 1/32	23/32	1 3/16	1 1/4	2 1/16

All dimensions in inches. Dimensions for reference only . . . subject to change

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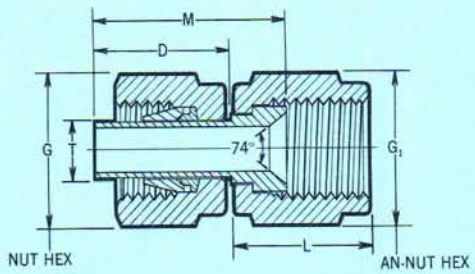
SWAGELOK TO AN ADAPTER

NOTE—G-G$_1$ dimensions are across hex flats



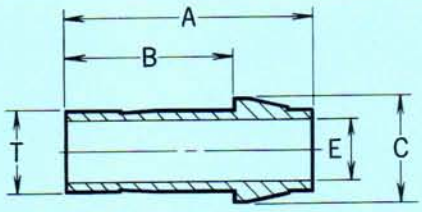
T Tube O.D.	AN Tube O.D.	CATALOG NUMBER	M	D	L	G	G$_1$
1/8	1/8	-200-A-2ANF	47/64	17/32	17/32	7/16	3/8
1/8	1/4	-200-A-4ANF	3/4	17/32	39/64	7/16	9/16
3/16	3/16	-300-A-3ANF	51/64	9/16	19/32	1/2	7/16
1/4	1/4	-400-A-4ANF	27/32	5/8	39/64	9/16	9/16
5/16	5/16	-500-A-5ANF	29/32	21/32	43/64	5/8	5/8
3/8	3/8	-600-A-6ANF	63/64	11/16	23/32	11/16	11/16
1/2	1/2	-810-A-8ANF	1 1/4	29/32	27/32	7/8	7/8
5/8	5/8	-1010-A-10ANF	1 23/64	31/32	31/32	1	1
3/4	3/4	-1210-A-12ANF	1 25/64	31/32	1 1/64	1 1/8	1 1/4
1	1	-1610-A-16ANF	1 43/64	1 7/32	1 1/8	1 1/2	1 1/2

NOTE:
To tighten both ends of AN Adapter connections properly, tighten nuts, with wrench, 1/4 turn from finger-tight position.

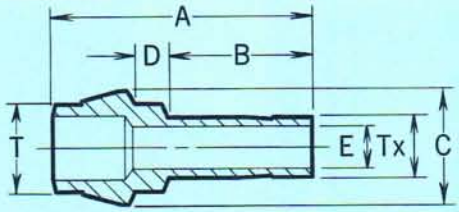
PORT CONNECTOR (Used to close-connect two SWAGELOK Ports)

Installation Instructions

1. Remove Nut and Ferrules from first of the two SWAGELOK Ports to be connected. 2. Slip Nut only (no Ferrules) on Port Connector over machined ferrule. 3. Insert Connector into first port and snug up Nut by hand. 4. Tighten with wrench 1/4 turn only. Subsequent connections are made by tightening slightly with wrench after snugging the Nut by hand. 5. Insert second end of Port Connector into other port and tighten Nut 1 1/4 turns from finger-tight, using normal SWAGELOK Nut and Ferrules.



PORT CONNECTOR



REDUCING PORT CONNECTOR

T Tube O.D.	CATALOG NUMBER	A	B	C	E
1/16	-101-PC	21/32	27/64	9/64	1/32
1/8	-201-PC	31/32	39/64	1/4	3/32
3/16	-301-PC	1	41/64	5/16	9/64
1/4	-401-PC	1 3/32	47/64	3/8	3/16
5/16	-501-PC	1 9/64	25/32	7/16	1/4
3/8	-601-PC	1 5/32	51/64	1/2	5/16
1/2	-811-PC	1 45/64	1 1/32	43/64	25/64
5/8	-1011-PC	1 49/64	1 3/32	51/64	1/2
3/4	-1211-PC	1 49/64	1 3/32	59/64	19/32

T Tube O.D.	CATALOG NUMBER	Tx Reduced Tube O.D.	A	B	C	D	E
1/8	-201-PC-1	1/16	13/16	1 1/32	1/4	7/64	1/32
3/16	-301-PC-2	1/8	1 1/31	17/32	5/16	9/64	3/32
1/4	-401-PC-1	1/16	27/32	1 1/32	3/8	9/64	1/32
1/4	-401-PC-2	1/8	1 1/32	17/32	3/8	9/64	3/32
1/4	-401-PC-3	3/16	1 1/16	9/16	3/8	9/64	1/8
5/16	-501-PC-4	1/4	1 3/32	5/8	7/16	1/8	.193
3/8	-601-PC-1	1/16	27/32	1 1/32	1/2	9/64	1/32
3/8	-601-PC-2	1/8	1 1/32	17/32	1/2	9/64	3/32
3/8	-601-PC-4	1/4	1 1/8	5/8	1/2	9/64	.193
1/2	-811-PC-4	1/4	1 29/64	5/8	43/64	5/32	.193
1/2	-811-PC-6	3/8	1 1/2	1 1/16	43/64	5/32	9/32
3/4	-1211-PC-8	1/2	1 47/64	29/32	59/64	5/32	25/64

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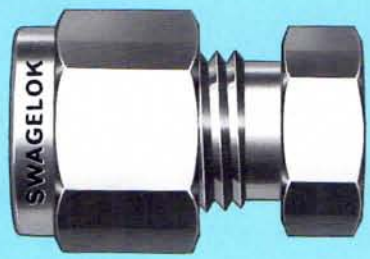
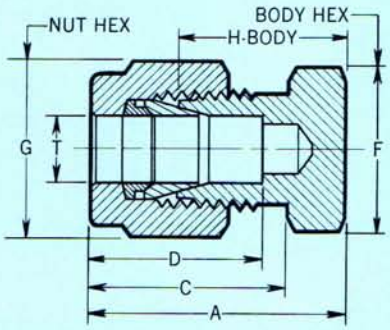
Component parts of SWAGELOK Tube Fittings are all made of the same material

CAP (FOR CAPPING END OF TUBE)



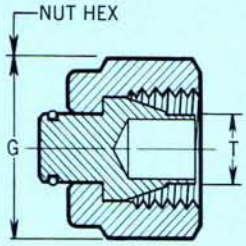
NOTE—A-D dimensions are finger tight / G-F dimensions are across hex flats



T Tube O.D.	CATALOG NUMBER	A	C	D	F	G	H
1/16	-100-C	19/32	7/16	11/32	5/16	5/16	7/16
1/8	-200-C	13/16	5/8	17/32	7/16	7/16	17/32
3/16	-300-C	55/64	21/32	9/16	7/16	1/2	37/64
1/4	-400-C	15/16	23/32	5/8	1/2	9/16	5/8
5/16	-500-C	63/64	3/4	21/32	9/16	5/8	43/64
3/8	-600-C	1 1/32	25/32	11/16	5/8	11/16	23/32
1/2	-810-C	1 5/32	7/8	29/32	13/16	7/8	3/4
5/8	-1010-C	1 3/16	7/8	31/32	15/16	1	25/32
3/4	-1210-C	1 1/4	7/8	31/32	1 1/16	1 1/8	27/32
7/8	-1410-C	1 11/32	7/8	1 1/32	1 3/16	1 1/4	15/16
1	-1610-C	1 1/2	1 1/32	1 7/32	1 3/8	1 1/2	1 1/32

PLUG (FOR PLUGGING UNUSED PORT OF FITTING)

NOTE—G dimension is across hex flats



T Tube O.D.	CATALOG NUMBER	G
1/16	-100-P	5/16
1/8	-200-P	7/16
3/16	-300-P	1/2
1/4	-400-P	9/16
5/16	-500-P	5/8
3/8	-600-P	11/16
1/2	-810-P	7/8
5/8	-1010-P	1
3/4	-1210-P	1 1/8
7/8	-1410-P	1 1/4
1	-1610-P	1 1/2

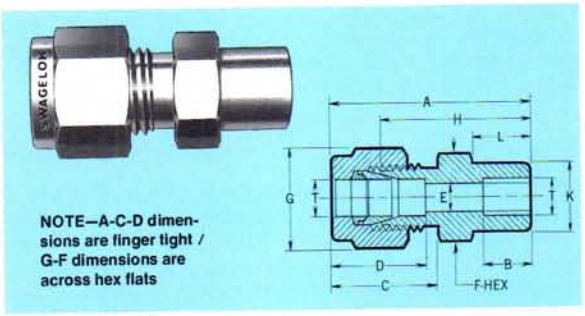
NOTE:
To tighten plug properly from finger-tight position, snug up nut with wrench only 1/4 turn.

All dimensions in inches. Dimensions for reference only . . . subject to change

Swagelok® Tube Fittings

AVAILABLE IN ALL MACHINEABLE METALS AND PLASTICS FOR PRESSURE AND VACUUM SERVICE

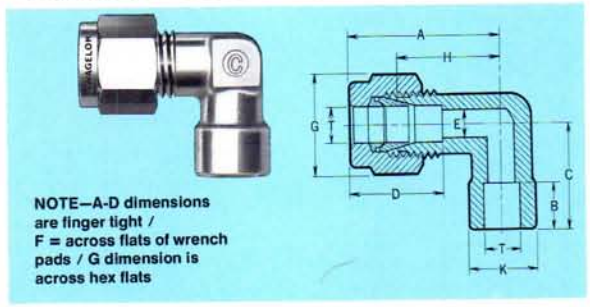
SWAGELOK TO TUBE SOCKET WELD UNION



NOTE—A-C-D dimensions are finger tight / G-F dimensions are across hex flats

T Tube O.D.	CATALOG NUMBER	A	B	C	D	E Min. Opening	F	G	H	K	L
1/8	-200-6-2TSW	1 5/32	1/4	5/8	17/32	3/32	7/16	7/16	7/8	5/16	11/32
3/16	-300-6-3TSW	1 13/64	9/32	21/32	9/16	1/8	7/16	1/2	61/64	3/8	3/8
1/4	-400-6-4TSW	1 11/32	5/16	23/32	5/8	3/16	1/2	9/16	1 1/32	7/16	13/32
3/8	-600-6-6TSW	1 1/2	3/8	25/32	11/16	9/32	5/8	11/16	1 3/16	5/8	15/32
1/2	-810-6-8TSW	1 5/8	1/2	7/8	29/32	13/32	13/16	7/8	1 7/32	3/4	15/32
5/8	-1010-6-10TSW	1 21/32	9/16	7/8	31/32	1/2	15/16	1	1 1/4	7/8	15/32
3/4	-1210-6-12TSW	1 23/32	9/16	7/8	31/32	5/8	1 1/16	1 1/8	1 5/16	1 1/16	15/32
1	-1610-6-16TSW	2 1/16	3/4	1 1/32	1 7/32	7/8	1 3/8	1 1/2	1 19/32	1 5/16	9/16

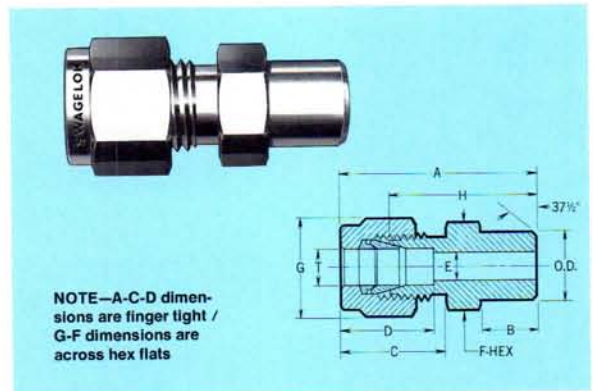
SWAGELOK TO TUBE SOCKET WELD ELBOW



NOTE—A-D dimensions are finger tight / F = across flats of wrench pads / G dimension is across hex flats

T Tube O.D.	CATALOG NUMBER	A	B	C	D	E Min. Opening	F	G	H	K
1/8	-200-9-2TSW	15/16	1/4	21/32	17/32	3/32	7/16	7/16	21/32	1/2
3/16	-300-9-3TSW	31/32	9/32	11/16	9/16	1/8	7/16	1/2	11/16	1/2
1/4	-400-9-4TSW	1 1/32	5/16	23/32	5/8	3/16	7/16	9/16	23/32	1/2
3/8	-600-9-6TSW	1 5/32	3/8	27/32	11/16	9/32	1/2	11/16	27/32	19/32
1/2	-810-9-8TSW	1 3/8	1/2	31/32	29/32	13/32	11/16	7/8	31/32	13/16
5/8	-1010-9-10TSW	1 7/16	9/16	1 1/32	31/32	1/2	13/16	1	1 1/32	15/16
3/4	-1210-9-12TSW	1 9/16	9/16	1 5/32	31/32	5/8	1	1 1/8	1 5/32	1 1/8
1	-1610-9-16TSW	1 25/32	3/4	1 5/16	1 7/32	7/8	1 1/4	1 1/2	1 5/16	1 7/16

SWAGELOK TO MALE PIPE WELD CONNECTOR

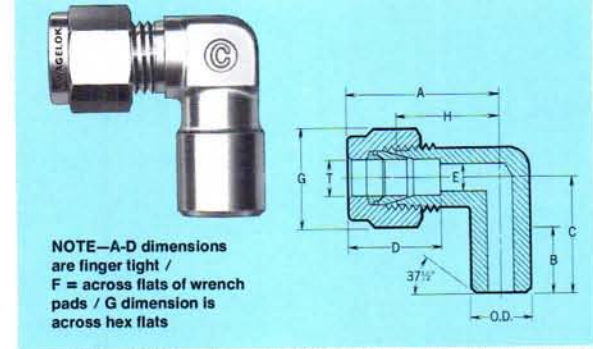


NOTE—A-C-D dimensions are finger tight / G-F dimensions are across hex flats

T Tube O.D.	Male Pipe Weld Size	CATALOG NUMBER	Pipe Weld O.D.	A	B	C	D	E Min. Opening	F	G	H
1/8	1/8	-200-1-2MPW	.405	1 3/16	3/8	5/8	17/32	3/32 *	7/16	7/16	29/32
3/16	1/8	-300-1-2MPW	.405	1 15/64	3/8	21/32	9/16	1/8	7/16	1/2	61/64
1/4	1/8	-400-1-2MPW	.405	1 5/16	3/8	23/32	5/8	3/16	1/2	9/16	1
1/4	1/4	-400-1-4MPW	.540	1 1/2	9/16	23/32	5/8	3/16	9/16	9/16	1 3/16
3/8	1/4	-600-1-4MPW	.540	1 19/32	9/16	25/32	11/16	9/32	5/8	11/16	1 9/32
3/8	3/8	-600-1-6MPW	.675	1 19/32	9/16	25/32	11/16	9/32	11/16	11/16	1 9/32
3/8	1/2	-600-1-8MPW	.840	1 13/16	3/4	25/32	11/16	9/32	7/8	11/16	1 1/2
1/2	3/8	-810-1-6MPW	.675	1 23/32	9/16	7/8	29/32	13/32	13/16	7/8	1 5/16
1/2	1/2	-810-1-8MPW	.840	1 29/32	3/4	7/8	29/32	13/32	7/8	7/8	1 1/2
1/2	3/4	-810-1-12MPW	1.050	2	3/4	7/8	29/32	13/32	1 1/16	7/8	1 19/32
5/8	1/2	-1010-1-8MPW	.840	1 15/16	3/4	7/8	31/32	1/2	15/16	1	1 17/32
3/4	3/4	-1210-1-12MPW	1.050	2	3/4	7/8	31/32	5/8	1 1/16	1 1/8	1 19/32
1	1	-1610-1-16MPW	1.315	2 1/16	15/16	1 1/32	1 7/32	7/8	1 3/8	1 1/2	1 31/32

* "E" dimension is minimum opening. Fitting is back-drilled to larger bore I.D. at pipe end.

SWAGELOK TO MALE PIPE WELD ELBOW



NOTE—A-D dimensions are finger tight / F = across flats of wrench pads / G dimension is across hex flats

T Tube O.D.	Male Pipe Weld Size	CATALOG NUMBER	Pipe Weld O.D.	A	B	C	D	E Min. Opening	F	G	H
1/8	1/8	-200-2-2MPW	.405	15/16	3/8	23/32	17/32	3/32	7/16	7/16	21/32
3/16	1/8	-300-2-2MPW	.405	31/32	3/8	3/4	9/16	1/8	7/16	1/2	11/16
1/4	1/8	-400-2-2MPW	.405	1 1/32	3/8	25/32	5/8	3/16	7/16	9/16	23/32
1/4	1/4	-400-2-4MPW	.540	1 3/32	9/16	15/16	5/8	3/16	1/2	9/16	25/32
3/8	1/4	-600-2-4MPW	.540	1 5/32	9/16	1	11/16	9/32	1/2	11/16	27/32
1/2	3/8	-810-2-6MPW	.675	1 3/8	9/16	1 1/8	29/32	13/32	11/16	7/8	31/32
1/2	1/2	-810-2-8MPW	.840	1 7/16	3/4	1 5/16	29/32	13/32	13/16	7/8	1 1/32
5/8	1/2	-1010-2-8MPW	.840	1 7/16	3/4	1 3/8	31/32	1/2	13/16	1	1 1/32
3/4	3/4	-1210-2-12MPW	1.050	1 9/16	3/4	1 1/2	31/32	5/8	1	1 1/8	1 5/32
1	3/4	-1610-2-12MPW	1.050	1 25/32	15/16	1 21/32	1 7/32	3/4	1 1/4	1 1/2	1 5/16
1	1	-1610-2-16MPW	1.315	1 25/32	15/16	1 27/32	1 7/32	7/8	1 1/4	1 1/2	1 5/16

For additional information see Weld Fittings subsection of Master Catalog Binder.

When ordering be sure to specify material. See page 28 for complete ordering information.

Swagelok® Tube Fittings

AVAILABLE IN ALL MACHINEABLE METALS AND PLASTICS FOR PRESSURE AND VACUUM SERVICE

Component parts of SWAGELOK Tube Fittings are all made of the same material

O-SEAL FITTINGS

SWAGELOK O-Seal Connectors and Adapters with tapered pipe threads provide a vacuum-tight or high-pressure seal with existing pipe thread ports.

O-Seal Straight Thread Fittings are designed for use with straight thread ports to make similar leak-tight connections.

O-Seal Fittings are manufactured within precise tolerances to control proper O-Ring squeeze, insuring helium leak-tightness for vacuum applications. The fittings are designed so that when installed, the O-Ring is completely retained by metal to prevent O-Ring extrusion. Standard O-Ring is Buna compound.

INSTALLATION INSTRUCTIONS

In order to make a tight seal with SWAGELOK O-Seal Fittings, all that is necessary is to have a smooth flat surface for the O-Ring. It is very important that this surface be perpendicular to the axis of the threads.

When installing an O-Seal fitting, turn it until finger tight. (The squeeze on O-Ring can be felt during the last ¼ turn.) After finger tight installation, snug lightly with a wrench.

When connecting the tubing to the SWAGELOK connectors, always use a back-up wrench on the O-Seal fitting hex so that it does not turn while the nut is being tightened. Also use a back-up wrench when disconnecting a tubing connection.

For a raised surface, such as Figure 1, it is recommended that the flat surface have a diameter at least as large as dimension "A" for the various size O-Seal fittings. This diameter is sufficient to allow metal to metal contact outside of the O-Ring sealing diameter, which will prevent O-Ring extrusion at high pressure.

Figure 2 is an O-Seal fitting used with a counterbored or recessed hole. In this case, the diameter "B" is sufficient to allow the round shoulder of the O-Seal to clear for proper installation. "D" gives the maximum depth that can be used with this diameter.

Figure 3 is a deeper counterbored or recessed hole and dimension "E" is the maximum depth that will allow a thin wrench (⅛") to hold the O-Seal fitting while the SWAGELOK connection is made to the tubing. The diameter "C" is sufficient to allow the hex of the fitting to turn in the recessed hole.

MOUNTING DIMENSIONS FOR O-SEAL CONNECTORS AND ADAPTERS

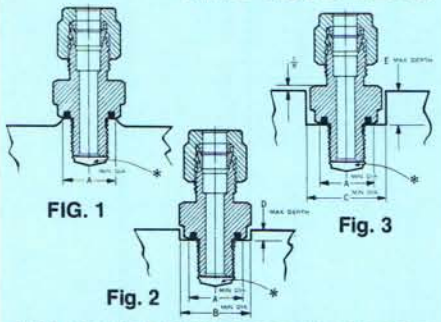


FIG. 1

Fig. 3

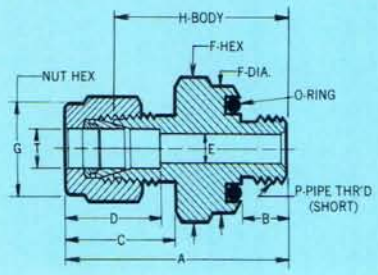
Fig. 2

*ALLOW CLEARANCE FOR FULL THREAD

CATALOG NUMBER	Straight Thread	Pipe Thread	A Min. Dia. For Sealing	B Min. Diameter	D Max. Depth	C Min. Diameter	E Max. Depth
-100-1-OR	5/16-24		1/2	19/32	3/32	21/32	5/32
-100-1-1-OR		1/16 NPT	1/2	19/32	3/32	21/32	5/32
-200-1-OR	5/16-24		1/2	19/32	3/32	21/32	7/32
-200-1-2-OR		1/8 NPT	11/16	25/32	5/32	7/8	9/32
-300-1-OR	3/8-24		17/32	21/32	3/32	3/4	7/32
-400-1-OR	7/16-20		11/16	25/32	5/32	7/8	9/32
-400-1-4-OR		1/4 NPT	13/16	31/32	5/32	1 3/32	5/16
-500-1-OR	1/2-20		3/4	29/32	5/32	1 1/32	5/16
-600-1-OR	9/16-18		13/16	31/32	5/32	1 3/32	5/16
-600-1-6-OR		3/8 NPT	1	1 5/32	5/32	1 5/16	1 1/32
-810-1-OR	3/4-16		1	1 5/32	5/32	1 5/16	1 1/32
-810-1-8-OR		1/2 NPT	17/32	1 11/32	7/32	1 17/32	7/16
-1010-1-OR	7/8-14		17/32	1 11/32	7/32	1 17/32	7/16
-1210-1-OR	1 1/16-12		1 13/32	1 17/32	7/32	1 3/4	1/2
-1210-1-12-OR		3/4 NPT	1 13/32	1 17/32	7/32	1 3/4	1/2
-1410-1-OR	1 1/16-12		1 13/32	1 17/32	7/32	1 3/4	1/2
-1610-1-OR	1 5/16-12		1 11/16	1 25/32	7/32	2 1/32	9/16
-1610-1-16-OR		1" NPT	1 11/16	1 25/32	7/32	2 1/32	9/16

O-SEAL MALE CONNECTOR PIPE THREAD

NOTE—A-C-D dimensions are finger tight / G-F dimensions are across hex flats.



T Tube O.D.	P Male Pipe Size	CATALOG NUMBER	A	B	C	D	E Min. Opening	F	G	H	O Ring I.D. O.D.	Uniform Size No.
1/16	1/8	-100-1-2-OR	1/8	9/32	7/16	11/32	.052	3/4	5/16	31/32	7/16 × 5/8	-111
1/8	1/8	-200-1-2-OR	5/16	9/32	5/8	17/32	3/32	3/4	7/16	1 1/32	7/16 × 5/8	-111
1/8	1/4	-200-1-4-OR	7/16	3/8	5/8	17/32	3/32	15/16	7/16	1 5/32	9/16 × 3/4	-113
3/16	1/8	-300-1-2-OR	11/32	9/32	21/32	9/16	1/8	3/4	1/2	1 1/16	7/16 × 5/8	-111
3/16	1/4	-300-1-4-OR	15/32	3/8	21/32	9/16	1/8	15/16	1/2	1 3/16	9/16 × 3/4	-113
1/4	1/8	-400-1-2-OR	13/32	9/32	23/32	5/8	3/16	3/4	9/16	1 3/32	7/16 × 5/8	-111
1/4	1/4	-400-1-4-OR	17/32	3/8	23/32	5/8	3/16	15/16	9/16	1 7/32	9/16 × 3/4	-113
1/4	3/8	-400-1-6-OR	19/32	13/32	23/32	5/8	3/16	1 1/8	9/16	1 9/32	3/4 × 15/16	-116
5/16	1/8	-500-1-2-OR	17/16	9/32	3/4	21/32	3/16	3/4	5/8	1 1/8	7/16 × 5/8	-111
5/16	1/4	-500-1-4-OR	19/16	3/8	3/4	21/32	1/4	15/16	5/8	1 1/4	9/16 × 3/4	-113
3/8	1/8	-600-1-2-OR	15/32	9/32	25/32	11/16	3/16	3/4	11/16	1 5/32	7/16 × 5/8	-111
3/8	1/4	-600-1-4-OR	19/32	3/8	25/32	11/16	9/32	15/16	11/16	1 9/32	9/16 × 3/4	-113
3/8	3/8	-600-1-6-OR	21/32	13/32	25/32	11/16	9/32	1 1/8	11/16	1 11/32	3/4 × 15/16	-116
3/8	1/2	-600-1-8-OR	1 7/8	17/32	25/32	11/16	9/32	1 5/16	11/16	1 9/16	7/8 × 1 1/8	-212
1/2	1/4	-810-1-4-OR	1 11/16	3/8	7/8	29/32	9/32	15/16	7/8	1 9/32	9/16 × 3/4	-113
1/2	3/8	-810-1-6-OR	1 3/4	13/32	7/8	29/32	13/32	1 1/8	7/8	1 11/32	3/4 × 15/16	-116
1/2	1/2	-810-1-8-OR	1 31/32	17/32	7/8	29/32	13/32	1 5/16	7/8	1 9/16	7/8 × 1 1/8	-212
5/8	1/2	-1010-1-8-OR	1 31/32	17/32	7/8	31/32	1/2	1 5/16	1	1 9/16	7/8 × 1 1/8	-212
5/8	3/4	-1010-1-12-OR	2 1/16	9/16	7/8	31/32	1/2	1 1/2	1	1 21/32	1 1/16 × 1 5/16	-215
3/4	1/2	-1210-1-8-OR	1 31/32	17/32	7/8	31/32	35/64	1 5/16	1 1/8	1 9/16	7/8 × 1 1/8	-212
3/4	3/4	-1210-1-12-OR	2 1/16	9/16	7/8	31/32	5/8	1 1/2	1 1/8	1 21/32	1 1/16 × 1 5/16	-215
1	3/4	-1610-1-12-OR	2 7/32	9/16	1 1/32	1 7/32	5/8	1 1/2	1 1/2	1 3/4	1 1/16 × 1 5/16	-215
1	1	-1610-1-16-OR	2 3/8	21/32	1 1/32	1 7/32	7/8	1 3/4	1 1/2	1 29/32	1 5/16 × 1 9/16	-219

All dimensions in inches. Dimensions for reference only . . . subject to change

Swagelok® Tube Fittings

AVAILABLE IN ALL MACHINEABLE METALS AND PLASTICS FOR PRESSURE AND VACUUM SERVICE

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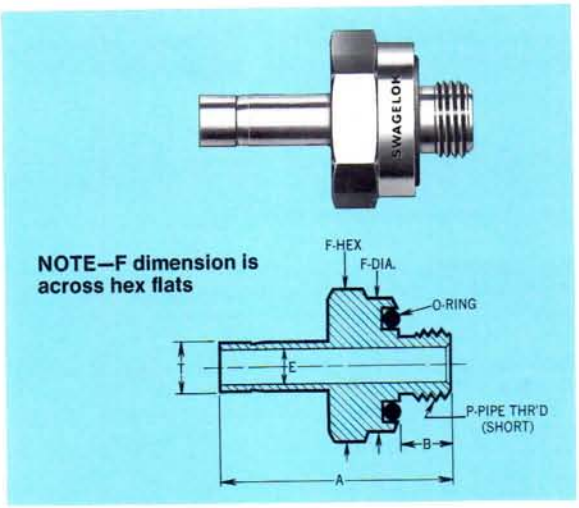
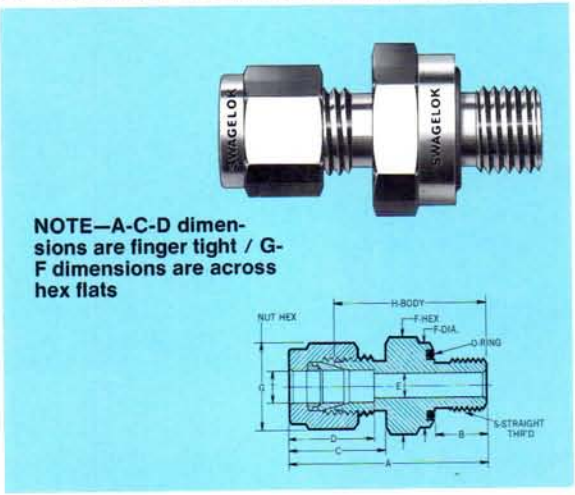
O-SEAL MALE ADAPTER PIPE THREAD



NOTE—F dimension is across hex flats

T Tube O.D.	P Male Pipe Size	CATALOG NUMBER	A	B	E Minimum Opening	F	O Ring I.D.	O Ring O.D.	Uniform Size Number
1/16	1/8	-101-A-2-OR	1 1/32	9/32	1/32	3/4	7/16	5/8	-111
1/8	1/8	-201-A-2-OR	1 7/32	9/32	3/32	3/4	7/16	5/8	-111
1/8	1/4	-201-A-4-OR	1 11/32	3/8	3/32	15/16	9/16	3/4	-113
3/16	1/8	-301-A-2-OR	1 1/4	9/32	1/8	3/4	7/16	5/8	-111
3/16	1/4	-301-A-4-OR	1 3/8	3/8	1/8	15/16	9/16	3/4	-113
1/4	1/8	-401-A-2-OR	1 5/16	9/32	.193	3/4	7/16	5/8	-111
1/4	1/4	-401-A-4-OR	1 7/16	3/8	.193	15/16	9/16	3/4	-113
1/4	3/8	-401-A-6-OR	1 1/2	13/32	.193	1 1/8	3/4	15/16	-116
5/16	1/8	-501-A-2-OR	1 11/32	9/32	3/16	3/4	7/16	5/8	-111
5/16	1/4	-501-A-4-OR	1 15/32	3/8	1/4	15/16	9/16	3/4	-113
3/8	1/8	-601-A-2-OR	1 3/8	9/32	3/16	3/4	7/16	5/8	-111
3/8	1/4	-601-A-4-OR	1 1/2	3/8	9/32	15/16	9/16	3/4	-113
3/8	3/8	-601-A-6-OR	1 9/16	13/32	9/32	1 1/8	3/4	15/16	-116
1/2	3/8	-811-A-6-OR	1 25/32	13/32	25/64	1 1/8	3/4	15/16	-116
5/8	1/2	-1011-A-8-OR	2 1/16	17/32	1/2	1 5/16	7/8	1 1/8	-212
3/4	3/4	-1211-A-12-OR	2 5/32	9/16	19/32	1 1/2	1 1/16	1 5/16	-215
1	1	-1611-A-16-OR	2 9/16	21/32	51/64	1 3/4	1 5/16	1 9/16	-219

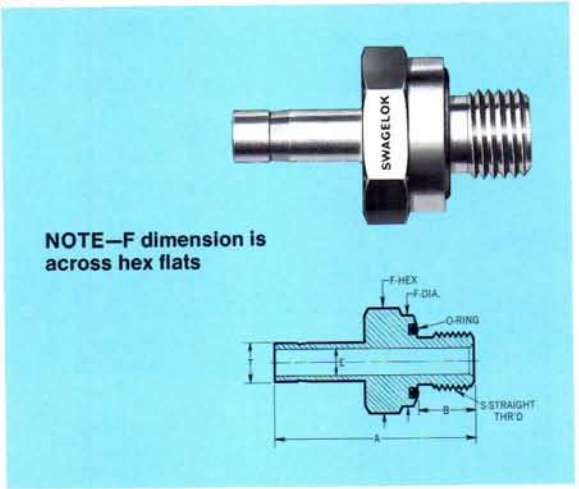
O-SEAL STRAIGHT THREAD CONNECTOR



NOTE—A-C-D dimensions are finger tight / G-F dimensions are across hex flats

T Tube O.D.	S Thread Size	CATALOG NUMBER	A	B	C	D	E Min. Opening	F	G	H	O Ring I.D.	O Ring O.D.	Uniform Size No.
1/16	5/16-24	-100-1-OR	1 1/16	11/32	7/16	11/32	.052	9/16	5/16	29/32	5/16	7/16	-011
1/8	5/16-24	-200-1-OR	1 5/16	11/32	5/8	17/32	3/32	9/16	7/16	1 1/32	5/16	7/16	-011
3/16	3/8-24	-300-1-OR	1 3/8	3/8	21/32	9/16	1/8	5/8	1/2	1 3/32	3/8	1/2	-012
1/4	7/16-20	-400-1-OR	1 17/32	13/32	23/32	5/8	3/16	3/4	9/16	1 7/32	7/16	5/8	-111
5/16	1/2-20	-500-1-OR	1 5/8	7/16	3/4	21/32	1/4	7/8	5/8	1 5/16	1/2	11/16	-112
3/8	9/16-18	-600-1-OR	1 11/16	15/32	25/32	11/16	9/32	15/16	11/16	1 3/8	9/16	3/4	-113
1/2	3/4-16	-810-1-OR	1 13/16	15/32	7/8	29/32	13/32	1 1/8	7/8	1 13/32	3/4	15/16	-116
5/8	7/8-14	-1010-1-OR	1 29/32	15/32	7/8	31/32	1/2	1 5/16	1	1 1/2	7/8	1 1/8	-212
3/4	1 1/16-12	-1210-1-OR	2 1/16	9/16	7/8	31/32	5/8	1 1/2	1 1/8	1 21/32	1 1/16	1 5/16	-215
7/8	1 1/16-12	-1410-1-OR	2 1/16	9/16	7/8	1 1/32	23/32	1 1/2	1 1/4	1 21/32	1 1/16	1 5/16	-215
1	1 5/16-12	-1610-1-OR	2 9/32	9/16	1 1/32	1 7/32	7/8	1 3/4	1 1/2	1 13/16	1 5/16	1 9/16	-219

O-SEAL STRAIGHT THREAD ADAPTER



NOTE—F dimension is across hex flats

T Tube O.D.	S Thread Size	CATALOG NUMBER	A	B	E Minimum Opening	F	O Ring I.D.	O Ring O.D.	Uniform Size Number
1/16	5/16-24	-101-A-OR	31/32	11/32	1/32	9/16	5/16	7/16	-011
1/8	5/16-24	-201-A-OR	1 7/32	11/32	3/32	9/16	5/16	7/16	-011
3/16	3/8-24	-301-A-OR	1 9/32	3/8	1/8	5/8	3/8	1/2	-012
1/4	7/16-20	-401-A-OR	1 7/16	13/32	.193	3/4	7/16	5/8	-111
5/16	1/2-20	-501-A-OR	1 17/32	7/16	1/4	7/8	1/2	11/16	-112
3/8	9/16-18	-601-A-OR	1 19/32	15/32	9/32	15/16	9/16	3/4	-113
1/2	3/4-16	-811-A-OR	1 27/32	15/32	25/64	1 1/8	3/4	15/16	-116
5/8	7/8-14	-1011-A-OR	2	15/32	1/2	1 5/16	7/8	1 1/8	-212
3/4	1 1/16-12	-1211-A-OR	2 5/32	9/16	19/32	1 1/2	1 1/16	1 5/16	-215
7/8	1 1/16-12	-1411-A-OR	2 7/32	9/16	11/16	1 1/2	1 1/16	1 5/16	-215
1	1 5/16-12	-1611-A-OR	2 15/32	9/16	51/64	1 3/4	1 5/16	1 9/16	-219

For additional information on adapters, see page 13.

When ordering be sure to specify material. See page 28 for complete ordering information.

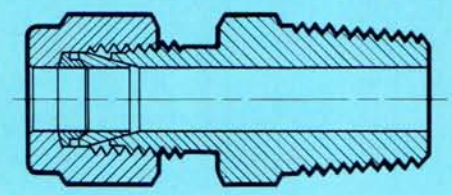
Swagelok®

Tube Fittings

AVAILABLE IN ALL MACHINEABLE METALS AND PLASTICS FOR PRESSURE AND VACUUM SERVICE

Component parts of SWAGELOK Tube Fittings are all made of the same material

THERMOCOUPLE CONNECTORS



FOR DIMENSIONS SEE MALE CONNECTOR ON PAGE 7

HOW TO MAKE THERMOCOUPLE CONNECTORS

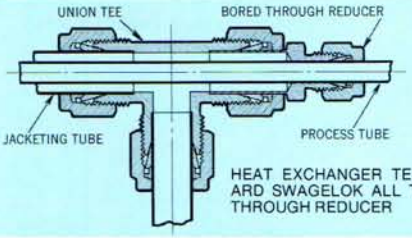
To order, select the desired Male Connector and add suffix BT.
For example, SS-400-1-4BT.

Thermocouples or dip tubes are easily handled by SWAGELOK Thermocouple Connectors. They are available in brass, aluminum, steel, stainless steel, Monel and nylon. Other machineable metals and plastics can be furnished when required.

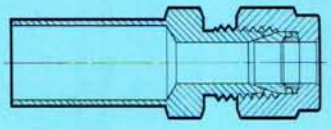
NOTE — The root diameter of the pipe thread end of male connectors makes it impractical to bore through all male connectors. For instance, a -600-1-2 or a -1210-1-8 cannot be bored through without seriously reducing the pipe end strength or destroying the pipe end.

SWAGELOK HEAT EXCHANGER TEES

Made with standard SWAGELOK Union Tee and bored through Reducer.

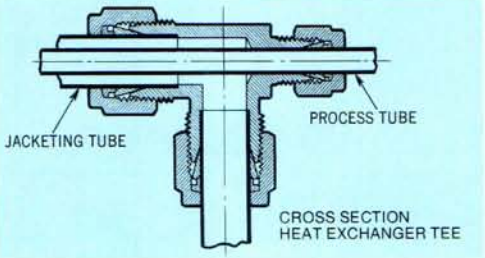


HEAT EXCHANGER TEE MADE WITH STANDARD SWAGELOK ALL TUBE TEE AND BORED THROUGH REDUCER



To order—use part number of SWAGELOK Reducer and add BT (bored through) which will specify O.D. of the PROCESS TUBE.
Example: B-600-R-8BT.

Note: Most users prefer to use our standard reducer and bore it in their own shop.



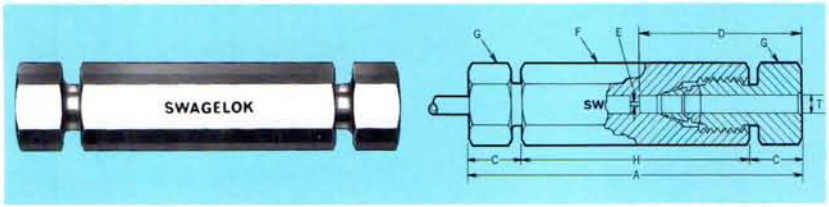
CROSS SECTION HEAT EXCHANGER TEE

Manufactured with any combination of SWAGELOK tube ends.

To order SWAGELOK Heat Exchanger Tees specify in the following order: jacketing tube O.D. x the process tube O.D. x the branch tube O.D.
Example: SS-1210-3-8BT-12.

GAS CHROMATOGRAPH FITTINGS

Shown is only one out of thousands of different Gas Chromatograph Fittings which we make for special applications. Because of the wide variety of end connections, threads, tapers, etc., we only show this low dead volume union as typical of many others. Consult your local SWAGELOK distributor for advice on use of standard configurations to create specials to your order.



T Tube O.D.	CATALOG NUMBER	A	C	D	E Minimum Opening	F	G	H	Dead Space
1/16	-1FO-6GC	1 1/4	1 3/64	39/64	.0135	1/4	1/4	27/32	6.6×10⁻⁵ cc

-1FO-6GC (formerly catalog no. -100GC-6)

All dimensions in inches. Dimensions for reference only . . . subject to change

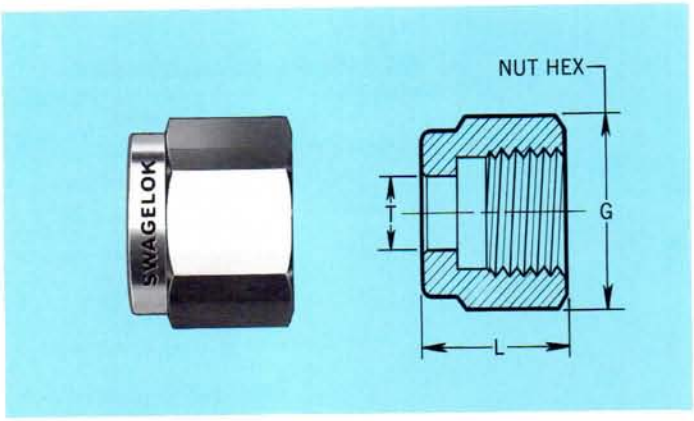
Swagelok® Tube Fittings

AVAILABLE IN ALL MACHINEABLE METALS AND PLASTICS FOR PRESSURE AND VACUUM SERVICE

Component parts of SWAGELOK Tube Fittings are all made of the same material

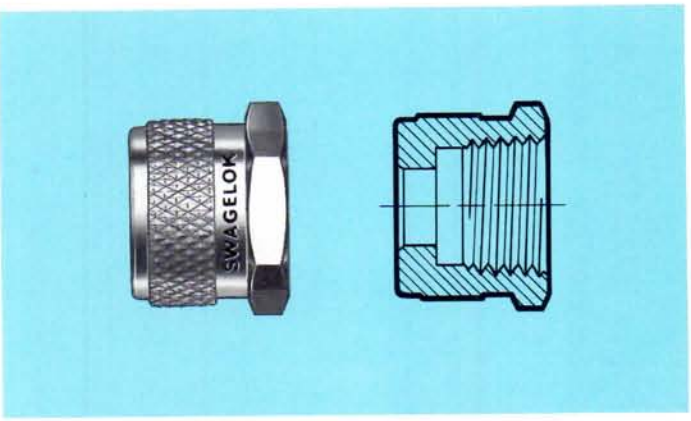
REPLACEMENT NUTS AND FERRULES

NUT



T Tube O.D.	CATALOG NUMBER	G	L
1/16	-102-1	5/16	5/16
1/8	-202-1	7/16	15/32
3/16	-302-1	1/2	15/32
1/4	-402-1	9/16	1/2
5/16	-502-1	5/8	17/32
3/8	-602-1	11/16	9/16
1/2	-812-1	7/8	11/16
5/8	-1012-1	1	11/16
3/4	-1212-1	1 1/8	11/16
7/8	-1412-1	1 1/4	11/16
1	-1612-1	1 1/2	13/16

KNURLED NUT



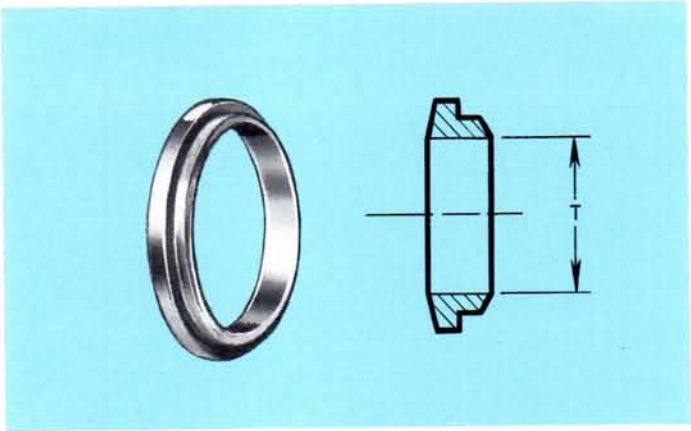
Knurled Nuts are available in the same sizes as shown for SWAGELOK Nuts.

To order, add suffix K to catalog number. Example: B-102-1K.

To order Knurled Nut on assembled fitting with nylon ferrules, add suffix KN. Example: B-400-1-2KN.

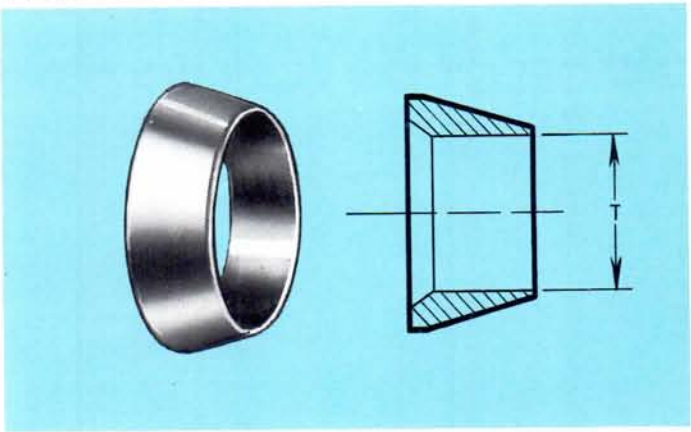
To order Knurled Nut on assembled fitting with TFE ferrules, add suffix KT. Example: SS-400-1-2KT.

BACK FERRULE



T Tube O.D.	CATALOG NUMBER
1/16	-104-1
1/8	-204-1
3/16	-304-1
1/4	-404-1
5/16	-504-1
3/8	-604-1
1/2	-814-1
5/8	-1014-1
3/4	-1214-1
7/8	-1414-1
1	-1614-1

FRONT FERRULE



T Tube O.D.	CATALOG NUMBER
1/16	-103-1
1/8	-203-1
3/16	-303-1
1/4	-403-1
5/16	-503-1
3/8	-603-1
1/2	-813-1
5/8	-1013-1
3/4	-1213-1
7/8	-1413-1
1	-1613-1

When ordering be sure to specify material. See page 28 for complete ordering information.

Swagelok® Tube Fittings

AVAILABLE IN ALL MACHINEABLE METALS AND PLASTICS FOR PRESSURE AND VACUUM SERVICE

Component parts of SWAGELOK Tube Fittings are all made of the same material

FERRULE-PAK® package simplifies ordering, stocking, assembling.

The SWAGELOK Ferrule-Pak offers new convenience at the same prices as individual front-back ferrule sets. The Pak contains 100 ferrule sets, with ten sets rodded on each of ten arbors. Arbors may be dispensed one at a time. The clear plastic cover protects the remaining ferrules in the package, and allows instant check of inventory.

PATENTED

To dispense, simply slide the Ferrule-Pak cover past the top end of the cardboard backing far enough to release one arbor.

To assemble, hold the fitting body vertically and insert the arbor point into the bore of the fitting. Hold a ferrule set firmly with thumb and forefinger and withdraw the arbor. Then tighten the nut finger-tight.

ORDERING INSTRUCTIONS

CATALOG NUMBER		
TUBE O.D. SIZE	QUANTITY 1 FERRULE-PAK (100 SETS)	1 ARBOR (10 SETS)
1/16"	-100 Sets—100	-100 Sets—10
1/8"	-200 Sets—100	-200 Sets—10
1/4"	-400 Sets—100	-400 Sets—10
3/8"	-600 Sets—100	-600 Sets—10
1/2"	-810 Sets—100	-810 Sets—10

To identify materials, use MATERIAL DESIGNATOR Code prefix as shown on Page 28. (Example: B = Brass, SS = 316 Stainless Steel, etc.)

SWAGELOK KN TUBE FITTINGS MOUNTED ON POLYETHYLENE TUBING

The SWAGELOK KN Fitting provides a leak-tight seal on polyethylene tubing of almost all wall thicknesses without the use of inserts. It consists of a brass SWAGELOK Tube Fitting body, nylon ferrules and a brass knurled nut. In order to set the ferrules, initial connections are made with a wrench by tightening the nut one-and-one-quarter turns from finger-tight. Leakproof reconnections are made with finger-tight assembly.

SWAGELOK ON PLASTICIZED PVC OR TYGON TUBING

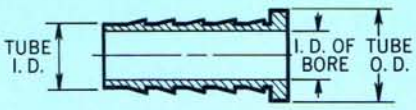
SWAGELOK Inserts are used in securing soft plastic tubing with standard SWAGELOK Tube Fittings. In determining the correct size of SWAGELOK Insert to be used, always check outside diameter and inside diameter of the plastic tubing.

For a complete line of hose connectors for soft plastic tubing see Hose Connectors subsection of Master Catalog Binder.

CATALOG NUMBER	TUBE O.D.	TUBE I.D.	I.D. OF BORE
-305-2	3/16	1/8	3/32
-405-2	1/4	1/8	3/32
-405-170	1/4	.170	7/64
-405-3	1/4	3/16	9/64
-505-2	5/16	1/8	3/32
-505-3	5/16	3/16	1/8
-505-4	5/16	1/4	3/16
-605-3	3/8	3/16	1/8
-605-4	3/8	1/4	3/16
-815-4	1/2	1/4	3/16
-815-6	1/2	3/8	5/16
-1015-6	5/8	3/8	5/16
-1015-8	5/8	1/2	7/16
-1215-8	3/4	1/2	7/16
-1215-10	3/4	5/8	9/16
-1415-10	7/8	5/8	9/16
-1415-12	7/8	3/4	11/16
-1615-12	1	3/4	11/16
-1615-14	1	7/8	13/16

INSERT

Not necessary with most plastic tubing. For use with Tygon or other types of soft polyvinyl chloride plastic tubing.



EXAMPLE—In using Tygon plastic tubing 3/8" O.D. by 1/4" I.D. the following parts would be used:

MATERIAL	SWAGELOK FITTING	SWAGELOK INSERT
Brass	B-600-1-4	B-605-4
Aluminum	A-600-1-4	A-605-4
Steel	S-600-1-4	S-605-4
Stainless Steel	SS-600-1-4	SS-605-4
Monel	M-600-1-4	M-605-4
Nylon	NY-600-1-4	NY-605-4

All dimensions in inches. Dimensions for reference only . . . subject to change

Swagelok®

Tube Fittings

AVAILABLE IN ALL MACHINEABLE METALS AND PLASTICS FOR PRESSURE AND VACUUM SERVICE

Component parts of SWAGELOK Tube Fittings are all made of the same material

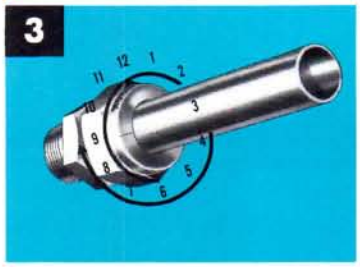
SWAGELOK Tube Fittings come to you completely assembled, finger-tight. They are ready for immediate use. Disassembly before use can result in dirt or foreign material getting into the fitting and causing leaks.

INSTALLATION INSTRUCTIONS

SWAGELOK Tube Fittings are installed in three easy steps.

STEP 1
SIMPLY INSERT THE TUBING INTO THE SWAGELOK TUBE FITTING. MAKE SURE THAT THE TUBING RESTS FIRMLY ON THE SHOULDER OF THE FITTING AND THAT THE NUT IS FINGER-TIGHT.

STEP 2
BEFORE TIGHTENING THE SWAGELOK NUT, SCRIBE THE NUT AT THE 6:00 O'CLOCK POSITION.



STEP 3
NOW WHILE HOLDING THE FITTING BODY STEADY WITH A BACKUP WRENCH, TIGHTEN THE NUT ONE-AND-ONE - QUARTER TURNS*, WATCHING THE SCRIBE MARK, MAKE ONE COMPLETE REVOLUTION AND CONTINUE TO THE 9:00 O'CLOCK POSITION.

By scribing the nut yourself at the 6:00 o'clock position *as it appears to you,* there will be no doubt as to the starting position. When tightened 1¼ turns to the 9:00 o'clock position you can easily see that the fitting has been properly installed.

High Pressure Applications:

Due to the variation of tubing diameters, a common starting point is desirable. Therefore, use a wrench to snug up the nut until the tubing will not turn (by hand) in the fitting. At this point, scribe the nut and body of the fitting. Now tighten the nut one-and-one-quarter turns and the fitting is ready to hold pressures high enough to yield the tubing.

*For 1/16", 1/8" and 3/16" size tube fittings, only 3/4 turn from finger-tight is necessary.

RE-TIGHTENING INSTRUCTIONS

Connections can be disconnected and re-tightened many, many times and the same reliable, leak-proof seal obtained every time the reconnection is made.

FITTING SHOWN IN DISCONNECTED POSITION

TUBING WITH PRE-SWAGED FERRULES INSERTED INTO THE FITTING UNTIL FRONT FERRULE SEATS IN FITTING.

TIGHTEN NUT BY HAND. ROTATE NUT ABOUT ONE-QUARTER TURN WITH WRENCH (OR TO ORIGINAL ONE-AND-ONE-QUARTER TIGHT POSITION). THEN SNUG SLIGHTLY WITH WRENCH.

PRE-SWAGING INSTRUCTIONS

When SWAGELOK Tube Fittings are to be installed in cramped quarters or overhead where ladders must be used, it is sometimes found advantageous to use a pre-swaging tool on the tubing in an open ground area, thus pre-swaging the ferrules onto the tubing. The tubing is then removed from the pre-swaging tool and the tubing (with nut and pre-swaged ferrules) can now be attached to a fitting merely by following the re-tightening instructions.

1. Assemble SWAGELOK nut and ferrules to pre-swaging tool. Insert tubing and tighten nut one-and-one-quarter turns.

2. The nut is loosened and the tubing with pre-swaged ferrules is removed from the pre-swaging tool.

3. The connection can now be made by merely snugging up the nut as described in the re-tightening instructions.

When ordering be sure to specify material. See page 28 for complete ordering information.

How to order SWAGELOK tube fittings

TYPICAL SWAGELOK PART NUMBERS

MATERIAL	MATERIAL DESIGNATOR	TUBE SIZE DESIGNATOR [Sixteenths/Inch or (MM)]	FITTING SERIES DESIGNATOR	COMPONENT DESIGNATOR	TYPE OF FITTING DESIGNATOR	REDUCED SIZE OR TYPE OF OTHER END [Sixteenths/Inch or (MM)]	COMPLETE PART NUMBER	SEE CATALOG PAGE NO.
Brass	B	6 (3/8")	0	0 (Complete Assembly)	1 (Male Connector)	6 (3/8" Pipe)	B-600-1-6	7
Steel	S	16 (1")	1	0 (Complete Assembly)	2 (Male Elbow)	16 (1" Pipe)	S-1610-2-16	8
316 Stainless Steel	SS	6 (6 Millimeter)	M	0 (Complete Assembly)	6 (Union)		SS-6M0-6	Metric Tube Fitting Catalog C-M373
Aluminum	A	4 (1/4")	0	1 (Body Only)	A (Adapter)	4 (1/4" Male Pipe)	A-401-A-4	8
Monel	M	6 (3/8")	0	0 (Complete Assembly)	9 (Union Elbow)		M-600-9	15
Nylon	NY	4 (1/4")	0	0 (Complete Assembly)	6 (Union)	2 (Reducing 1/8" Tube)	NY-400-6-2	15
TFE	T	4 (1/4")	0	0 (Complete Assembly)	3 (Tee)		T-400-3	16

Mandatory Dash

Ordering Instructions

The numbering system for SWAGELOK Tube Fittings is designed so that all catalog numbers are prefixed by a MATERIAL DESIGNATOR Code followed by a dash. Examples: B–(Brass), S–(Steel), SS–(316 Stainless Steel), A–(Aluminum), M–(Monel), NY–(Nylon), T–(TFE).

The SIZE DESIGNATOR following the mandatory dash indicates the tubing O.D. size in sixteenths of an inch (or millimeters).

After the SIZE DESIGNATOR is the FITTING SERIES DESIGNATOR. See page 6 for complete list.

After the FITTING SERIES DESIGNATOR is COMPONENT DESIGNATOR. See page 6 for complete list.

After the next mandatory dash is the TYPE OF FITTING DESIGNATOR. See page 6 for complete list. This number or letter identifies the TYPE OF FITTING (such as male connector, union elbow, reducing union, tee, adapter, etc.).

After the next dash is suffix denoting REDUCED SIZE or TYPE OF OTHER END CONNECTION (if it differs from the first end), also in sixteenths of an inch, (or millimeters).

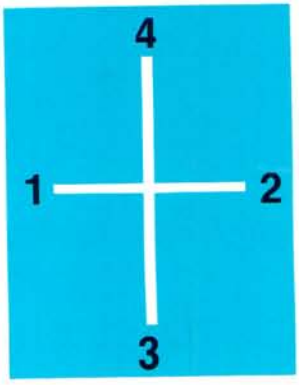
For Tube Fittings over 1", see Tube Fittings (over 1") subsection of Master Catalog Binder. For Metric Tube Fittings see Metric Tube Fitting Catalog C-M373.

FOR A COMPLETE LIST OF MATERIAL DESIGNATOR CODES, SEE REVERSE SIDE OF "FITTINGS" DIVIDER IN MASTER CATALOG BINDER.

Tees and Crosses

TEES are described by first sizing the run (1 to 2) and then the branch (3). CROSSES are described by first sizing the run (1 to 2) and then the branch (3 to 4).

Example: B-600-3TTF (See page 12). (Brass Female Branch Tee).



MONEL—T.M. International Nickel, TYGON—T.M. U.S. Stoneware Company

YOUR LOCAL SALES & SERVICE REPRESENTATIVE

11-74-100M-250M-BL
Printed in U.S.A.

Swagelok®

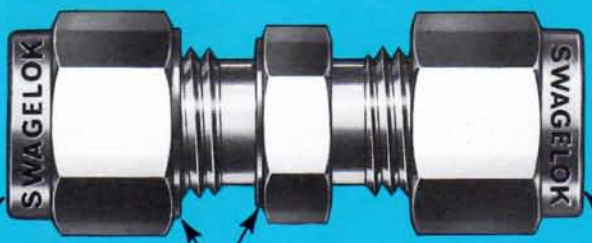
metric tube fittings

The recent increase in metric tubing requirements has prompted a SWAGELOK Metric Tube Fitting design. Without doubt, the whole world will go metric. Many forward looking companies are designing for the future and SWAGELOK is proud to be America's leader in this progress.

SWAGELOK Metric Tube Fittings are quite similar in appearance to SWAGELOK Tube Fittings in fractional sizes. The significant difference, however, is in the internal diameter of the tube fitting components. Due to the external similarity between metric and fractional sizes, we have machined a stepped shoulder into the body hex and nut hex to easily identify SWAGELOK Metric Tube Fittings.

In addition to the fittings shown, SWAGELOK also makes a wide range of Metric Tube Fittings in sizes from 2MM to 38MM tube sizes. 8MM sizes are not shown. SWAGELOK 500 Series Fractional Tube Fittings will accept 8MM tubing systems. Please note especially the male and female adapters and unions which are used to ease the conversion from fractional to metric tubing. Note also that many fittings are available with ISO threads for connecting to equipment ports using British BSP Pl, Whitworth, Din and Keg straight threads, as well as to such equipment utilizing Din, Keg and British BSP Tr tapered threads.

SWAGELOK Tube Fittings are the subject of pending and issued U. S. and foreign patents.



SWAGELOK Metric Tube End — Stepped Shoulder — Standard SWAGELOK Tube End (Fractional)

Elbows and Tees have no step on forging—all forgings are stamped (MM)

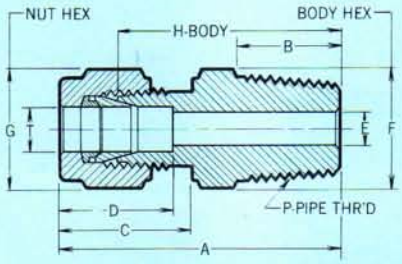
CAUTION

DO NOT MIX OR INTERCHANGE PARTS OF TUBE FITTINGS MADE BY OTHER MANUFACTURERS

SWAGELOK Tube Fittings are manufactured to exacting tolerances. The critical interaction of precision parts as designed is essential to reliability and safety. Using parts of fittings made by other manufacturers with SWAGELOK Tube Fitting parts will not provide reliable connections. Damage or injuries may result from interchanging or mixing parts of tube fittings made by other manufacturers with SWAGELOK Tube Fitting parts.

CRAWFORD FITTING COMPANY / 29500 Solon Road / Cleveland, Ohio 44139
CRAWFORD FITTINGS (CANADA), LTD. / Niagara Falls, Ontario

MALE CONNECTOR TO NPT

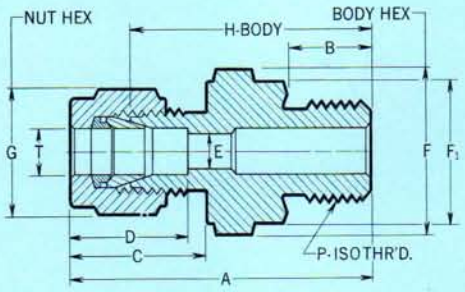


T TUBE O.D. (MM)	P MALE PIPE SIZE	CATALOG NUMBER	A (MM)	B (MM)	C (MM)	D (MM)	E MINIMUM OPENING (MM)	F (MM)	F (INCHES)	G (MM)	G (INCHES)	H (MM)
3MM	⅛NPT	-3MO-1-2	30.2	9.5	15.9	13.5	2.4	11.1	7/16	11.1	7/16	23.0
6MM	¼NPT	-6MO-1-4	38.1	14.3	18.3	15.9	4.8	14.3	9/16	14.3	9/16	30.2
10MM	¼NPT	-10MO-1-4	42.1	14.3	20.6	17.5	7.1	17.5	11/16	19.1	¾	34.1
12MM	½NPT	-12MO-1-8	48.4	19.1	22.2	23.0	9.5	22.2	⅞	22.2	⅞	38.1

MALE CONNECTOR TO ISO (TAPERED)

T TUBE O.D. (MM)	P ISO MALE PIPE SIZE	CATALOG NUMBER	A (MM)	B (MM)	C (MM)	D (MM)	E MINIMUM OPENING (MM)	F (MM)	F (INCHES)	G (MM)	G (INCHES)	H (MM)
3MM	⅛-28 R7	-3MO-1-R⅛T	29.4	7.9	15.9	13.5	2.4	11.1	7/16	11.1	7/16	22.2
6MM	⅛-28 R7	-6MO-1-R⅛T	31.8	7.9	18.3	15.9	4.8	12.7	½	14.3	9/16	23.8
6MM	¼-19 R7	-6MO-1-R¼T	35.8	11.9	18.3	15.9	4.8	14.3	9/16	14.3	9/16	27.8
10MM	¼-19 R7	-10MO-1-R¼T	39.7	11.9	20.6	17.5	6.4	17.5	11/16	19.1	¾	31.8
12MM	½-14 R7	-12MO-1-R½T	43.7	14.3	22.2	23.0	9.5	22.2	⅞	22.2	⅞	33.3

MALE CONNECTOR TO ISO (STRAIGHT)



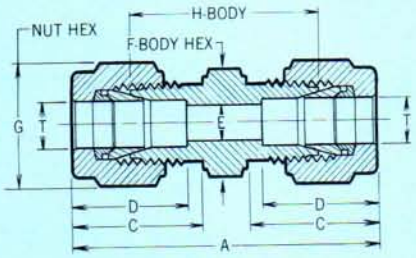
T TUBE O.D. (MM)	P ISO MALE PIPE SIZE	CATALOG NUMBER	A (MM)	B (MM)	C (MM)	D (MM)	E MINIMUM OPENING (MM)	F (MM)	F (INCHES)	F_1 (MM)	G (MM)	G (INCHES)	H (MM)
3MM	⅛-28 R228	-3MO-1-R⅛	33.8	7.9	15.9	13.5	2.4	14.3	9/16	13.7	11.1	7/16	26.6
6MM	⅛-28 R228	-6MO-1-R⅛	36.2	7.9	18.3	15.9	4.0	14.3	9/16	13.7	14.3	9/16	28.2
6MM	¼-19 R228	-6MO-1-R¼	40.5	11.9	18.3	15.9	4.8	19.1	¾	18.7	14.3	9/16	32.6
10MM	¼-19 R228	-10MO-1-R¼	42.8	11.9	20.6	17.5	4.8	19.1	¾	18.7	19.1	¾	34.9
12MM	½-14 R228	-12MO-1-R½	49.9	14.3	22.2	23.0	9.5	27.0	1 1/16	26.7	22.2	⅞	39.7

NOTE

A-C-D dimensions are finger-tight / G-F dimensions are across hex flats.

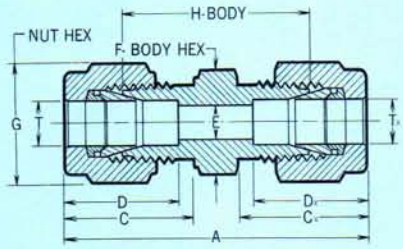
Component parts of SWAGELOK Tube Fittings are all made of the same material. All dimensions in millimeters unless noted otherwise. Dimensions for reference only, subject to change.

UNION



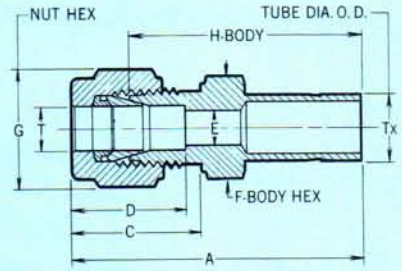
T TUBE O.D. (MM)	CATALOG NUMBER	A (MM)	C (MM)	D (MM)	E MINIMUM OPENING (MM)	F (MM)	F (INCHES)	G (MM)	G (INCHES)	H (MM)
3MM	-3MO-6	36.5	15.9	13.5	2.4	11.1	7/16	11.1	7/16	22.2
6MM	-6MO-6	42.1	18.3	15.9	4.8	12.7	1/2	14.3	9/16	26.2
10MM	-10MO-6	48.4	20.6	17.5	7.1	17.5	11/16	19.1	3/4	32.5
12MM	-12MO-6	51.6	22.2	23.0	9.5	20.6	13/16	22.2	7/8	31.0

UNION • Metric to Fractional



T TUBE O.D. (MM)	Tx TUBE O.D. (inches)	CATALOG NUMBER	A (MM)	C (MM)	Cx (MM)	D (MM)	Dx (MM)	E MINIMUM OPENING (MM)	F (MM)	F (INCHES)	G (MM)	G (INCHES)	H (MM)
3MM	1/8	-3MO-6-2	36.5	15.9	15.9	13.5	13.5	2.4	11.1	7/16	11.1	7/16	22.2
6MM	1/4	-6MO-6-4	42.1	18.3	18.3	15.9	15.9	4.8	12.7	1/2	14.3	9/16	26.2
10MM	3/8	-10MO-6-6	44.5	20.6	19.8	17.5	17.5	7.1	17.5	11/16	19.1	3/4	31.8
12MM	1/2	-12MO-6-8	51.6	22.2	22.2	23.0	23.0	9.5	20.6	13/16	22.2	7/8	31.0

REDUCER • Metric to Fractional



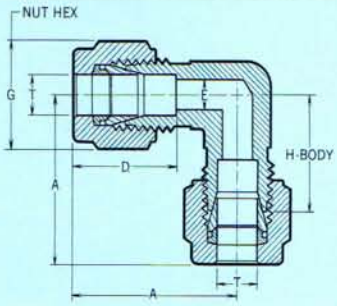
T TUBE O.D. (MM)	Tx O.D. (inches)	CATALOG NUMBER	A (MM)	C (MM)	D (MM)	E MINIMUM OPENING (MM)	F (MM)	F (INCHES)	G (MM)	G (INCHES)	H (MM)
3MM	1/8	-3MO-R-2	34.1	15.9	13.5	2.0	11.1	7/16	11.1	7/16	27.0
3MM	1/4	-3MO-R-4	36.5	15.9	13.5	2.4	11.1	7/16	11.1	7/16	29.4
6MM	1/4	-6MO-R-4	39.7	18.3	15.9	4.8	12.7	1/2	14.3	9/16	31.8
10MM	3/8	-10MO-R-6	45.2	20.6	17.5	7.1	17.5	11/16	19.1	3/4	37.3
12MM	1/2	-12MO-R-8	52.4	22.2	23.0	9.9	20.6	13/16	22.2	7/8	42.1

NOTE

A-C-Cx-D-Dx dimensions are finger-tight / G-F dimensions are across hex flats.

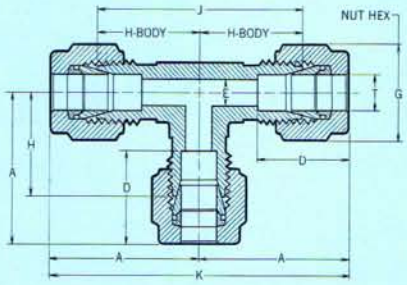
Component parts of SWAGELOK Tube Fittings are all made of the same material. All dimensions in millimeters unless noted otherwise. Dimensions for reference only, subject to change.

UNION ELBOW



T TUBE O.D. (MM)	CATALOG NUMBER	A (MM)	D (MM)	E MINIMUM OPENING (MM)	F (MM)	F (INCHES)	G (MM)	G (INCHES)	H (MM)
3MM	-3MO-9	23.8	13.5	2.4	9.5	3/8	11.1	7/16	16.7
6MM	-6MO-9	26.2	15.9	4.8	11.1	7/16	14.3	9/16	18.3
10MM	-10MO-9	33.3	17.5	7.1	17.5	11/16	19.1	3/4	25.4
12MM	-12MO-9	34.9	23.0	9.5	17.5	11/16	22.2	7/8	24.6

UNION TEE



T TUBE O.D. (MM)	CATALOG NUMBER	A (MM)	D (MM)	E MINIMUM OPENING (MM)	F (MM)	F (INCHES)	G (MM)	G (INCHES)	H (MM)	J (MM)	K (MM)
3MM	-3MO-3	23.8	13.5	2.4	9.5	3/8	11.1	7/16	16.7	33.3	47.6
6MM	-6MO-3	26.2	15.9	4.8	11.1	7/16	14.3	9/16	18.3	36.5	52.4
10MM	-10MO-3	33.3	17.5	7.1	17.5	11/16	19.1	3/4	25.4	50.8	66.7
12MM	-12MO-3	34.9	23.0	9.5	17.5	11/16	22.2	7/8	24.6	49.2	69.9

NOTE

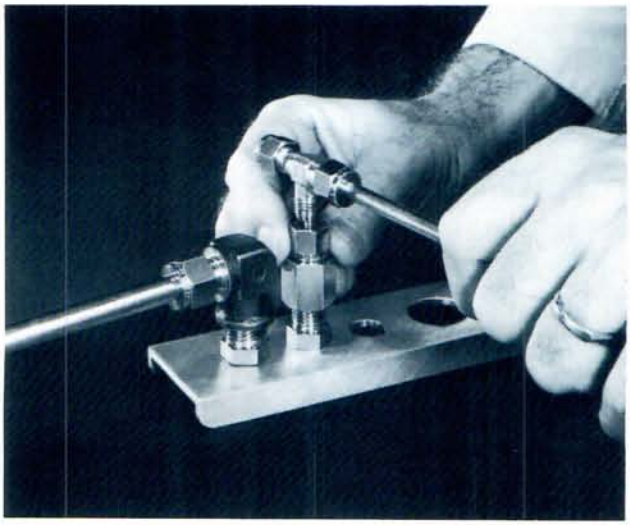
A-D-K dimensions are finger-tight / all ports are identical / F=across flats of wrench pads / G dimension is across hex flats.

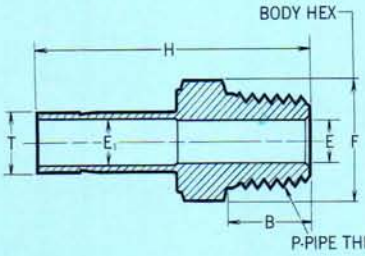
Component parts of SWAGELOK Tube Fittings are all made of the same material. All dimensions in millimeters unless noted otherwise. Dimensions for reference only, subject to change.

ADAPTERS

SWAGELOK Adapters are the ideal way to ease the conversion to metric system from NPT threads.

For Male Run, Male Branch, Female Run and Female Branch Tees, use a combination Union Tee and Adapter as shown. Adapters can also be used to make Male and Female Elbows when used in conjunction with Union Elbows or to adapt valves with SWAGELOK ends to pipe systems.



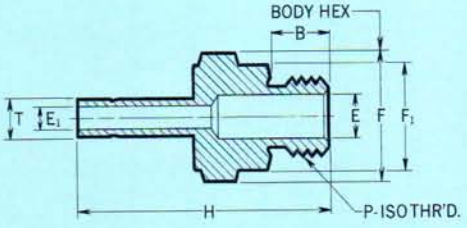


MALE ADAPTER TO NPT

T TUBE O.D. (MM)	P MALE PIPE SIZE	CATALOG NUMBER	B (MM)	E (MM)	E1 (MM)	F (MM)	F (INCHES)	H (MM)
3MM	⅛ NPT	-3M1-A-2	9.5	4.8	2.2	11.1	7/16	28.6
6MM	¼ NPT	-6M1-A-4	14.3	4.6	4.6	14.3	9/16	35.7
10MM	¼ NPT	-10M1-A-4	14.3	7.7	7.7	14.3	9/16	38.1
12MM	½ NPT	-12M1-A-8	19.1	9.1	9.1	22.2	⅞	49.2

MALE ADAPTER TO ISO (TAPERED)

T TUBE O.D. (MM)	P ISO MALE PIPE SIZE	CATALOG NUMBER	B (MM)	E (MM)	E1 (MM)	F (MM)	F (INCHES)	H (MM)
3MM	⅛-28 R7	-3M1-A-R⅛T	7.9	4.0	2.2	11.1	7/16	27.0
6MM	⅛-28 R7	-6M1-A-R⅛T	7.9	4.6	4.6	11.1	7/16	29.5
6MM	¼-19 R7	-6M1-A-R¼T	11.9	4.6	4.6	14.3	9/16	33.3
10MM	¼-19 R7	-10M1-A-R¼T	11.9	6.4	7.7	14.3	9/16	35.7
12MM	½-14 R7	-12M1-A-R½T	14.3	11.9	9.3	22.2	⅞	44.5



MALE ADAPTER TO ISO (STRAIGHT)

T TUBE O.D.	P ISO MALE PIPE SIZE	CATALOG NUMBER	B (MM)	E (MM)	E1 (MM)	F (MM)	F (INCHES)	F1 (MM)	H (MM)
3MM	⅛-28 R228	-3M1-A-R⅛	7.9	4.0	2.2	14.3	9/16	13.7	31.4
6MM	⅛-28 R228	-6M1-A-R⅛	7.9	4.0	4.6	14.3	9/16	13.7	33.7
6MM	¼-19 R228	-6M1-A-R¼	11.9	4.6	4.6	19.1	¾	18.7	38.1
10MM	¼-19 R228	-10M1-A-R¼	11.9	4.8	7.7	19.1	¾	18.7	40.5
12MM	½-14 R228	-12M1-A-R½	14.3	11.9	9.3	27.0	1 1/16	26.7	50.8

NOTE

F dimension is across hex flats.

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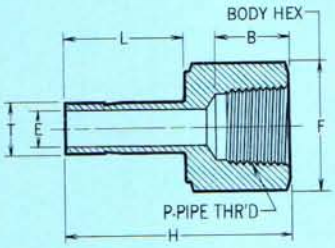
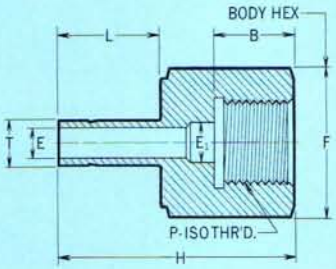


FEMALE ADAPTER TO NPT

T TUBE O.D. (MM)	P FEMALE PIPE SIZE	CATALOG NUMBER	B (MM)	E MINIMUM OPENING (MM)	F (MM)	F (INCHES)	H (MM)	L (MM)
3MM	⅛NPT	-3M1-A-2F	9.9	2.2	14.3	9/16	27.0	13.5
6MM	¼NPT	-6M1-A-4F	15.1	4.6	19.1	¾	34.1	15.9
10MM	¼NPT	-10M1-A-4F	15.1	7.7	19.1	¾	35.7	17.5
12MM	½NPT	-12M1-A-8F	19.8	9.3	27.0	1 1/16	47.6	23.0

FEMALE ADAPTER TO ISO (TAPERED)

T TUBE O.D.	P ISO FEMALE PIPE SIZE	CATALOG NUMBER	B (MM)	E MINIMUM OPENING (MM)	F (MM)	F (INCHES)	H (MM)	L (MM)
3MM	⅛-28 R7	-3M1-A-R⅛TF	8.7	2.2	14.3	9/16	26.2	13.5
6MM	⅛-28 R7	-6M1-A-R⅛TF	8.7	4.6	14.3	9/16	28.6	15.9
6MM	¼-19 R7	-6M1-A-R¼TF	12.7	4.6	19.1	¾	34.1	15.9
10MM	¼-19 R7	-10M1-A-R¼TF	12.7	7.7	19.1	¾	35.7	17.5
12MM	½-14 R7	-12M1-A-R½TF	15.9	9.3	27.0	1 1/16	47.6	23.0



FEMALE ADAPTER TO ISO (STRAIGHT)

T TUBE O.D.	P ISO FEMALE PIPE SIZE	CATALOG NUMBER	B (MM)	E (MM)	E1 (MM)	F (MM)	F (INCHES)	H (MM)	L (MM)
3MM	⅛-28 R228	-3M1-A-R⅛F	7.9	2.2	4.0	14.3	9/16	27.8	13.5
6MM	⅛-28 R228	-6M1-A-R⅛F	7.9	4.6	4.0	14.3	9/16	30.2	15.9
6MM	¼-19 R228	-6M1-A-R¼F	11.9	4.6	6.4	19.1	¾	35.7	15.9
10MM	¼-19 R228	-10M1-A-R¼F	11.9	7.7	6.4	19.1	¾	37.3	17.5
12MM	½-14 R228	-12M1-A-R½F	14.3	9.3	11.9	27.0	1 1/16	43.7	23.0

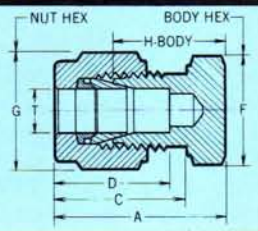
NOTE

F dimension is across hex flats.

Component parts of SWAGELOK Tube Fittings are all made of the same material. All dimensions in millimeters unless noted otherwise. Dimensions for reference only, subject to change.

CAP

FOR CAPPING END OF TUBE

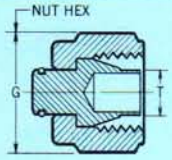


T TUBE O.D. (MM)	CATALOG NUMBER	A (MM)	C (MM)	D (MM)	F (MM)	F (INCHES)	G (MM)	G (INCHES)	H (MM)
3MM	-3MO-C	20.6	15.9	13.5	11.1	7/16	11.1	7/16	13.5
6MM	-6MO-C	23.8	18.3	15.9	12.7	1/2	14.3	9/16	15.9
10MM	-10MO-C	27.8	20.6	17.5	17.5	11/16	19.1	3/4	19.8
12MM	-12MO-C	29.4	22.2	23.0	20.6	13/16	22.2	7/8	19.1

PLUG

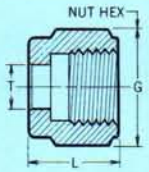
FOR PLUGGING UNUSED PORT OF FITTING

NOTE
To tighten plug properly from finger-tight position, snug up nut with wrench only 1/4 turn.



T TUBE O.D. (MM)	CATALOG NUMBER	G (MM)	G (INCHES)
3MM	-3MO-P	11.1	7/16
6MM	-6MO-P	14.3	9/16
10MM	-10MO-P	19.1	3/4
12MM	-12MO-P	22.2	7/8

NUT

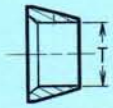


T TUBE O.D. (MM)	CATALOG NUMBER	G (MM)	G (INCHES)	L (MM)
3MM	-3M2-1	11.1	7/16	11.9
6MM	-6M2-1	14.3	9/16	12.7
10MM	-10M2-1	19.1	3/4	15.9
12MM	-12M2-1	22.2	7/8	17.5

BACK FERRULE

T TUBE O.D. (MM)	CATALOG NUMBER
3MM	-3M4-1
6MM	-6M4-1
10MM	-10M4-1
12MM	-12M4-1

FRONT FERRULE



T TUBE O.D. (MM)	CATALOG NUMBER
3MM	-3M3-1
6MM	-6M3-1
10MM	-10M3-1
12MM	-12M3-1

NOTE
A-C-D dimensions are finger-tight / G-F dimensions are across hex flats.

Component parts of SWAGELOK Tube Fittings are all made of the same material. All dimensions in millimeters unless noted otherwise. Dimensions for reference only, subject to change.

ISO threads are an attempt by the International Standards Organization to standardize the nomenclature of screw threads. The table clearly shows that ISO R-228 is also referred to as Whitworth Parallel, DIN-259, R1/8, or BSP PI. The ISO R-7 is also referred to as DIN-2999, R1/8 keg, and BSP Tr.

For a complete list of other sizes available consult your SWAGELOK Distributor.

TYPICAL ISO THREAD DESIGNATIONS	NOMINAL SIZE	TAPERED OR STRAIGHT	MALE OR FEMALE	COMPATIBLE WITH
-R1/8T	1/8" (1/8-28 R7)	Tapered	Male	DIN-2999, R1/8 Keg, BSP Tr
-R1/4	1/4" (1/4-19 R228)	Straight	Male	DIN-259, R1/8, BSP PI Whitworth Parallel
-R1/4F	1/4" (1/4-19 R228)	Straight	Female	DIN-259, R1/8, BSP PI Whitworth Parallel
-R1/2TF	1/2" (1/2-14 R7)	Tapered	Female	DIN-2999, R1/8 Keg, BSP Tr

ORDERING INSTRUCTIONS

THE SYSTEM—The numbering system for SWAGELOK Metric Tube Fittings is designed so that all catalog numbers are prefixed by a MATERIAL DESIGNATOR Code followed by a dash. **THE MATERIAL**—Examples: B-(Brass), S-(Carbon Steel), SS-(316 Stainless Steel). For a complete list of Material Designator Codes, see reverse side of "FITTINGS" divider in Master Catalog Binder. **THE SIZE**—The SIZE DESIGNATOR following the dash indicates the tubing O.D. in millimeters. The "M" following the size emphasizes that it is a metric fitting. The last segment of the SIZE DESIGNATOR indicates either a complete fitting with nut(s) and ferrules (0), or an adapter body (1). **THE TYPE OF FITTING**—After the next dash is the TYPE OF FITTING DESIGNATOR. This number or letter identifies the TYPE OF FITTING (such as male connector, union elbow, union, tee, adapter, etc.). **THE SECOND END**—After the next dash is the REDUCED SIZE OR TYPE OF END CONNECTION (if it differs from the first end), in millimeters (M), sixteenths of an inch (4=¼") or ISO threads (R).

TYPICAL METRIC PART NUMBERS

MATERIAL	MATERIAL DESIGNATOR		TUBE SIZE DESIGNATOR			TYPE OF FITTING DESIGNATOR		REDUCED SIZE OR TYPE OF END CONNECTION (MM) OR SIXTEENTH/INCH			SEE PAGE
Brass	B	—	6 M (6MM)	0 Complete Fitting	—	1 Male Connector	—	4 ¼ Male NPT			2
Steel	S	—	6 M (6MM)	0 Complete Fitting	—	6 Union	—	4 ¼ SWAGELOK			3
316 Stainless Steel	SS	—	10 M (10MM)	0 Complete Fitting	—	1 Male Connector	—	R ISO	¼ ¼ Nom.	T Tapered Male	2
Brass	B	—	12 M (12MM)	1 Body	—	A Adapter	—	R ISO	½ ½ Nom.	F Straight Female	6
Steel	S	—	6 M (6MM)	0 Complete Fitting	—	1 Male Connector	—	R ISO	¼ ¼ Nom.	Straight Male	2
316 Stainless Steel	SS		10 M (10MM)	0 Complete Fitting		6 Union		Not Required			3

MANDATORY DASHES — OPTIONAL DASH

INSTALLATION INSTRUCTIONS

SWAGELOK Tube Fittings are installed in three easy steps.

STEP 1
Simply insert the tubing into the SWAGELOK Tube Fitting. Make sure that the tubing rests firmly on the shoulder of the fitting and that the nut is finger-tight.

STEP 2
Before tightening the SWAGELOK nut, scribe the nut at the 6:00 o'clock position.

STEP 3
Now while holding the fitting body steady with a backup wrench, tighten the nut one-and-one-quarter turns*. Watching the scribe mark, make one complete revolution and continue to the 9:00 o'clock position.

By scribing the nut yourself at the 6:00 o'clock position as it appears to you, there will be no doubt as to the starting position. When tightened 1¼ turns to the 9:00 o'clock position you can easily see that the fitting has been properly installed.

*For 1/16", ⅛", 3/16" and 2, 3 and 4MM size tube fittings, only ¾ turn from finger-tight is necessary.

HIGH PRESSURE APPLICATIONS

Due to the variation in tubing diameters, a common starting point is desirable . . . therefore, with a wrench, snug up the nut until the tubing will not turn (by hand) in the fitting. At this point, scribe the nut and body of the fitting. Now tighten the nut one-and-one-quarter turns* and the fitting is ready to hold high vacuums and high pressures.

RE-TIGHTENING INSTRUCTIONS

Connections can be disconnected and re-tightened many, many times and the same reliable, leak-proof seal obtained every time the reconnection is made.

Fitting shown in disconnected position.

Tubing with pre-swaged ferrules inserted into the fitting until front ferrule seats in fitting.

Tighten nut by hand. Rotate nut about one-quarter turn with wrench (or to original one-and-one-quarter tight position). Then snug slightly with wrench.

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YOUR LOCAL SALES & SERVICE REPRESENTATIVE:

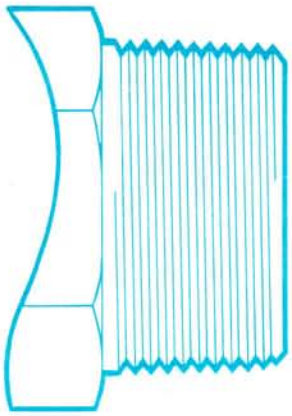
3-74 - 100M 125M - BL

Tube Fittings
(over 1")

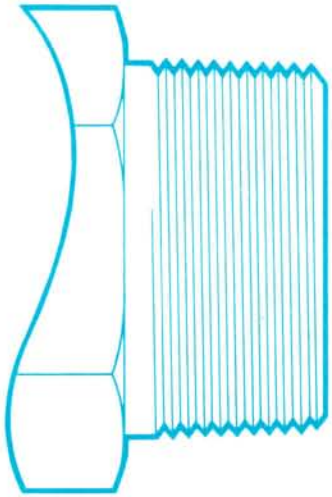
PIPE AND TUBE END SIZE CHART

PIPE THREAD SIZE NPT

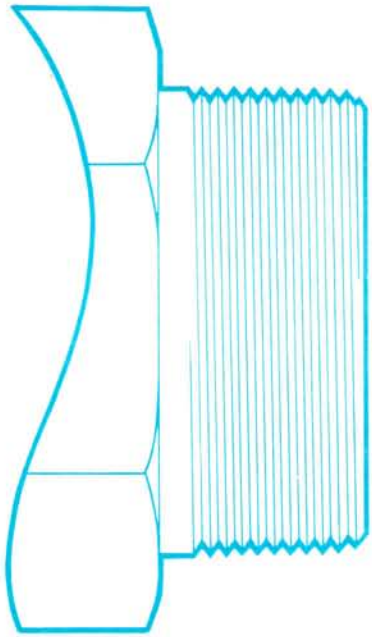
1-1/4"



1-1/2"



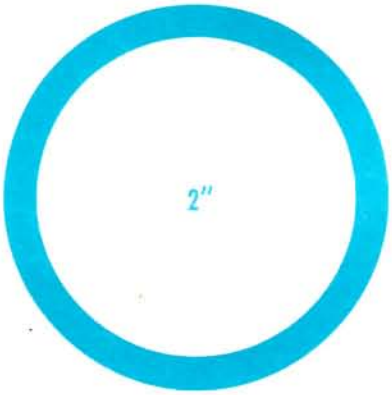
2"



TUBING O.D. SIZE

SWAGELOK FITTING SIZE
2000

SWAGELOK FITTING SIZE
2400

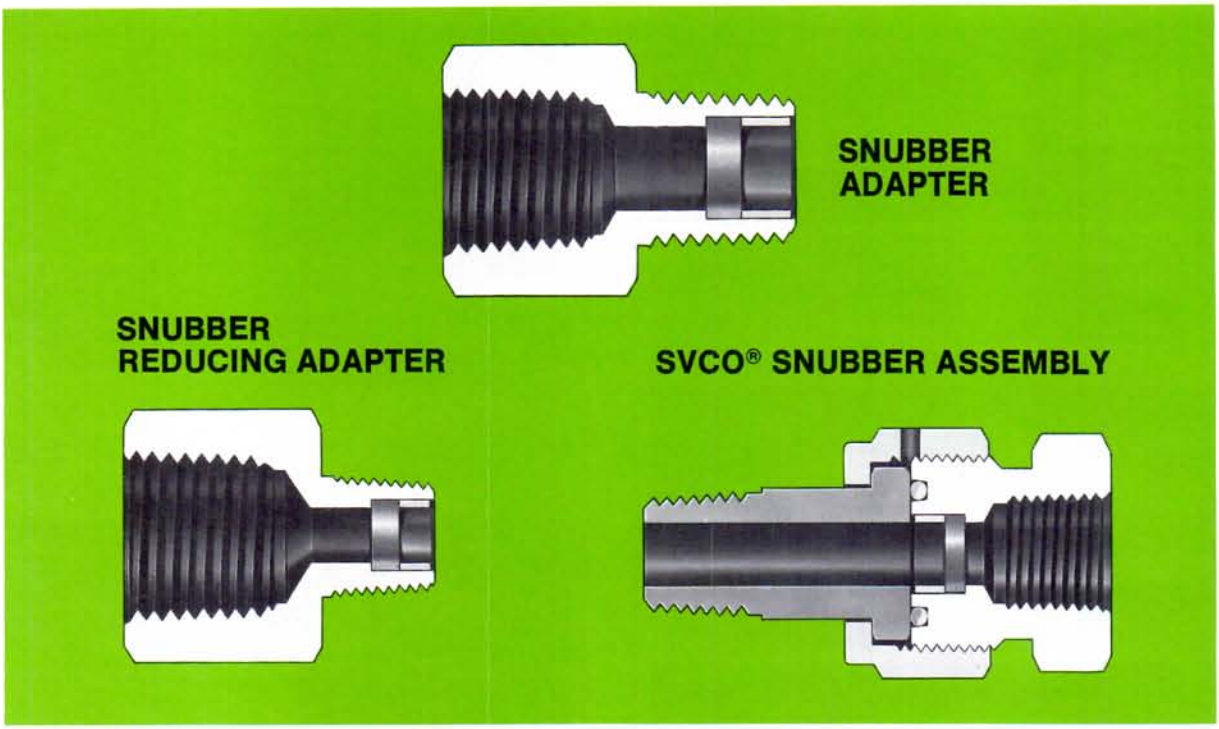


SWAGELOK FITTING SIZE
3200

For pipe thread and tubing O.D. sizes 1" and under, see reverse side of tab, Tube Fittings (1" and under).

CAJON®

SNUBBER FITTINGS
(GAUGE PROTECTORS)



PURPOSE

CAJON Snubber Fittings protect gauges and instruments from system pressure surges, with minimum flow restriction.

Advanced pressure sensing devices, as well as many other types of sophisticated instrumentation, are subject to early fatigue failure when exposed to repeated pressure surges or contamination. CAJON Snubber Fittings eliminate the effects of these surges and filter foreign materials, preventing damage to expensive equipment.

APPLICATIONS

New CAJON Snubber Fittings are designed for various laboratory and process applications, including:

Gauge and instrument protection in systems subject to hydraulic or pneumatic shock.

Reduction of pressure impulses in systems using piston pumps, rotary pumps, quick opening valves, or relief valves.

Reducing fluctuation in pressure readings due to system pressure surges.

Prevention of damage to sensitive equipment caused by foreign material within a system.

Flame arresters.

FEATURES

- Standard pipe fitting configurations include Adapters and Reducing Adapters. For complete size ranges, see dimensional tables.
- VCO Coupling configuration available for ease of assembly and gauge positioning.
- Fittings and couplings available in brass and 316 stainless steel.
- All elements are sintered 316 stainless steel.
- Provides increased snubbing capabilities.
- Five basic element ranges available.

TECHNICAL DATA

Maximum differential pressure — Same as working pressure shown in TABLE OF DIMENSIONS.

Effective element area — -4-SRA-2 = .019 in.^{2}
All others = .062 in.^{2}

Assembly method — Element is held in place by a press fit sleeve. This interference fit holds far in excess of fitting working pressures.

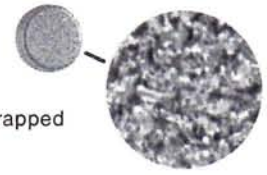
Materials —
Body — Brass or 316 stainless steel
Element — 316 stainless steel
Sleeve — 316 stainless steel
SVCO O-Ring — Viton

ELEMENTS

With five basic elements available, CAJON Snubbers can meet the requirement of fluid applications ranging from light gases to viscosities above 1,000 SSU.

ELEMENT DESIGNATOR	ELEMENT RANGES	
	FLUID	AIR FLOW
EG	Light gases Mercury Manometers	40 cc/min. @25 psig
EA	Air—Steam	3,400 cc/min. @25 psig (.120 SCFM)
EW	Water and light oils below 250 SSU	4,800 cc/min. @25 psig (.169 SCFM)
EL	Oils from 250-1000 SSU	5,950 cc/min. @10 psig (.210 SCFM)
EH	Oils of 1000 SSU and above	34,800 cc/min. @10 psig (1.228 SCFM)

NOTE: All fittings are stamped with the proper Element Designator.



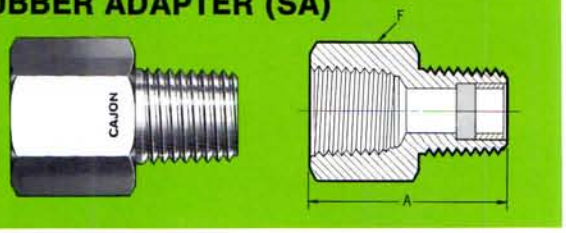
Sintered stainless steel element magnified 13X. Particle contamination is trapped in the matrix.

CAJON®

SNUBBER FITTINGS (GAUGE PROTECTORS)

TABLE OF DIMENSIONS

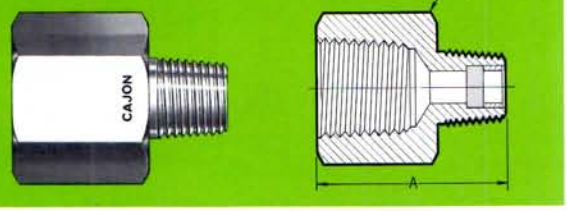
SNUBBER ADAPTER (SA)



PIPE SIZE	CATALOG NUMBER	A	F HEX	WORKING PRESSURE (PSIG) (B) BRASS	WORKING PRESSURE (PSIG) (SS) 316
¼	-4-SA-E_	1⅜	⅜	3,000	5,600
½	-8-SA-E_	1 29/32	1 1/16	2,100	4,100

Show Element Designator*

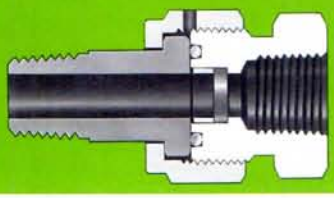
SNUBBER REDUCING ADAPTER (SRA)



FEMALE PIPE SIZE	MALE PIPE SIZE	CATALOG NUMBER	A	F HEX	WORKING PRESSURE (PSIG) (B) BRASS	WORKING PRESSURE (PSIG) (SS) 316
¼	⅛	-4-SRA-2-E_	1¼	¾	3,000	5,600
½	¼	-8-SRA-4-E_	1 13/16	1 1/16	2,100	4,100
½	⅜	-8-SRA-6-E_	1 13/16	1 1/16	2,100	4,100

Show Element Designator*

SVCO® SNUBBER ASSEMBLY

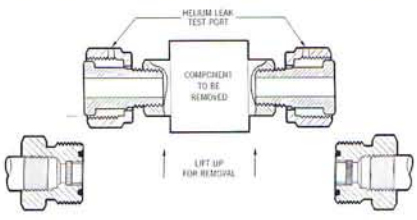


FEATURES

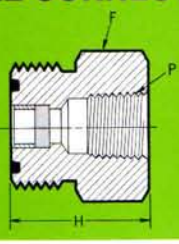
- Allows gauge rotation without loosening pipe threads.
- Eliminates the need for axial clearance on assembly or disassembly.
- Eliminates thread wear problems on gauges or instruments.
- Provides rapid means of equipment exchange.
- Metal-to-metal contact contains O-Ring.
- Quality thread for repeated make-up.
- Test port for immediate leak detection.
- Blind bodies and nuts available.

NO AXIAL CLEARANCE NEEDED FOR DISASSEMBLY

The coupling can be disconnected and a section removed from the system without disturbing other components or connections.



SVCO® FEMALE CONNECTOR BODY

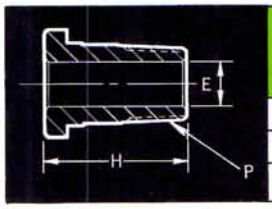


P FEMALE PIPE THREAD	CATALOG NUMBER	F HEX	H	UNIFORM THREAD SIZE	O-RING SIZE	WORKING PRESSURE (PSIG) (B) BRASS	WORKING PRESSURE (PSIG) (SS) 316
¼	-10-SVCO-7-4-E_	1 1/16	1¼	1-14	113	3,000	5,600
½	-10-SVCO-7-8-E_	1 1/16	1 13/16	1-14	113	2,500	4,000

Show Element Designator*

NOTE: Blind bodies are available to cap off a disconnected gland. This would be used in the event one gauge is used for several applications. Catalog Number: -10-VCO-1-BL.

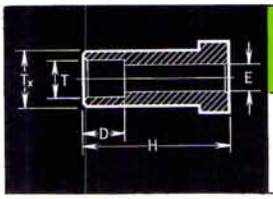
VCO® MALE PIPE THREAD GLAND



P MALE PIPE THREAD	CATALOG NUMBER	E	H
⅛	-10-VCO-3M-2	3/16	1 1/16
¼	-10-VCO-3M-4	9/32	1¼
⅜	-10-VCO-3M-6	⅜	1¼

NOTE: For pressure ratings of SVCO assembly use SVCO Female Connector Body Working Pressure.

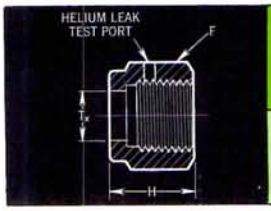
VCO® GLAND (WELD)



T TUBE SOCKET	CATALOG NUMBER	D	E	H	Tx
⅝	-10-VCO-3	⅜	7/16	1 1/16	¾

WORKING PRESSURE: Brass 1700 psig, 316 SS 2900 psig.

VCO® NUT



CATALOG NUMBER	F HEX FLAT	H	Tx	UNIFORM THREAD SIZE
-10-VCO-4	1⅛	11/16	¾	1-14

NOTE: Blind nuts are available to prevent contamination of disconnected gauges. Catalog Number: -10-VCO-4-BL.

ORDERING INSTRUCTIONS
Add B for brass or SS for 316 stainless steel as a prefix to the catalog number.

*Element Designator, G, A, W, L, or H must follow the "E" in the above catalog numbers when ordering.
Example: B-4-SRA-2-EG, SS-10-SVCO-7-2-EL.

YOUR LOCAL SALES & SERVICE REPRESENTATIVE

PRINTED IN U.S.A.
9-74-100M-BL

NUPRO®

HEAT EXCHANGER AND CONDENSER TUBE PLUGS

VARIETY OF SIZES AND MATERIALS

B-TP-1-1/2-(11-14)
BRASS

S-TP-1-(11-14)
STEEL

F-TP-3/4-(15-20)
FIBRE

SS-TP-1/2-(11-14)
316 STAINLESS STEEL

PURPOSE

NUPRO Heat Exchanger and Condenser Tube Plugs are engineered to effectively seal the ends of leaking heat exchanger or condenser tubes, permitting continued use of the unit without replacing the entire tube bundle.

APPLICATIONS

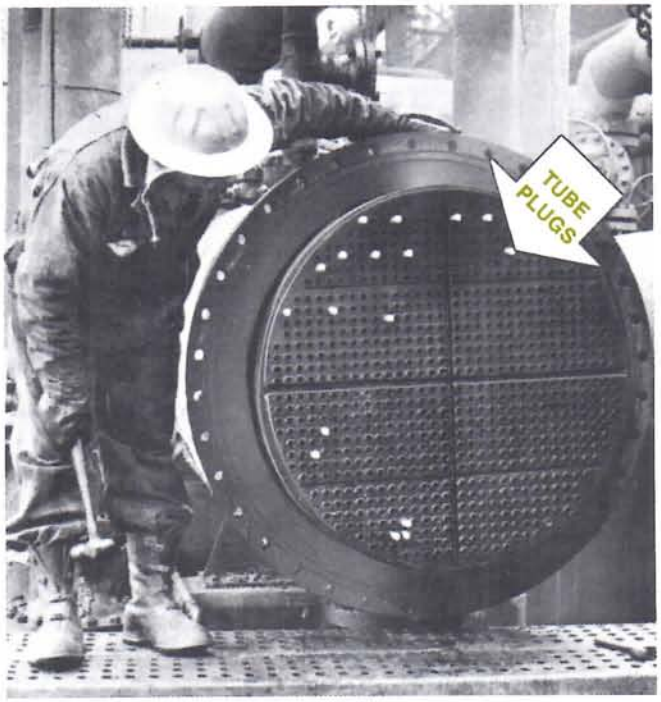
Most tube type heat exchangers and condensers are originally designed with more surface area (tubes) than required for optimum operation of the unit. As the tubes become fouled or start to leak, NUPRO Tube Plugs are used to seal the ends, thus isolating them from the system. This permits continued use of the unit without major overhaul and prolongs the useful service life of the tube bundle.

INSTALLATION

Simply insert the small end of the plug into the tube end and drive it in. Optimum uniform taper and smooth surface finish assure positive sealing with a minimum force, resulting in tighter and longer-lasting isolation of the defective tubes. Stress is reduced, minimizing the danger of cracking the tube sheet. The rounded dome assures concentricity of the plug with the tube during installation.

FEATURES

• Wide variety of materials • Optimum taper for easy sealing • Large choice of sizes • Flexibility over a range of tube wall thicknesses • One-piece construction • Easily installed • Seals at high temperatures



NUPRO Tube Plugs driven into leaking tubes just before heat exchanger goes back into operation.

NUPRO COMPANY • 4800 EAST 345th STREET • WILLOUGHBY, OHIO 44094

TECHNICAL DATA

NUPRO Tube Plugs are manufactured in three sizes for a variety of tube diameters, corresponding to tube wall thicknesses of 11 through 14 gauge, 12 through 17 gauge, and 15 through 20 gauge. Special tube plugs for non-standard tube wall thicknesses can be quoted upon request.

MATERIALS

NUPRO Tube Plugs are standard in brass, 316 stainless steel, carbon steel, Monel, and fibre. Each pair of Fibre Condenser Tube Plugs is packaged in a sealed polyethylene bag with a desiccant enclosed to prevent swelling from moisture. Other materials such as Inconel and nickel can be furnished upon request.

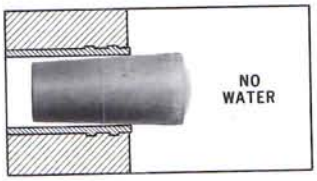
FIBRE CONDENSER TUBE PLUGS

Fibre Condenser Plugs are for use with 15-20 gauge condenser tubes. Made of tough, vulcanized cloth fibre, the condenser plug is hygroscopic and swells on contact with water, making a tight seal. No problems are encountered with porosity or pin-hole leaks as with wooden plugs.

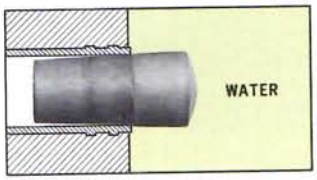
Technical Data — For use with water. Temperature limit + 160°F.

CORROSION COMPATIBILITY CHART

HEAT EXCHANGER TUBE MATERIAL	TUBE PLUG MATERIAL				
	BRASS B	CARBON STEEL S	INCONEL INC	MONEL M	316 STAINLESS STEEL SS
Admiralty Brass	X			X	
Aluminum Brass	X			X	
Aluminum Bronze	X			X	
Arsenical Copper	X			X	
Carbon Steel		X			
Copper	X			X	
Cupro-Nickel (10%)	X			X	
Cupro-Nickel (20%)	X			X	
Cupro-Nickel (30%)	X			X	
Inconel			X		
Monel	X			X	
Muntz Metal	X			X	
Nickel			X	X	
Stainless Steel 304					X
Stainless Steel 316					X
Stainless Steel 347					X



CONDENSER TUBE PLUG
INSTALLED IN LEAKING TUBE



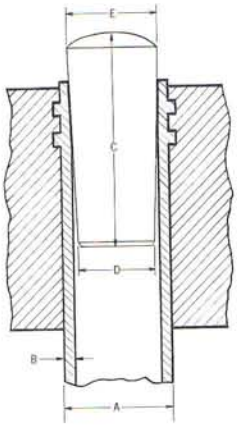
CONDENSER TUBE PLUG
SWOLLEN TIGHTLY IN PLACE
AFTER CONTACT WITH WATER

TABLE OF DIMENSIONS

METAL HEAT EXCHANGER TUBE PLUGS

Catalog Number*	A Tube O.D.	B Tube Wall Gauge	C Length	D Diameter	E Diameter
-TP-½-(11-14)	½	11 to 14	1 9/16	.280	.366
-TP-½-(15-20)	½	15 to 20	1 9/16	.371	.457
-TP-⅝-(11-14)	⅝	11 to 14	1 9/16	.405	.491
-TP-⅝-(15-20)	⅝	15 to 20	1 19/32	.496	.582
-TP-¾-(11-14)	¾	11 to 14	1 19/32	.530	.616
-TP-¾-(12-17)	¾	12 to 17	2 3/32	.546	.663
-TP-¾-(15-20)	¾	15 to 20	1 19/32	.621	.707
-TP-⅞-(11-14)	⅞	11 to 14	1⅝	.655	.741
-TP-⅞-(15-20)	⅞	15 to 20	1⅝	.746	.832
-TP-1 -(11-14)	1	11 to 14	1⅝	.780	.866
-TP-1 -(15-20)	1	15 to 20	1⅝	.871	.957

*For a complete ordering number add B for Brass, SS for 316 Stainless Steel, INC for Inconel, M for Monel, and S for Carbon Steel as prefix to catalog numbers. Example: B-TP-⅞-(15-20), M-TP-¾-(11-14).



FIBRE CONDENSER TUBE PLUGS

Part Number	A Tube O.D.	B Tube Wall Gauge	C Length	D Diameter	E Diameter
F-TP-½-(15-20)	½	15 to 20	1 9/16	.355	.469
F-TP-⅝-(15-20)	⅝	15 to 20	1 19/32	.480	.594
F-TP-¾-(15-20)	¾	15 to 20	1 19/32	.605	.719
F-TP-⅞-(15-20)	⅞	15 to 20	1⅝	.730	.844
F-TP-1 -(15-20)	1	15 to 20	1⅝	.855	.969

CREDITS: Monel-Inconel, TM International Nickel

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PRINTED IN U.S.A.

11-74-125M-250M-CL

Goop®

SILVER GOOP

Available in tubes (1 oz.) and cans (1 lb.)

Formulated for antiseize on threaded parts of stainless steel and super alloys • Temperatures to 1500°F • Non-melting • Stays in place • Will not drip off red-hot surfaces • Will not give off poisonous metal or oxide fumes at high heat • Balanced composition keeps compound between mating surfaces to prevent seizing, regardless of force applied • Lowers take-up torque on threaded parts, nuts, bolts and pipe threads • Resists water washout • Forms bond with surface to which it is applied • Only occasional application needed after parts have been coated the first few times in use • Not recommended for aluminum or magnesium.

BLUE GOOP

Available in tubes (2 oz.) and cans (1 lb.)

Antiseize compound for use on titanium, stainless steel, steel, aluminum and high-temperature alloys • Seals as it lubricates • Impervious to water washout, most acids, all petroleum solvents • Can be used up to 400°F • Will not drip, run or lose lubricity under severe conditions.

HIGH PURITY GOOP

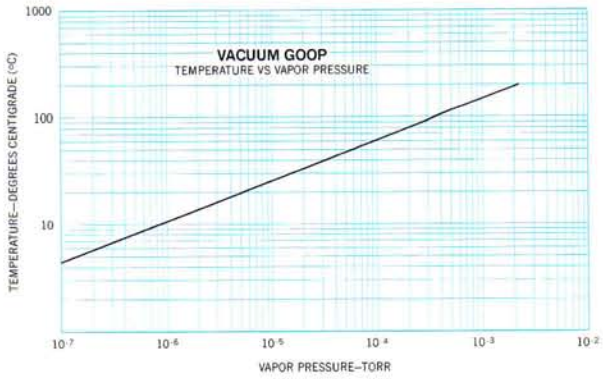
Available in tubes (1 oz.)

Antiseizing and sealing compound for use on titanium, stainless steel, steel, aluminum and high-temperature alloys • Inert under conditions to 400°F. Can be used when oily contamination may otherwise be a problem • Noncorrosive to metals • Impervious to moisture, high voltage and thermal cycling.

VAC GOOP

Available in tubes (1 oz.). Packaged 20 tubes per carton

Anti-gall sealant formulated for threads, O-Rings, gaskets, glass seals and metal parts in vacuum systems • Low vapor pressure minimizes outgassing problems • Inert ingredients assure compatibility with all materials used in system • Can be used up to 200°C • Impervious to moisture.



CRAWFORD FITTING COMPANY, 29500 Solon Road, Cleveland, Ohio 44139
CRAWFORD FITTINGS (CANADA) LTD., Ontario

STRIP TEEZE®

MAKES JOINTS BETTER

MADE OF TFE

576" x ¼" Roll 288" x ½"

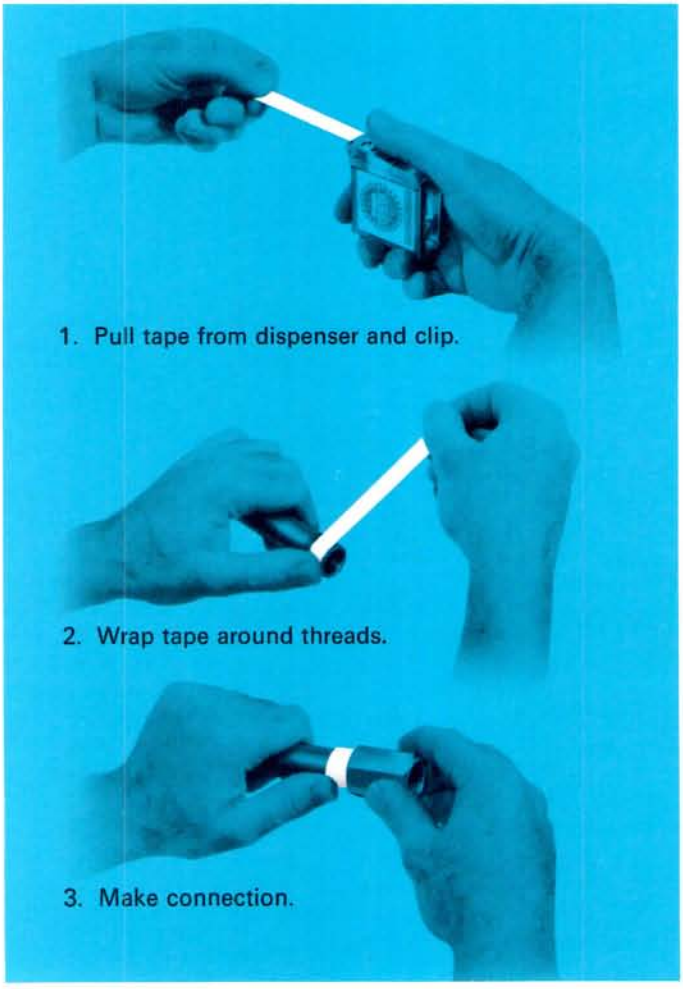
RECOMMENDED FOR:

CHEMICALS • CORROSIVES • HYDRAULIC FLUIDS • FREON 22 • AROMATIC FUELS • PLASTICS • ALUMINUM • STAINLESS STEEL • CERAMIC • SYNTHETIC RUBBER • MONEL AND CARBON STEEL PIPE

Temperatures: −250°F +500°F

HOW STRIP TEEZE TAPE IS APPLIED

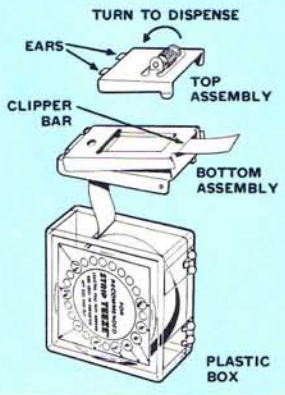
Lay end of tape beginning with second thread from the end, and hold in place with thumb. Wrap in direction of thread—clockwise for right hand thread. Draw free end around threads tightly so that it conforms to threaded surface. Press in firmly at overlap point. Tape will hold in position by itself.



1. Pull tape from dispenser and clip.
2. Wrap tape around threads.
3. Make connection.

CLIPPER-DISPENSER

The handy clipper-dispenser is precision made to fit and operate on the top of the clear plastic box in which Strip-Teeze is packaged.
The tape is clipped off by depressing the top assembly with the thumb. To obtain another length of tape, rotate knurled wheel with thumb, in direction shown by arrow in illustration, just enough to dispense tape. Grasp tape with fingers and pull tape to desired length, clip.



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9-74-135M-250M-BL

NUPRO®

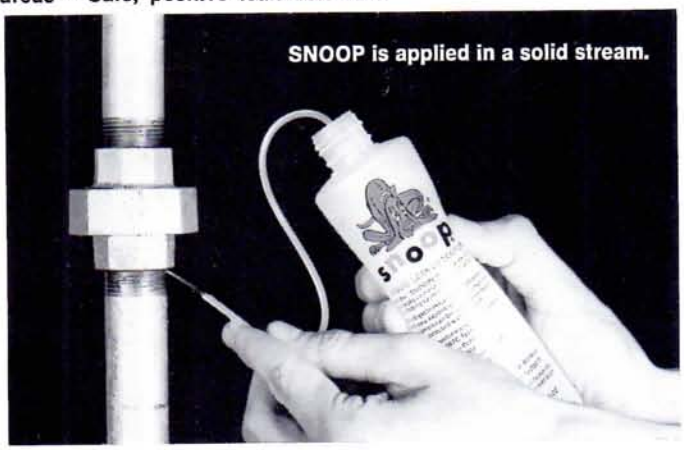
snoop®

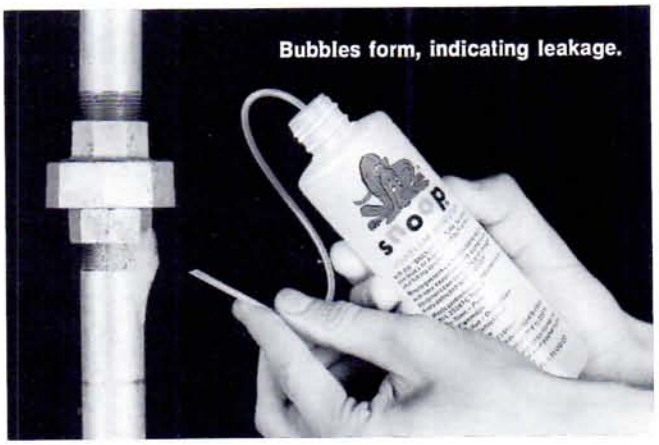
LIQUID LEAK DETECTOR

PURPOSE: SNOOP Liquid Leak Detector locates leaks in air and gas lines, and is used in gas pressure testing of fluid process lines for tightness.

Patented

FEATURES: Non-toxic—pure • Non-flammable • No residue—dries clean • Will not collect dust • No chlorine or halogen additives • Bubbles indicate size of leak • Detects leaks on vertical surfaces • Virtually odorless • 12″ SNOOPER Tube for use in hard-to-reach areas • Safe, positive leak detection





OPERATION: SNOOP is packaged in a squeezable plastic bottle containing a flexible SNOOPER Tube which is extendable to 12 inches. The end of the SNOOPER Tube in the bottle must be below the SNOOP liquid level line when the bottle is upright. The container may be used like an oil can to get into hard-to-reach spots. SNOOP is applied in a solid stream by squeezing the bottle while holding the end of the SNOOPER Tube at the joint or area being inspected. There is no need to invert the SNOOP bottle. The SNOOPER Tube allows application to the top or bottom of a suspected connection with the bottle held upright.

APPLICATIONS: SNOOP is recommended for use in leak testing any pressurized gas system such as air, argon, nitrogen, helium, etc. SNOOP can also be used in gas pressure testing liquid lines or vacuum systems. It is quite common to apply a 10 to 15 psi gas test on these systems to insure leak-tight integrity before introducing the liquid system fluid or pulling vacuum. Another application is testing pressurized electrical conduits. SNOOP, in its compact, easy-to-use container can be easily carried in your pocket or tool box for immediate use in a wide range of applications in the shop and laboratory.

TECHNICAL DATA: SNOOP exceeds the performance requirements of military specification Mil-L-25567C Type 1, Oxygen Systems, Leak Detection Compound, for use over a temperature range of +27°F to +200°F. The compound has been formulated to provide bubbling action over a long period of time, and gives positive leak indication when testing a joint where gravity tends to remove the test fluid. SNOOP is extremely pure and contains no chlorine or other harmful impurities. SNOOP dries clean, leaving no residue to collect dust or cause corrosion of tested components.

NUPRO COMPANY • 4800 EAST 345th STREET • WILLOUGHBY, OHIO 44094

NUPRO®

real cool snoop®

LIQUID LEAK DETECTOR

Patented

PURPOSE:

Real Cool SNOOP Liquid Leak Detector locates leaks in all types of gas systems and will not freeze at sub-zero temperatures.

OPERATION: Real Cool SNOOP is packaged in a squeezable plastic bottle containing a flexible SNOOPER Tube which is extendable to 12″. It is applied in the same manner as standard SNOOP described on the reverse side of this sheet.

APPLICATIONS: Real Cool SNOOP may be used for leak testing pressurized gas systems where ambient temperatures may be as low as −65°F. Since it will not freeze at −65°F, Real Cool SNOOP may be kept in tool boxes or other outside storage during winter months in cold climates without affecting its performance.

FEATURES: Detects leaks in all types of pressurized gas systems such as air, argon, nitrogen, helium, etc.

• Dries clean • Will not collect dust • No chlorine or halogen additives • Bubbles indicate size of leak • Detects leaks on vertical surfaces • Virtually odorless • 12″ SNOOPER Tube for detection in hard-to-reach areas • Safe, positive leak detection

TECHNICAL DATA: Real Cool SNOOP meets the performance requirements of military specification Mil-L-25567C Type 2 (−65°F to +35°F). The useful temperature range is −65°F to +35°F with oxygen and −65°F to +200°F with other gases. Real Cool SNOOP is non-flammable in the liquid state. Its low degree of toxicity represents no serious hazard as far as normal industrial usage is concerned.

YOUR LOCAL SALES & SERVICE REPRESENTATIVE:

10-74-125M-250M-BL

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Heat Exchanger &
Condenser Tube Plugs

WHITEY® SAMPLE CYLINDERS

WHITEY COMPANY • 5679 LANDREGAN STREET • OAKLAND, CALIFORNIA 94662

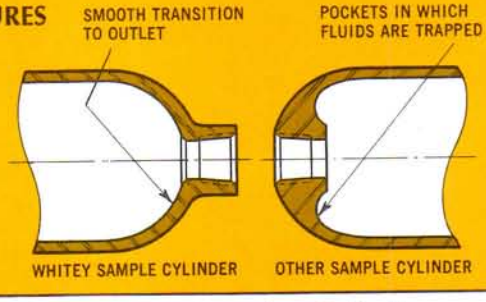
PURPOSE

WHITEY Sample Cylinders provide safe, reliable containment of pressurized fluid samples. They permit the safe handling of the fluids during sampling and transporting between laboratory facilities and field storage sites. WHITEY Sample Cylinders also provide safe, reliable containment of samples of corrosive, toxic, hazardous or expensive fluids.

APPLICATIONS

The primary uses of WHITEY Sample Cylinders are the drawing, transportation, and storage of fluid samples in the petrochemical, chemical processing, aerospace and related industries. They find numerous applications in laboratories and research installations. Examples are surge accumulators and chemical reaction vessels.

FEATURES



EASILY CLEANED — The internal configuration of the WHITEY Sample Cylinder provides a smooth transition through the necks. This design eliminates "pockets" common among other sample cylinders, which are virtually impossible to clean out. A WHITEY Cylinder can be completely and easily cleaned after use since there are no "pockets" to trap sample residue. WHITEY Cylinders are thoroughly cleaned in trichloroethane vapor before they are packaged and shipped.

CONSTRUCTION — WHITEY Sample Cylinders are spun from seamless stainless steel tubing. The resulting product is totally seamless and without welds.

MATERIAL — All cylinders are available as standard in type 304 stainless steel for strength and corrosion resistance.

END CONNECTIONS — Cylinders are supplied with female NPT pipe ends. Threads are precision machined to mate with the male NPT ends of an appropriate cylinder valve such as the WHITEY "DK" Forged Body Shut-off Valve. "Strip Teeze" TFE tape or other suitable sealant is recommended when making up the pipe joint to eliminate thread galling and to effect a better seal.

VERSATILE DESIGN — All WHITEY Cylinders are supplied double-ended. A precision stainless steel pipe plug is supplied, loosely inserted into one end of each cylinder for applications where single-ended cylinders are required.

CAJON PIPE PLUGS — Only CAJON precision pipe plugs are supplied with WHITEY Sample Cylinders.

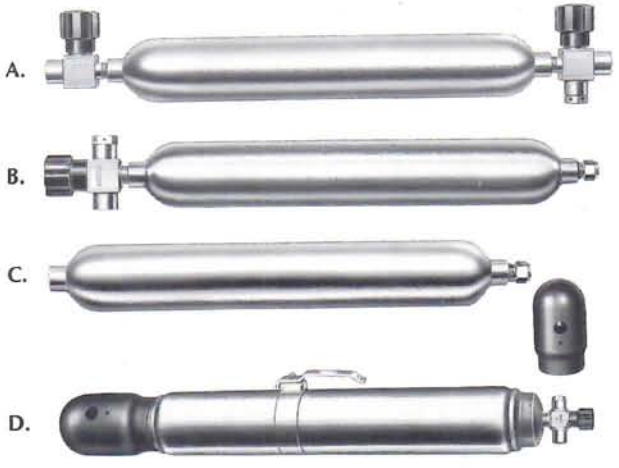
Standard WHITEY Sample Cylinders may be ordered in a number of different ways.

A. DOUBLE-ENDED, WITH VALVES — May be either WHITEY or NUPRO valves consistent with sample conditions of temperature, pressure and process fluid. Specify Male NPT inlet connection. Pipe joints sealed with "Strip Teeze". Assembly leak tested with 500 psi nitrogen gas prior to shipment.

B. SINGLE-ENDED, WITH VALVE—Valve with Male NPT inlet connection on one end of cylinder. CAJON precision stainless steel pipe plug in other end. Sealing and leak testing same as with double-ended cylinders.

C. PLAIN — CAJON stainless steel pipe plug loosely inserted in one end; other end protected with plastic insert.

D. WITH END CAPS & CARRYING HANDLE—Cadmium-plated steel caps, painted black, are attached to cadmium-plated steel neck rings that are peened onto neck of cylinder (One Gallon Cylinders only). Stainless steel carrying handles are available for 4" O.D. cylinders (1000 cc and One Gallon sizes).



All WHITEY Cylinders meet applicable D.O.T. Specifications.

CYLINDER VALVING

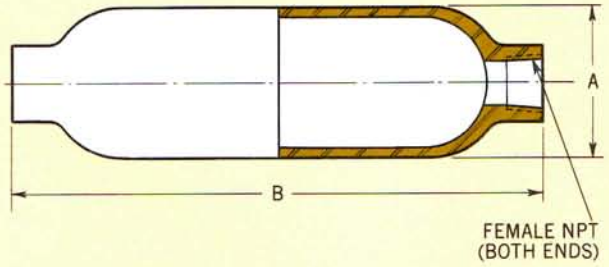
WHITEY "DK" Forged Body Shut-off Valves are specially designed for cylinder applications. Their rugged construction permits rough handling and yet provides repetitive, reliable gas-tight shut-off over a wide range of service conditions. The valves are also available with an integral rupture disc safety device for applications that require overpressure protection. WHITEY Forged Body Valves, with regulating stems, may also be used, depending upon the flow capacity and the degree of regulation required.

NUPRO Bellows Valves may be used in those systems where containment of hazardous, toxic, or expensive fluids is required. (SS-4H2 is an excellent choice.)

SWAGELOK Quick-Connects with double-end shut-off (DESO) provide a rapid method of drawing a sample. The body end is installed in the process line and the stem end into a WHITEY Sample Cylinder. When the connection is made, the sample is drawn. When the connection is broken, both the process line and the cylinder are sealed.

TABLE OF DIMENSIONS

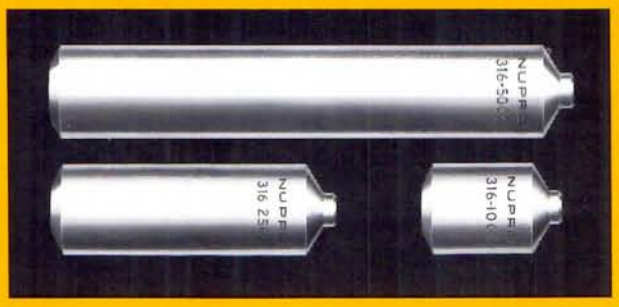
PART NUMBER	INTERNAL VOLUME (C.C.)	DOT CLASSIFICATION	SERVICE PRESSURE (PSIG)	FEMALE PIPE ENDS NPT	"A" O.D. (INCHES)	"B" LENGTH (INCHES)	WALL THICKNESS (INCHES) Nominal	AVG. WEIGHT (LB.-OZ.)
304-HDF2-40	40	3E-1800	1800	1/8	1-1/4	3-3/4	.083	0-6
304-HDF4-75	75	3E-1800	1800	1/4	1-1/2	4-7/8	.083	0-8
304-HDF4-150	150	3E-1800	1800	1/4	1-1/2	8-1/4	.083	0-13
304-HDF4-300	300	3E-1800	1800	1/4	2	9-1/4	.095	1-8
304-HDF4-500	500	3E-1800	1800	1/4	2	13-7/8	.095	2-2
304-HDF4-1000	1000	3A-1800	1800	1/4	4	9-1/2	.187	7-6
304-HDF8-1 GAL	3785 (1 Gallon)	3A-1800	1800	1/2	4	25-1/2*	.188	18-0



*Add 6-1/4 inches per end for protective caps. Caps do not exceed the 4" cylinder O.D.

STRIP TEEZE—Reg. T.M. Crawford Fitting Company

NUPRO®
MINIATURE SAMPLE CYLINDERS



PURPOSE

NUPRO Miniature Sample Cylinders fulfill the need for a small, compact, corrosion resistant vessel with closely controlled volume. They may be adapted easily to a wide variety of standard and special fittings and valves found in the laboratory.

APPLICATIONS

NUPRO Miniature Sample Cylinders are recommended for use in small volume sampling systems in conjunction with many analytical instruments, such as chromatographs. Large samples drawn from process lines may readily be broken into several smaller samples of known volume to be subjected to a series of analyses. The all metal, butt weld construction permits use with vacuum, high purity gases, temperature extremes, corrosives, radioactive or other dangerous and expensive fluids.

NUPRO COMPANY
15635 Saranac Road • Cleveland, Ohio 44110

TECHNICAL DATA

MATERIAL — Corrosion resistant type 316 stainless steel.

CONSTRUCTION — All welded, full penetration butt welds, bead removed — Smooth transition through port for easy cleaning.

END CONNECTIONS — Specially designed weld port which can accept ¼" O.D. socket weld or ⅜" O.D. butt weld fittings, valves or tubing.

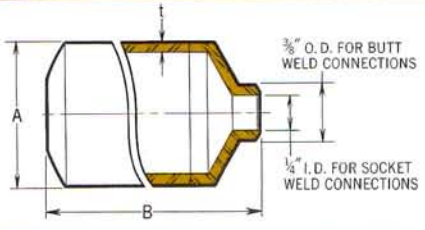
PRESSURE RATING — 1000 psig @ 70°F.

CLEANING — All assemblies are ultrasonically cleaned to NUPRO specification NC-11.

TESTING —

1. All assemblies proof pressure tested to 5/3 the working pressure (1667 psig) with dry nitrogen gas.
2. All assemblies helium leak tested to a rate of 4.14×10^{-9} $\frac{\text{atm. c. c.}}{\text{sec.}}$
3. Dye penetrant inspection to NUPRO specification NC-30 and/or radiographic inspection to NUPRO specification NC-40 are periodically performed on welds as a quality control procedure necessary to assure full penetration and soundness.

TABLE OF DIMENSIONS



PART NUMBER	INTERNAL VOLUME (C.C.)	VOLUME TOLERANCE (%)	SERVICE PRESSURE (PSIG)	"A" (INCHES)	"B" (INCHES)	"t" (INCHES)
SS-4CS-TSW-10	10	±5	1000	1	1-39/64	.065
SS-4CS-TSW-25	25	±5	1000	1	3-9/64	.065
SS-4CS-TSW-50	50	±5	1000	1	5-23/32	.065

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2-74-100M-225M-CL

TUBING PRESSURE RATINGS

This is a difficult subject to cover in simple terms, tables and graphs because of the many variables in tubing materials, wall thicknesses, hardness and surface finishes.

Although SWAGELOK Tube Fittings greatly simplify and lower the cost of a tubing installation, certain good practices are necessary. The tubing material must be softer than the fitting material. Typical recommended ordering instructions are shown for each type of tubing.

When tubing is properly selected and handled and when SWAGELOK Tube Fittings are assembled according to instructions, assemblies will remain leak-free far beyond the allowable working pressures shown. SWAGELOK Tube Fittings have been repeatedly tested to the *burst* of the tubing in both the *minimum* and *maximum* wall thickness shown for each size.

SWAGELOK Tube Fittings are not normally recommended for tube wall thicknesses beyond the ranges shown for each size. If you have tubing thinner or thicker than shown on the tables, request information from your local distributor.

Shown in the TABLES 1, 2, 3 & 4 are maximum allowable working pressures for ALUMINUM, COPPER, STEEL and STAINLESS STEEL tubing in various wall thicknesses.

All allowable working pressure loads are calculated from S values as specified by Table 302.3.1A and Paragraph 304.1.2 of Code for Pressure Piping ASA B31.3-1959.

TABLE 5 shows factors for calculation of working pressures at elevated temperatures. For a given material, multiply the factor shown times allowable working pressure.

TABLE 6 is a Chart of Factors. It can be used to calculate allowable pressures with other tubing materials not shown in tables 1, 2, 3 & 4. Multiply the factor x allowable stress value in psi to determine allowable pressure.

ALLOWABLE PRESSURE CHARTS

TABLE 1 • ALUMINUM TUBING

Minimum ultimate tensile strength 38,000 p.s.i. • For metal temperatures not to exceed -20° to 100°F. • Allowable working pressure loads calculated from S values as specified by Table 302.3.1A and Paragraph 304.1.2 of Code for Pressure Piping ASA B31.3-1959

TUBE O.D. (IN.)	TUBE WALL THICKNESS (INCHES)								SWAGELOK FITTING SERIES
	.035	.049	.058	.065	.083	.095	.109	.120	
1/8"	WORKING PRESSURE* (PSIG)								200
3/16"	4,142	5,966							300
1/4"	2,992	4,408	5,405						400
5/16"	2,327	3,401	4,132						500
3/8"	1,909	2,764	3,353	3,819					600
1/2"	1,406	2,014	2,422	2,755					810
5/8"	1,111	1,586	1,900	2,147					1010
3/4"	912	1,301	1,558	1,767	2,299				1210
7/8"	779	1,111	1,320	1,491					1410
1"	684	959	1,149	1,301	1,681	1,947			1610

SUGGESTED ORDERING INFORMATION
Aluminum-alloy drawn seamless tubing ASTM B-210 or equivalent.

TABLE 2 • COPPER TUBING

Minimum ultimate tensile strength 30,000 p.s.i. • For metal temperatures not to exceed -20° to 100°F. • Allowable working pressure loads calculated from S values as specified by Table 302.3.1A and Paragraph 304.1.2 of Code for Pressure Piping ASA B31.3-1959

TUBE O.D. (IN.)	TUBE WALL THICKNESS (INCHES)								SWAGELOK FITTING SERIES
	.028	.035	.049	.065	.083	.095	.109	.120	
1/8"	3,198	4,056	WORKING PRESSURE (PSIG)						200
3/16"	2,034	2,616	3,768						300
1/4"	1,464	1,890	2,784	3,750					400
5/16"		1,470	2,148	2,952					500
3/8"		1,206	1,746	2,412					600
1/2"		888	1,272	1,740	2,292				810
5/8"		702	1,002	1,356	1,776	2,076			1010
3/4"		576	822	1,116	1,452	1,686	1,968		1210
7/8"		492	702	942	1,230	1,422	1,656		1410
1"		432	606	822	1,062	1,230	1,428	1,590	1610

SUGGESTED ORDERING INFORMATION
Soft annealed seamless copper tubing ASTM B-75 or equivalent.

ALLOWABLE PRESSURE CHARTS (Continued)

TABLE 3 • CARBON STEEL TUBING

Soft annealed carbon steel hydraulic tubing ASTM A-179 or equivalent • Minimum ultimate tensile strength 47,000 p.s.i. • For metal temperatures not to exceed -20° to 100°F. • Allowable working pressure loads calculated from S values as specified by Table 302.3.1A and Paragraph 304.1.2 of Code for Pressure Piping ASA B31.3-1959

TUBE O.D. (IN.)	TUBE WALL THICKNESS (INCHES)													SWAGELOK FITTING SERIES
	.028	.035	.049	.065	.083	.095	.109	.120	.134	.148	.165	.180	.220	
	WORKING PRESSURE (PSIG)													
1/8"	8,341	10,579												200
3/16"	5,305	6,823	9,828											300
1/4"	3,818	4,929	7,261	9,781										400
5/16"		3,834	5,602	7,699										500
3/8"		3,145	4,554	6,291										600
1/2"		2,316	3,317	4,538	5,978									810
5/8"		1,831	2,613	3,536	4,632	5,414								1010
3/4"		1,502	2,144	2,910	3,787	4,397	5,133							1210
7/8"		1,283	1,831	2,457	3,208	3,709	4,319							1410
1"		1,126	1,580	2,144	2,770	3,208	3,724	4,147						1610
1 1/4"				1,698	2,195	2,533	2,934	3,255	3,670	4,094	4,619	5,094		2000
1 1/2"					1,812	2,088	2,415	2,675	3,011	3,353	3,775	4,155	5,201	2400
2"						1,545	1,784	1,973	2,216	2,462	2,765	3,036	3,775	3200

SUGGESTED ORDERING INFORMATION

Soft annealed seamless carbon steel hydraulic tubing ASTM A-179 or equivalent.
Hardness Rb 72 or less. Tubing to be free of scratches. Suitable for bending and flaring.

TABLE 4 • STAINLESS STEEL TUBING

Annealed 304 or 316 stainless steel tubing ASTM A-269 or equivalent • Minimum ultimate tensile strength 75,000 p.s.i. • For metal temperatures not to exceed -20° to 100°F. • Allowable working pressure loads calculated from S values as specified by Table 302.3.1A and Paragraph 304.1.2 of Code for Pressure Piping ASA B31.3-1959

TUBE O.D. (IN.)	TUBE WALL THICKNESS (INCHES)											SWAGELOK FITTING SERIES
	.028	.035	.049	.065	.083	.095	.109	.120	.134	.156	.188	
	WORKING PRESSURE (PSIG)											
1/8"	9,993	12,675										200
3/16"	6,356	8,175	11,775									300
1/4"	4,575	5,906	8,700	11,718								400
5/16"		4,593	6,712	9,225								500
3/8"		3,768	5,456	7,537								600
1/2"		2,775	3,975	5,437	7,162							810
5/8"		2,193	3,131	4,237	5,550	6,487						1010
3/4"		1,800	2,568	3,487	4,537	5,268	6,150					1210
7/8"		1,537	2,193	2,943	3,843	4,443	5,175					1410
1"		1,350	1,893	2,568	3,318	3,843	4,462	4,968				1610
1 1/4"				2,035	2,630	3,034	3,515	3,899	4,397	5,199		2000
1 1/2"					2,171	2,501	2,893	3,205	3,608	4,254	5,224	2400
2"						1,852	2,137	2,365	2,655	3,120	3,812	3200

**For higher pressures and heavier wall tubing thickness, see High Pressure Fittings subsection of Master Catalog Binder.*

SUGGESTED ORDERING INFORMATION

Fully annealed Type (304, 316, etc.) (seamless or welded and drawn) stainless steel hydraulic tubing ASTM A-269 or equivalent.
Hardness Rb 80 or less. Tubing to be free of scratches. Suitable for bending and flaring.

TABLE 5 •
PRESSURE RATINGS at ELEVATED TEMPERATURES

	FACTORS				
°F.	Aluminum ASTM B-210	Copper ASTM B-75	Steel ASTM A-179	304 S.S. ASTM A-269	316 S.S. ASTM A-269
200	.87	.97	.96	.89	.99
400	.40	.45	.87	.73	.94
600	...	...	.79	.62	.92
800	...	...	.60	.53	.90
1000	...	...	.18	.47	.75
1200	...	...	...	.24	.35
1400	...	...	...	.07	.14
1600	...	...	...	...	.06
1800	...	...	...	...	.05

To determine allowable pressure at elevated temperatures, multiply allowable working pressure from Table 1, 2, 3 or 4 by factor shown in TABLE 5.

EXAMPLE:

Type 316 Stainless Steel 1/2" O.D. x .035" Wall at 1000°F.
2775 psi X .75 = 2081 psi

Allowable working pressure for 1/2" O.D. x .035" wall type 316 stainless steel tubing is therefore 2081 psi at 1000°F.

TABLE 6 • CHART OF FACTORS

For use in calculating Allowable Working Pressures of Tubing
Allowable working pressure = Factor X Allowable Stress Value in PSI

Allowable working pressure loads should be calculated from S values for a given metal temperature-degrees F-as specified by Table 302.3.1A and Paragraph 304.1.2 of Code for Pressure Piping ASA B31.3-1959

TUBE O.D. (IN.)	TUBE WALL THICKNESS (INCHES)											SWAGELOK FITTING SERIES
	.028	.035	.049	.065	.083	.095	.109	.120	.134	.148	.156	
	*LAME'S FORMULA											
1/8"	.533*	.676*										200
3/16"	.339	.436*	.628*									300
1/4"	.244	.315	.464	.625*								400
5/16"		.245	.358	.492*								500
3/8"		.201	.291	.402*								600
1/2"		.148	.212	.290	.382							810
5/8"		.117	.167	.226	.296	.346						1010
3/4"		.096	.137	.186	.242	.281	.328					1210
7/8"		.082	.117	.157	.205	.237	.276					1410
1"		.072	.101	.137	.177	.205	.238	.265				1610
1 1/4"				.1085	.1402	.1618	.1874	.2079	.2345	.2615	.2773	2000
1 1/2"					.1158	.1334	.1543	.1709	.1924	.2142	.2268	2400
2"						.0987	.1139	.1260	.1416	.1573	.1664	3200

***FOR REFERENCE WORK ONLY. NO IMPLICATION IS MADE THAT THESE FIGURES CAN BE USED FOR DESIGN WORK. APPLICABLE CODES AND PRACTICES IN INDUSTRY SHOULD BE CONSIDERED. CRAWFORD FITTING COMPANY IS NOT RESPONSIBLE FOR THE ACCURACY OF INFORMATION PRESENTED IN THIS TABLE.**

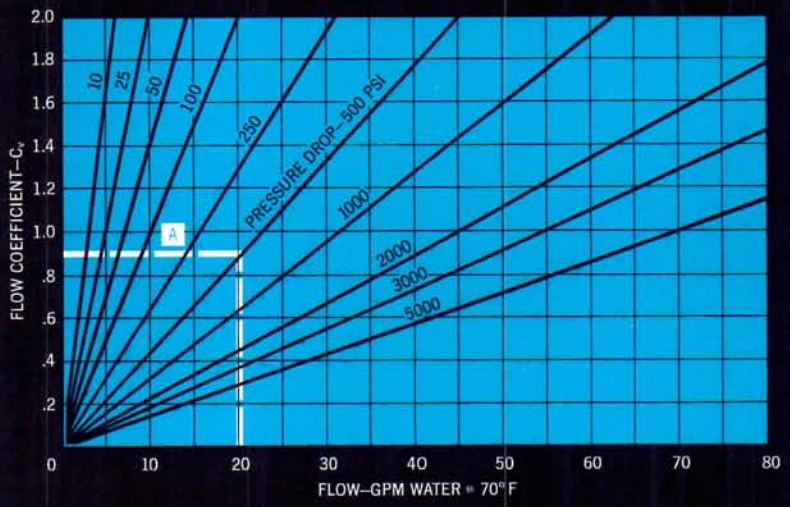
LIQUID FLOW CALCULATIONS

CAPACITY CURVE EXPLANATION

The valve flow coefficient (C_v) is defined as the number of gallons per minute of room temperature water which will flow through the valve with a pressure drop of 1 PSI across the valve. Flow capacity curves shown in our valve literature are plotted with the valve flow coefficient versus the number of turns open. For any stem position, or number of turns open for each valve, the C_v can quickly be found. The shape of the curve is also characteristic of the valve's performance. A gradually rising curve indicates an on-off type valve, whereas a curve with greater slope indicates a regulating or metering type valve.

The C_v shown with the valve **fully open** should be used in formulas for calculating flow through the valve for **maximum** capacity. These C_v figures also appear under the technical data sections for individual valves.

WATER CURVE



SPECIFIC GRAVITY TABLE FOR LIQUIDS

LIQUID	Specific gravity referred to water SG @ 70°F
Acetone	.792
Alcohol	.792
Benzene	.902
Gasoline	.690
Kerosene	.815
Water	1.000

FLOW FORMULAS FOR LIQUIDS

Recommended by the Fluid Controls Institute, Inc.

(1) $Q = C_v \sqrt{\frac{\Delta P}{SG}}$ (2) $C_v = Q \sqrt{\frac{SG}{\Delta P}}$ (3) $\Delta P = \frac{Q^2 (SG)}{C_v^2}$

Where:

- Q = Flow in U.S. gallons per minute (GPM)
- ΔP = Pressure drop (PSI)
- SG = Specific gravity of fluid (Water = 1.0)
- C_v = Valve flow coefficient

LIQUID FLOW CALCULATIONS

The water flow curves and liquid flow formulas are useful tools in determining the proper size valve for a liquid application. Certain basic parameters must be known in order to use the curves and formulas. The flow rate through a valve can be calculated if inlet and outlet pressures, valve C_v and specific gravity of the liquid at the flowing temperature are known. Viscosity may affect the accuracy of calculations. However, for liquids having viscosities close to water, reasonably accurate results can be obtained.

EXAMPLE A

Find the C_v of a valve required to pass 20 GPM of 70°F water with a pressure drop across the valve of 500 PSI.

On the above chart, locate the flow rate of 20 GPM and proceed vertically to the 500 PSI pressure drop line. Then proceed horizontally to the left and read the C_v; $C_v = 0.9$. Practically speaking, a valve having a slightly larger C_v should be chosen.

EXAMPLE B

Find the C_v of a valve required to pass 20 GPM of 70°F gasoline. The inlet pressure (upstream) is 1000 PSIA and the outlet pressure (downstream) is 500 PSIA.

$$C_v = Q \sqrt{\frac{SG}{\Delta P}} = 20 \sqrt{\frac{.690}{500}} = 0.74$$

EXAMPLE C

What is the GPM through a valve having a $C_v = 1.2$ for a liquid having a specific gravity of 0.75? Inlet pressure is 300 PSIA and outlet pressure is 175 PSIA.

$$Q = C_v \sqrt{\frac{\Delta P}{SG}} = 1.2 \sqrt{\frac{300-175}{.75}} = 15.5 \text{ GPM}$$

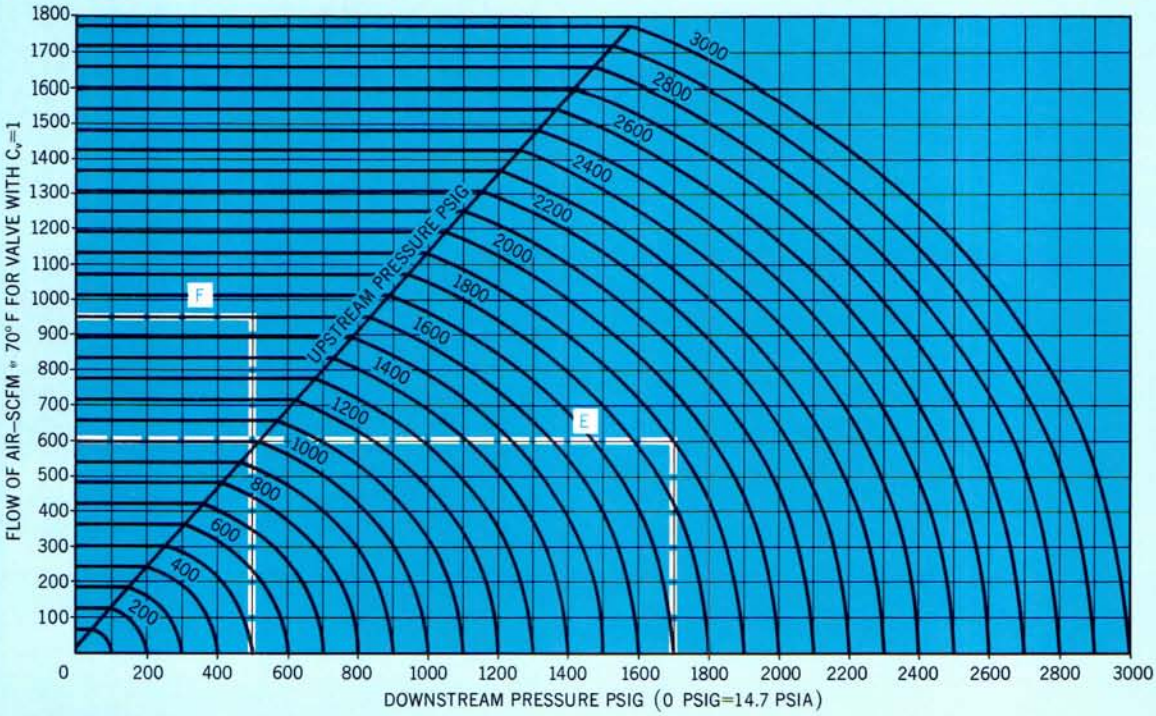
EXAMPLE D

Kerosene at 70°F is flowing at 5 GPM through a valve with a $C_v = .35$. What is the pressure drop across the valve?

$$\Delta P = \frac{Q^2 (SG)}{C_v^2} = \frac{5^2 (.815)}{.35^2} = 166 \text{ PSI}$$

GAS FLOW CALCULATIONS

AIR CURVE



FLOW FORMULAS FOR GASES

Recommended by the Fluid Controls Institute, Inc.

(4) $$Q = 16.05\ C_v \sqrt{\frac{(P_1^2 - P_2^2)}{(SG) \times T}}$$

(5*) $$Q = 13.61 \times P_1 \times C_v \sqrt{\frac{1}{(SG) \times T}}$$

Where: Q = Flow in SCFM
C_v = Valve flow coefficient
SG = Specific gravity of gas (Air @ 14.7 PSIA and 70°F = 1.0)
‡T = Absolute temperature of flowing gas (°F + 460)
$\triangle P = (P_1 - (P_2)$ Pressure drop (PSI)
P_1 = Inlet pressure (PSIA)
P_2 = Outlet pressure (PSIA)

‡Refer to "USEFUL CONVERSION DATA" on reverse side of "Technical Information" tab for converting °C to °F.

*When outlet pressure is approximately one half or less of the inlet pressure ($P_2 = .53P_1$) this condition becomes known as a critical pressure and then formula (5) must be used. Formula (5) is exactly the same as formula (4) except that $.53 \times P_1$ is substituted for P_2.

SPECIFIC GRAVITY TABLE FOR GASES

GAS	Specific gravity referred to air (SG) @ 70°F
Acetylene	.907
Air	1.000
Ammonia	.587
Argon	1.38
Butane	2.07
Carbon Dioxide	1.529
Helium	.137
Hydrogen	.0695
Methane	.554
Nitrogen	.967
Oxygen	1.105
Propane	1.562
Sulfur Dioxide	2.264

Flow calculations and charts for gases differ from those for liquids due primarily to the compressibility of gases. The above chart shows the flow rates in standard cubic feet per minute (SCFM) of 70°F air flowing through a valve having a $C_v = 1$. From this chart, sizing of a valve can be readily accomplished. Corrections for gases having specific gravities other than air and flowing at temperatures other than 70°F can be made by using formulas (4) or (5).

EXAMPLE E
Find the SCFM of 70°F air that will pass through a valve having a $C_v = 1$ with an inlet pressure of 1900 PSIG and a downstream pressure of 1700 PSIG. ¶ Locate the downstream pressure of 1700 PSIG on the chart and proceed vertically to the 1900 PSIG upstream pressure line. Then proceed horizontally to the left and read the flow rate equals 600 SCFM. ¶ Under the same conditions, what SCFM would pass through a valve with a $C_v = .72$? ¶ Since the chart is drawn for a valve having a $C_v = 1$, simply multiply the 600 SCFM by .72 which equals 432 SCFM.

EXAMPLE F
Find the SCFM of 70°F air that will pass through a valve having a $C_v = 1$ with an upstream pressure of 1600 PSIG and an outlet pressure of 500 PSIG. ¶ Locate the downstream pressure of 500 PSIG and proceed vertically past the critical pressure line to the 1600 PSIG upstream pressure line. Then proceed horizontally to the left and read the flow rate equals 950 SCFM.

EXAMPLE G
Butane at 70°F is flowing through a valve with a $C_v = .80$. The upstream pressure is 2000 PSIG and the outlet pressure is 500 PSIG. Find the flow rate. ¶ First, check for critical pressure to determine whether to use formula (4) or (5).

$.53 \times P_1 = .53 \times 2014.7 = 1067.8$ PSIA $\quad P_2 = 514.7$ PSIA (less than $.53P_1$).

The pressure is critical and formula (5) must be used.

$$Q = 13.61 \times P_1 \times C_v \sqrt{\frac{1}{(SG) \times T}} = 13.61 \times 2014.7 \times .80 \sqrt{\frac{1}{(2.07 \times 530)}} = 662 \text{ SCFM of butane}$$

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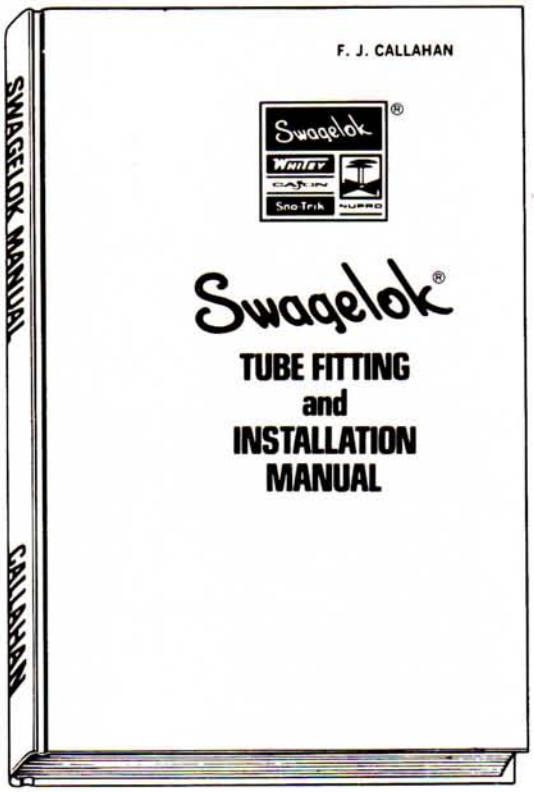
Sample Cylinders

Various types of Cylinder Valves are shown under the Regulating and Shut-off Valve subsection. WHITEY "DK" Series Forged Body Shut-off Valves are of particular interest for cylinder applications.


Swagelok®
WHITEY®
CAJON®
Sno-Trik®
NUPRO®



SWAGELOK TUBE FITTING & INSTALLATION MANUAL

The expanded new edition of the SWAGELOK Tube Fitting & Installation Manual, containing some 450 illustrations and tables, is offered for sale by your local SWAGELOK Sales and Service Representative. It will provide valuable assistance in training apprentice pipe and tube fitters, and serve as an excellent reference manual for instrument personnel.

This edition includes:

- Glossary of terms
- Using SWAGELOK Tube Fittings
- Tubing and tubing installation
- Steam tracing suggestions
- Vacuum systems
- Vacuum products
- Trouble shooting
- Types of fittings and type numbers
- Valve section
- Pipe fitting section
- Metric fitting section
- Determining tubing sizes
- Tubing calculations and pressure tables
- Corrosion charts
- General information section

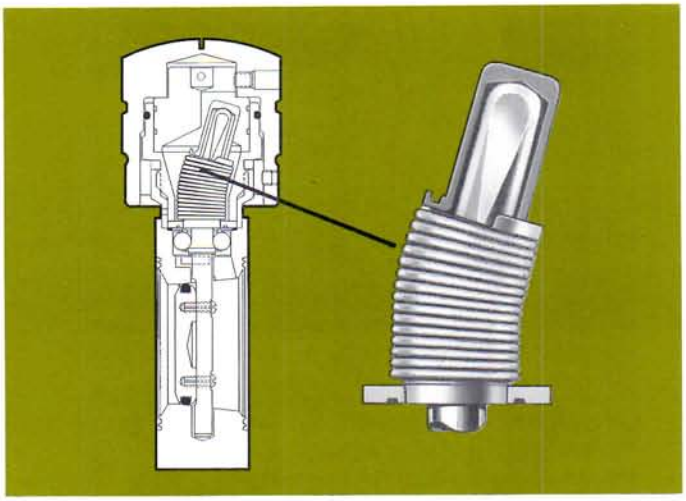
The manual is easy to carry, easy to use, providing ready reference for any application involving fittings, valves, tubing and components.

NUPRO® VACUUM VALVES

304-24VFBG Bellows Sealed Butterfly Vacuum Valve

304-24VFO O-Ring Sealed Butterfly Vacuum Valve

"24VFBG" SERIES BELLOWS SEALED BUTTERFLY VACUUM VALVE



PURPOSE

The NUPRO "24VFBG" Series Bellows Sealed Butterfly Vacuum Valve provides the ultimate in reliability in high vacuum systems. High conductance, low outgassing, quick, easy actuation and the long cycle life of this valve are results of its streamlined design and high quality materials of construction. A bellows provides an all-metal static seal between the system and atmosphere, while leakage through the valve is prevented by a Viton O-Ring encircling the flapper. The valve features integral CAJON flanged end connections, which are compatible with most vacuum systems employing up to 1½" tubing.

APPLICATIONS

The NUPRO "24VFBG" Series Bellows Sealed Butterfly Vacuum Valve is suited to those applications requiring high vacuum, bakeout and high conductance, particularly where absolute reliability of the system-to-atmosphere seal must be maintained. In vacuum systems, it can be used as a bypass valve in the roughing circuit, or a foreline valve when connected directly to the vacuum chamber.

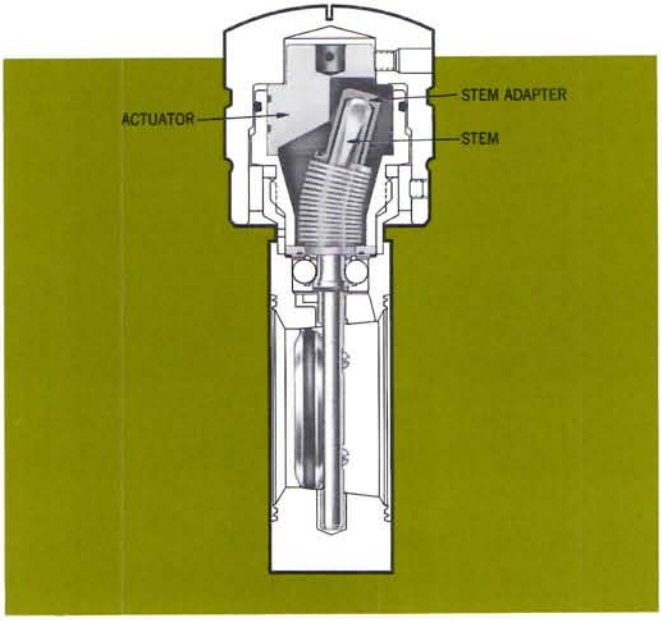
High volume light bulb and vacuum tube manufacturers rely heavily upon vacuum valves in their individual systems. Any analytical instrument or industrial or research process that requires the use of vacuum, such as gas analysis, electronic component manufacturing, cosmetics, freeze dried foods and drugs or physics experimentation, are excellent application areas. The NUPRO "24VFBG" can also be used with low positive pressures (*See TECHNICAL DATA*).

OPERATION

As the flapper rotates 90° from the fully open to the fully closed position there is no rotary movement of the bellows sub-assembly. This feature is accomplished by a unique mechanism which is similar to a rotary feed-through. The three basic parts of this valve actuating mechanism are the *stem,* with its canted design, the bellows sub-assembly, including a *stem adapter* that fits over the stem and extends down over the stem to where it is welded to the top of the bellows, and finally, the *actuator* in the handle with a milled-out area to engage the top of the stem adapter. The handle slides over the entire top works and is attached to the sleeve with two set screws. The operation of the actuating system is illustrated at the right.

The handle rotates, as does the stem, while the bellows merely flexes. The stem and the actuator ride against bearing surfaces on the inner and outer portions of the stem adapter, respectively. See the three illustrations below.

As a result, there is no twisting action of the bellows as the handle is rotated. At closure, motion of the low compression set Viton flapper O-Ring is nearly linear, resulting in reliable, leak-tight shut-off.



SPECIAL FEATURES

Bellows Stem Seal to Atmosphere—The stem is sealed from the atmosphere by a 321 stainless steel bellows. The body-to-bonnet seal is a solid copper O-Ring. Actual leakage through these two areas is eliminated. Although rotation of the handle and stem does occur, there is no rotary action transmitted to the bellows and sliding seals are therefore eliminated. Bellows stem seals are explained in detail in the "Manually Operated Bellows Valve" catalog.

High Conductance—Valve conductance is maintained at the highest possible level (150 liters per second) by streamlined design, increased internal diameters, short overall valve length and a smooth flow path.

Minimal Potential Virtual Leaks—Potential virtual leaks are minimized in the "24VFBG" by venting the volume within the bellows to the body bore. Also, flats are positioned on the upper and lower guide portions of the stem, stem screw threads are slotted and a recess is machined into the flapper to eliminate any gas pockets or trapped volumes *(See illustrations—TECHNICAL DATA.)*

Materials of Construction—High quality 304 stainless steel barstock is used for the valve body. To prevent any leak-through due to inclusions, which could occur in lower quality stainless steels, the flapper is machined from vacuum arc remelted 304 stainless steel. All components exposed to the system are stainless steel, copper or Viton.

Low Outgassing—The use of high quality stainless steel barstock reduces the amount of outgassing often found at a high level in more porous materials. To further reduce outgassing, the exposure of the Viton flapper O-Ring to the high vacuum side has been kept to a minimum.

Helium Leak Tested—Each valve is 100% helium leak-tested statically and dynamically at the bellows seal, the body-to-bonnet seal and the flapper O-Ring seal to the same sensitivity. *(See TECHNICAL DATA.)*

Cleaning and Packaging—All valves are ultrasonically cleaned, prior to shipment, to NUPRO Specification NC-11. Flanged surfaces are protected by two 2¾" O.D. polyethylene end caps. The valve is then heat-sealed in a heavy duty polyethylene bag.

Long Service Life—The unique design assures an extended service life, under normal vacuum conditions, in excess of 100,000 cycles, with periodic lubrication of the Viton flapper O-Ring. Close tolerance ball bearings around the stem minimize friction and increase performance. Slight end play of the stem provides self-centering of the Viton flapper O-Ring

in the tapered body bore. Nearly linear motion of the flapper O-Ring into the tapered body bore at shut-off eliminates excessive rubbing and tearing.

Bakeout Capability—Viton will effectively seal to temperatures of 200°C maximum, in this design. If bakeout is required, it is recommended that the valve be in the open position. If baked out closed, high breakaway torque and possible tearing of the O-Ring, could result.

Quick Actuation with Directional Handle—Quarter turn actuation with a positive dead stop is assured by a 90° milled-out area within the body mating with a hardened stainless steel pin, which is press fitted into the stem. The attractive knurled handle is slotted to indicate flapper position.

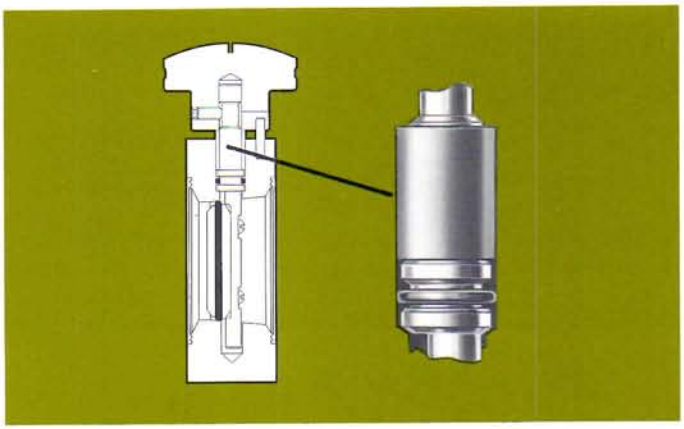
Pressurized System Capability—The "24VFBG" Series Vacuum Valve can also be used to provide high flow capacity in low positive pressure systems. Vacuum systems are often leak tested with low positive pressure gases. This feature is also useful when cleansing a vacuum system with a purge gas. *(See TECHNICAL DATA for maximum positive pressure ratings.)*

Replaceable Seals (Flapper O-Ring & Bellows)—The stem seal is an all-metal bellows, sealed to the body by a copper O-Ring. The flapper is sealed with a Viton O-Ring. All three seals can be easily replaced in a few minutes using a standard 5/64" hex key, a screwdriver and a 1¼" open end wrench. *(See NUPRO Technical Bulletin #31.)*

End Connections—Both end connections feature the CAJON double toroid, single seal design for ease of installation and vacuum tight sealing. They can also be used in pressurized systems. CAJON integral flanged end connections are compatible with almost any commercially available 2¾" O.D. vacuum flange. (For additional Technical Information on CAJON Vacuum Flanges refer to the Vacuum Products Catalog.)

Easy Installation—The "24VFBG" Series Vacuum Valve is installed in a vacuum system by (1) centering the O.F.H.C. copper gasket on both valve end connections, and (2) mating the system flanges to the valve with six nuts and bolts, which are pulled up so that the flange faces make metal-to-metal contact. CAJON gaskets are recommended for use with the integral CAJON flanged end connections.

"24VFO" SERIES O-RING SEALED BUTTERFLY VACUUM VALVE



PURPOSE

The NUPRO "24VFO" Series O-Ring Sealed Butterfly Vacuum Valve is designed for high conductance, low outgassing and long cycle life. Quick actuation with a directional handle and easy maintenance are among the other outstanding features of this valve. End connections are of the CAJON double toroid, single seal vacuum flange design, for systems employing up to 1½" tubing.

APPLICATIONS

The valve is suited for systems requiring high conductance and bakeout, but where the integrity of an all-metal bellows seal to atmosphere is not required. Vacuum chambers, gas analysis, environmental as well as vacuum system research are definite application areas.

OPERATION

One quarter turn of the directional handle moves the flapper from the closed to the fully open position. The nearly linear motion of the flapper O-Ring at shut-off results in positive, leak-tight sealing. The handle is held in place by double set screws. A milled-out area of the handle engages a stainless steel pin set into the valve body, assuring either a full open position, or a leak-tight closed position.

SPECIAL FEATURES

Generally, the same excellent features exhibited by the "24VFBG" Bellows Sealed Butterfly Vacuum Valve apply to the "24VFO" O-Ring Sealed Butterfly Vacuum Valve: • High conductance • Low outgassing • Minimum virtual leaks • High quality materials of construction • 100% helium leak tested • Cleaning and packaging • Bakeout capability • Quick actuation with directional handle • CAJON flanged end connections • Easy installation.

The following specific features of the "24VFO" O-Ring Sealed Butterfly Vacuum Valve make it an excellent choice in those systems not requiring the integrity of an all-metal bellows seal to atmosphere.

O-Ring Stem Seal to Atmosphere—The stem is sealed to atmosphere by a single low compression set Viton O-Ring. The O-Ring is positioned deep in the body bore, as close to the system as possible, to minimize dead space and potential virtual leaks. The body bore is burnished to reduce wear of the O-Ring.

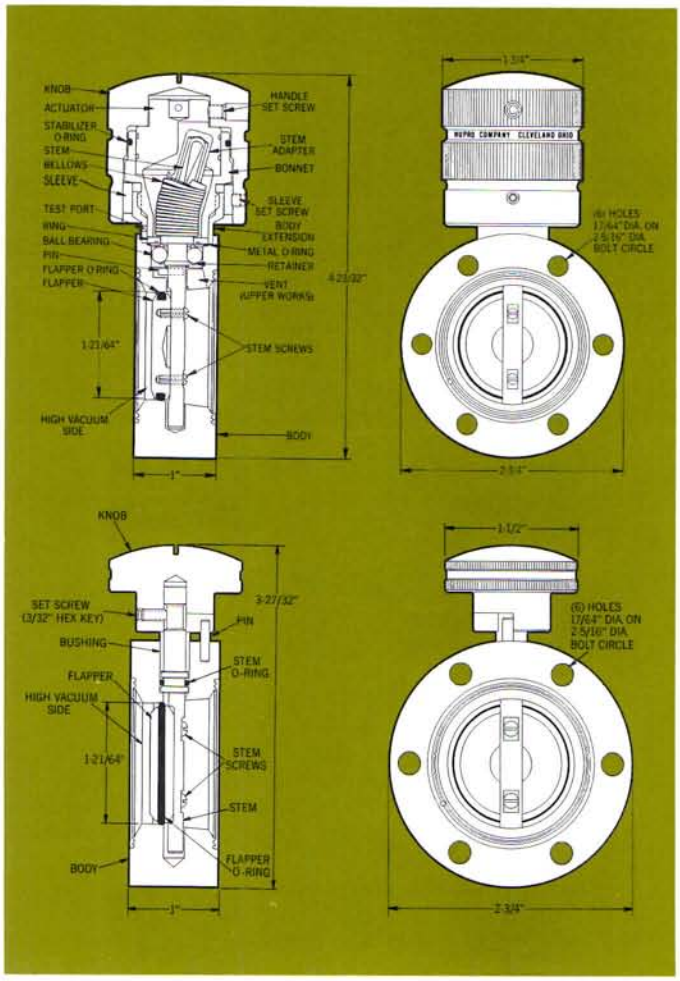
Long Service Life—An extended service life in excess of 100,000 cycles can be achieved, under normal vacuum conditions, due to the simplicity of the design. A close tolerance guide bushing provides differential hardness between the stem and body bore, which reduces wear on the stem and O-Ring stem seal and increases performance. The action of the flapper O-Ring at closure is identical to that in the "24-VFBG" Series Bellows Sealed Butterfly Vacuum Valve.

Positive Pressure Capabilities—The "24VFO" Series Vacuum Valve can be used in low positive pressure systems to provide high flow capacity. This feature is also useful in pressure testing or purging of vacuum systems. *(See TECHNICAL DATA.)*

Replaceable Seals—The valve contains only two seals, the O-Ring stem seal and the O-Ring flapper seal. Both are low compression set Viton. Both can readily be changed, if necessary. Complete overhaul of the valve can be accomplished in a few minutes using a standard 3/32" hex key and a screwdriver. Both O-Rings should be lightly lubricated with a suitable grease, (Vac Goop is suggested). *(See NUPRO Technical Bulletin #31.)*

TECHNICAL DATA

DIMENSIONS



MATERIALS

"24VFBG"

Knob—Aluminum, clear anodized
Actuator & Sleeve—Bronze
Bellows—321 stainless steel
Ball Bearings—316 stainless steel
Metal O-Ring—Oxygen free copper
Stem Screws—18-8 stainless steel
Set Screws—18-8 stainless steel
(Handle 3/32" hex key)
(Sleeve 5/64" hex key)
Flapper O-Ring—Viton (low compression set)
Knob Stabilizer O-Ring—Viton
Pin—420 stainless steel
All Other Parts—304 stainless steel

"24VFO"

Knob—Aluminum, clear anodized
Pin—420 stainless steel
Bushing—Phosphor bronze
Stem Screws—18-8 stainless steel
Set Screws—Alloy steel (3/32" hex key)
O-Rings—Viton (low compression set)
All Other Parts—304 stainless steel

RATINGS

"24VFBG"	"24VFO"
CONDUCTANCE—Calculated at over 150 liters per second	
TEMPERATURE—200°C maximum. If bakeout is required it is recommended that the valve be in the wide open position. If closed, high breakaway torque can result due to the properties of Viton.	
VACUUM—To 10^{-9} Torr with adequate pumping capacity	
PRESSURE A maximum pressure of 25 PSI may be applied to the valve in either the closed or open position due to the requirement for a thinner, more flexible bellows material.	PRESSURE In the closed position, a 200 PSI maximum differential pressure may be applied if the valve is installed so that the side marked HIGH VACUUM SIDE is considered the inlet. Pressure rating in the opposite direction is limited to 25 PSI due to containment of the flapper O-Ring.
WEIGHT—2 lbs. (approx.)	WEIGHT—1-1/3 lbs. (approx.)

FLANGE CONNECTION ACCESSORIES

CAJON gaskets are recommended for use with the integral CAJON flanged end connections on both the "24VFO" and the "24VFBG" vacuum valves. These are available in O.F.H.C. copper, Viton and high purity nickel, with the majority of applications using O.F.H.C. copper. Flange mounting bolts and nuts can be supplied. The 12 point bolts are made from high tensile strength A286 alloy lubricated to reduce torque during make-up. Nuts are 18-8 stainless steel. Bolts require a 1/4" standard 12 point socket or box end wrench and the nuts require a 7/16" open or box end wrench.

ORDERING INSTRUCTIONS

PART NUMBER	DESCRIPTION	PACKAGING QUANTITY
304-24VFO	NUPRO 1-1/2" O-Ring Sealed Butterfly Vacuum Valve	Individually Packaged
304-24VFBG	NUPRO 1-1/2" Bellows Sealed Butterfly Vacuum Valve	Individually Packaged
A286-24VF-S1	1/4-28 x 2-1/4" Long Pre-lubricated A286 bolts with pre-lubricated 18-8 stainless steel nuts	Twenty (20) bolts and nuts are included per package. Six are required per assembly.

OFHC—Reg. TM American Metal Climax, Inc.
VITON—Reg. TM E.I. DuPont
VARIAN CONFLAT—Reg. TM Varian Associates, Vacuum Division
VAC GOOP®—Reg. TM Crawford Fitting Company

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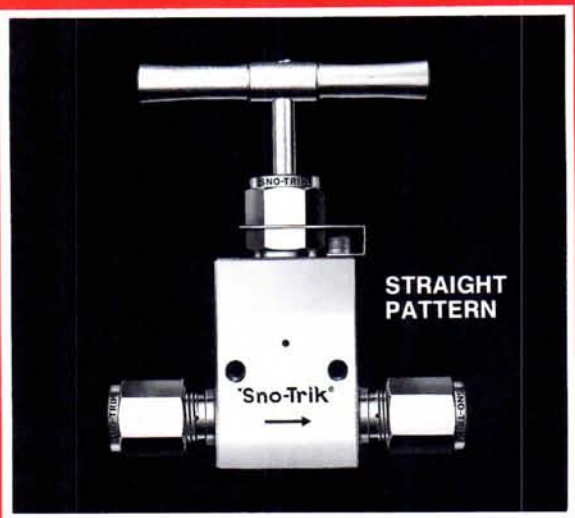
For:

- Critical vacuum applications refer to subsection on Bellows Seal Valves.
- Non-critical service refer to subsections on Regulating & Shut-off Valves and Ball Valves.
- Vacuum bleeds refer to subsection on Metering Valves.
- Vacuum fittings and accessories refer to subsection on Vacuum Products.

Data Sheet No. 5

'Sno-Trik®

VALVES for HIGH PRESSURE



PURPOSE

SNO-TRIK shut-off valves provide reliability, safety and long cycle life under the most severe service conditions found in high pressure systems and hazardous or corrosive fluid applications. Also used in medium pressure systems where high safety factors are desirable.

OPERATION

SNO-TRIK valves are hand operated by turning the functional bar handle approximately two and one-half turns to full flow. Air Operators are available for remote operation.

APPLICATIONS

All industries where shut-off or regulating service is required in high pressure or high temperature systems • Chemical processing • Power • Petrochemical • Equipment and machine manufacturing • Aerospace • Underwater technology • Liquid chromatography • Steam sampling • Research and development facilities.

FEATURES

Non-rotating stem at closure prevents damage to seat and stem tip • Packing below threads with pure TFE seal to isolate threads from system fluid • Positive backstop • Packing adjustable and replaceable without removing valve from line • Packing surrounded by stainless steel valve components to prevent cold flow • Smooth operation at rated pressure, accomplished with Acme power transmission threads operating in a phosphor bronze insert • Stainless steel body made of extruded barstock for maximum material integrity • Weep holes in body for instant leak detection and safety • Mounting holes on side and top of valve for mounting in any position • Locking device on packing nut • SNO-TRIK connections are standard, with adapters available to pipe, weld or SWAGELOK fittings • Every valve factory tested at 1½ times maximum working pressure.

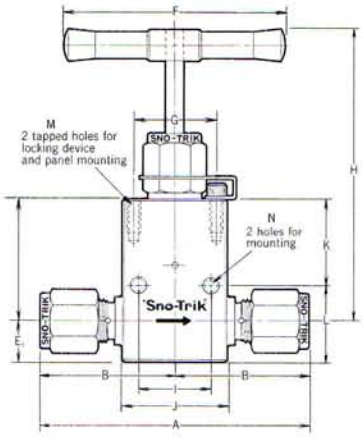
MATERIALS

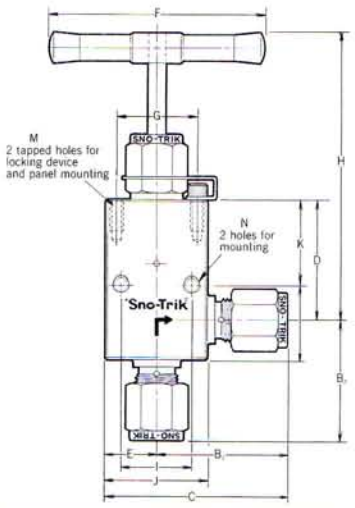
Body—44 and 64 Series: 22-13-5 extra high strength austenitic stainless steel
94 Series: 316 stainless steel
Packing Nut Insert—phosphor bronze
Stem and Stem Actuator—455 stainless steel
Packing—TFE standard, Asbestos-Inconel optional
Front Ferrule—316 stainless steel
Back Ferrule—17-4PH
All other parts—316 stainless steel
Other materials available on request

SAFETY DEMANDS RESPECT FOR HIGH PRESSURE

SNO-TRIK COMPANY • 32550 Old South Miles Road • Cleveland, Ohio 44139

TABLE OF DIMENSIONS





PATENTED

VALVE SIZE	PART NUMBER	ORIFICE DIAM-ETER	C_v	A	B	B_1	B_2	C	D	E	E_1	F	G	H OPEN	H CLOSED	I	J	K	L	M	N	BODY THICK-NESS
1/4''	SX-44-6-NR	0.0625	0.080	3 11/16	1 27/32	1 27/32	1 1/32	2 19/32	1 11/16	3/4	9/16	3 1/8	1 3/16	4 5/32	4	1 3/16	1 1/2	1 1/8	1 1/8	10-32	#10	1
	SX-44-3-NR		0.095																			
	SX-44-9-NR																					
	SX-44-9-RS-NR						1 29/32															
3/8''	SX-64-6-NR	0.125	0.180	4 3/4	2 3/8	2 3/8	2 1/16	3 3/8	2 5/16	1	1 1/16	3 1/8	1 3/16	4 27/32	4 1/16	1 1/2	2	1 1/2	1 1/2	10-32	1/4	1 1/4
	SX-64-3-NR		0.200																			
	SX-64-9-NR																					
	SX-64-9-RS-NR						2 23/64															
9/16''	SS-94-6-NR	0.187	0.627	6 5/16	3 5/32	3 5/32	2 29/32	4 13/32	3	1 1/4	1	5	2	6 23/32	6 5/32	2	2 1/2	2	2	5/16-18	5/16	1 5/8
	SS-94-3-NR		0.773																			
	SS-94-9-NR																					
	SS-94-9-RS-NR						3 1/4															
9/16'' MO	SS-94MO-6-NR	0.3125	1.27	6 5/16	3 5/32	3 5/32	2 29/32	4 13/32	3	1 1/4	1	5	2	6 23/32	6 5/32	2	2 1/2	2	2	5/16-18	5/16	1 5/8
	SS-94MO-3-NR		1.58																			
	SS-94MO-9-NR																					
	SS-94MO-9-RS-NR						3 1/4															

NOTE: A, B, B_1, B_2, & C dimensions are with nuts in finger-tight position. All dimensions in inches. Dimensions for reference only, subject to change. PRESSURE RATING—All are rated 60,000 psi, except MO valves which are rated 30,000 psi.

PRESSURE VERSUS TEMPERATURE

This chart shows the decrease of pressure rating of the valves as the temperature increases for 316 stainless steel and 22-13-5 stainless steel.

TEMPERATURE °F	FACTOR SS	SX
200	.99	.99
400	.94	.94
TFE packing 450°F		
600	.92	.92
Asbestos-Inconel packing 650° F*		
800	.90	.90
1000	.75	.75
1200	.35	.64

To determine allowable working pressure at elevated temperatures, multiply allowable working pressure by factor shown in table.

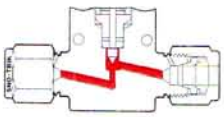
Example: 60,000 PSI @ 800°F = 60,000 × .90 = 54,000 PSI allowable pressure.

*SNO-TRIK Valves can be used at temperatures above 650°F, however, packing will not have the same integrity.

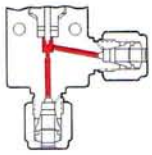
For additional pressure rating information, see Technical Information subsection of Master Catalog Binder.

DEAD SPACE

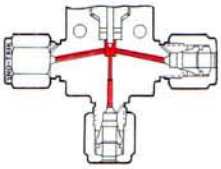
Defined as the volume between cones of installed tubes with valve in open position.



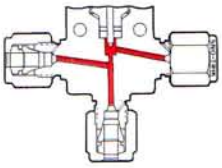
VALVE PART NO.	VOLUME, CUBIC IN.
SX-44-6-NR	.019
SX-64-6-NR	.045
SS-94-6-NR	.135
SS-94MO-6-NR	.293



SX-44-9-NR	.016
SX-64-9-NR	.043
SS-94-9-NR	.119
SS-94MO-9-NR	.247



SX-44-3-1P-NR	.022
SX-64-3-1P-NR	.051
SS-94-3-1P-NR	.156
SS-94MO-3-1P-NR	.357



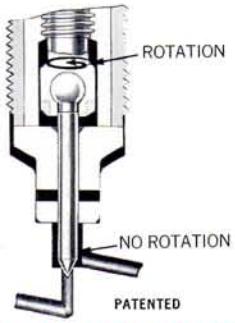
SX-44-3-2P-NR	.023
SX-64-3-2P-NR	.052
SS-94-3-2P-NR	.159
SS-94MO-3-2P-NR	.362

HAND OPERATED VALVES

SNO-TRIK straight, angle and cross pattern valves incorporate all the features of SNO-TRIK valve design. They withstand wide temperature variations, and shut-off repeatedly at working pressures as high as 60,000 psi.

Valve ports are integral SNO-TRIK fittings which are in-line, making the valve compact and easy to design and install into a system. Every valve is factory tested at 1½ times working pressure.

NON-ROTATING STEM PRINCIPLE



PATENTED

The non-rotating stem at closure is standard on all SNO-TRIK shut-off valves. It prevents possible galling or damage to the stem tip and valve seat if handle is turned when valve is closed. If valve is closed and operator continues to overtighten, rotation will occur only between actuator and ball.

STEM REPLACEMENT

The 1/4" valve stem is replaced by slipping keeper ring off, removing old stem, installing new stem, and replacing keeper ring.

STEM PART NO.:
455-3B-44-NR

The 3/8", 9/16" and 9/16"MO valves have replaceable stem tips, which can be screwed on and off.

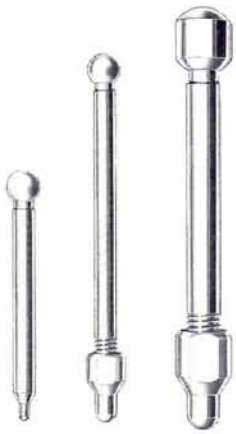
STEM TIP PART NO'S:

3/8"	455-3D-64-NR
9/16"	455-3D-94-NR
9/16"MO	455-3D-94MO-NR

PATENTED

METERING VALVES

All SNO-TRIK valves may be furnished with metering stems for improved regulation and control of fluids at high pressures. To specify, add "M" to valve part number. Example: SX-44-6-NRM



SNO-TRIK ADAPTERS

Allow use with any tubing system.
For additional information on adapters see High Pressure Fitting subsection of Master Catalog Binder.

Coned Tube Stub to Male Pipe Thread Adapter

Coned Tube Stub to Tube Socket Weld Adapter

Coned Tube Stub to Female Pipe Thread Adapter

Coned Tube Stub to Male Pipe Weld Adapter

Coned Tube Stub to SWAGELOK Fitting Reducer

RS (REPLACEABLE SEAT) VALVES

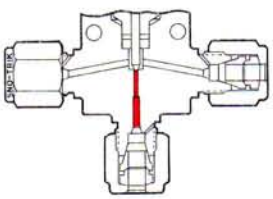
Available in angle and "1P" cross patterns

RS valves save cost and downtime in unusually severe applications which normally require valve replacement due to erosion, corrosion, wire-drawing, or other damaging conditions. The RS valves feature replaceable seats and stems for extended valve life in steam sampling, pure water sampling, high pressure throttling, abrasive systems, blow down, and water and steam jet applications. Valve seat is held in place by a male connector type assembly. When seat becomes worn it can be removed, reversed end for end, and put back into valve. Male connector is then replaced and tightened 1/4 turn past finger-tight. When reversed seat becomes worn, a new seat may be placed in valve via the same procedure.

ONE OR TWO PORTS TO PRESSURE

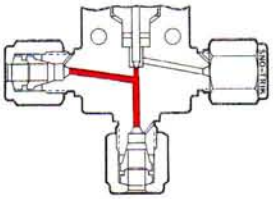
Cross pattern valves are available as shown with one or two ports to pressure.

1P



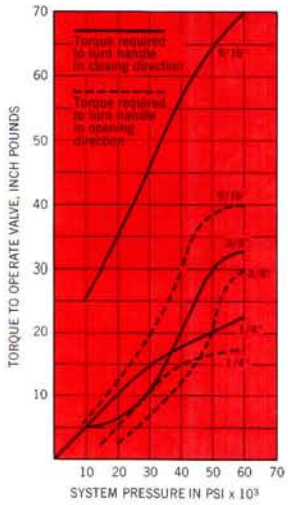
ONE PORT TO PRESSURE
SX-44-3-1P-NR

2P



TWO PORTS TO PRESSURE
SX-44-3-2P-NR

OPERATING TORQUE



AIR OPERATORS

NORMALLY OPEN | NORMALLY CLOSED | DOUBLE ACTING CYLINDER

Air Operators are available for all SNO-TRIK shut-off valves. The air operators may be Normally Open, Normally Closed, or Double Acting Cylinder (NO,NC,DAC). They require 100 psi plant air pressure or less for actuation. (See SNO-TRIK Technical Bulletin No. 5 for complete information.)

MO (MAXIMUM ORIFICE) VALVES

MO valves are designed for high flows or low Pressure Drop (△P) at high pressure in such application areas as the ceramics industry, urethane plants, underwater technology, and porcelain plants. Flow capacity is more than double that of standard 9/16" models. Pressure rating is 30,000 psi on all MO models. A complete line of MO fittings is available in 9/16" tube size.

ORDERING INSTRUCTIONS

The numbering system for SNO-TRIK Valves is designed so that all part numbers are prefixed by a Material Designator, followed by a dash.

Examples: SX–(22-13-5 stainless steel), 455– (455 stainless steel), SS– (316 stainless steel).

MATERIAL DESIGNATOR	SNO-TRIK END CONNECTIONS	PATTERN	OPTIONS	NON-ROTATING STEM TYPE
	44–¼"	-3* Cross	RS–Replaceable SEAT	
	64–⅜"	-6 Straight	AI-Hi Temp. Packing	
	94–9/16"	-9 Angle	NO, NC, DAC–Air Operators	NR–V Stem shut-off
	94MO-9/16" (Max. Orifice)			NRM–Metering Stem
SX	44	9	RS	NR
22-13-5 stainless steel				
SS	94	6	AI	NR
316 stainless steel				

Mandatory Dashes

*Specify one or two ports to pressure (1P, 2P).
Example: SX-44-3-1P-NR

BALL CHECK VALVES

PURPOSE

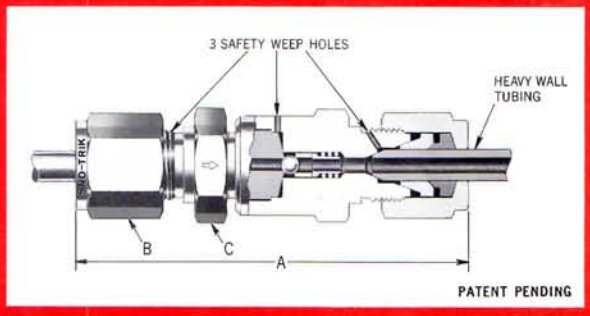
Allow unrestricted flow in one direction, and no flow in the opposite direction. Designed for extremely corrosive or erosive systems at high temperature or high pressure.

OPERATION

The SNO-TRIK Ball Check Valve can be used in all liquid systems. When upstream pressure overcomes system back pressure, the ball moves off its seat, allowing flow through the valve. When force of upstream pressure no longer exceeds the force of system back pressure, the ball is seated and reverse flow is prevented.

FEATURES

All 316 stainless steel body and ball • 302 stainless steel spring • 5–10 psi opening pressure differential • ¼", ⅜" and 9/16" SNO-TRIK end connections • 60,000 psi pressure rating at ambient temperature • 30,000 psi pressure rating in MO model. Temperatures to 900°F.



PATENT PENDING

TABLE OF DIMENSIONS

PART NUMBER	SNO-TRIK END CONNECTIONS	A	B NUT HEX	C BODY HEX
SS-44-6-BC	¼"	3 63/64	¾	1 1/16
SS-64-6-BC	⅜"	4⅜	1 5/16	1 1/16
SS-94-6-BC	9/16"	6 1/16	1⅜	1⅝
SS-94MO-6-BC	9/16"MO			

NOTE: "A" dimension is with nuts in finger-tight position.
All dimensions in inches.
Dimensions for reference only, subject to change.

SAFETY DEMANDS RESPECT FOR HIGH PRESSURE

Printed in U.S.A

YOUR LOCAL SALES & SERVICE REPRESENTATIVE

17-4PH, 22-13-5–TM Armco Steel/Inconel–TM International Nickel

12-73-125M-125M-MI

For a complete range of tube fittings for high pressures, see High Pressure Fittings subsection.

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AIR OPERATED BELLOWS VALVES

B, T & U SERIES

DOUBLE ACTING CYLINDER

NORMALLY CLOSED

NORMALLY OPENED

PURPOSE

NUPRO Double Acting Cylinder (-DAC), Normally Closed (-NC) and Normally Open (-NO) Air Operators are designed for remote control operation of the "B", "T" and "U" Series Bellows Valves to their maximum pressure ratings. Air Operators provide the most reliable means of operation and leak-tight closure available in a remote actuator. NUPRO Air Operated Bellows Valves eliminate the fire and explosion hazards, chatter and seat leakage, coil shorts, valve hang-ups, and noise often encountered with electrically operated devices.

APPLICATIONS

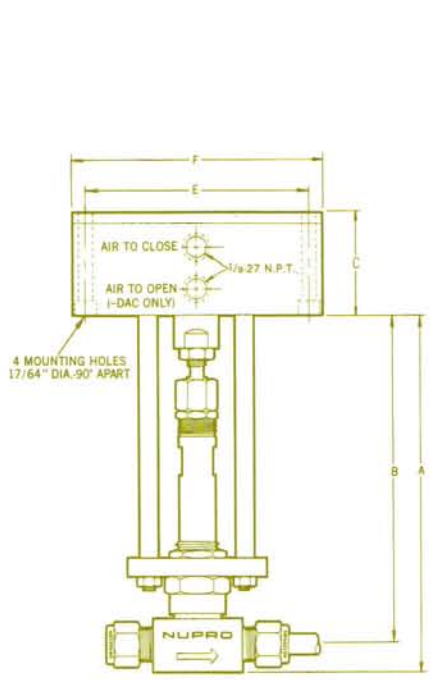
NUPRO -DAC, -NC and -NO Air Operated Bellows Valves are designed for remote control of tough-to-handle fluid systems. Examples are: Remote sampling valves in a corrosive automated process/Remote control of a vacuum system/Remote sampling of steam generators, condensers, feed water heaters, drain coolers, heat exchangers, demineralizers, etc., in nuclear and fossil fueled power generating plants/Remote control of hazardous, high temperature test loops such as liquid metals, and usage in remotely operated cryogenic systems such as liquid fluorine and oxygen. Since NUPRO Air Operated Bellows Sealed Valves are virtually maintenance free, they are ideally suited for service in limited access areas. The compact size and large flow capacity of these units permits installation where space or weight is at a premium.

OPERATION

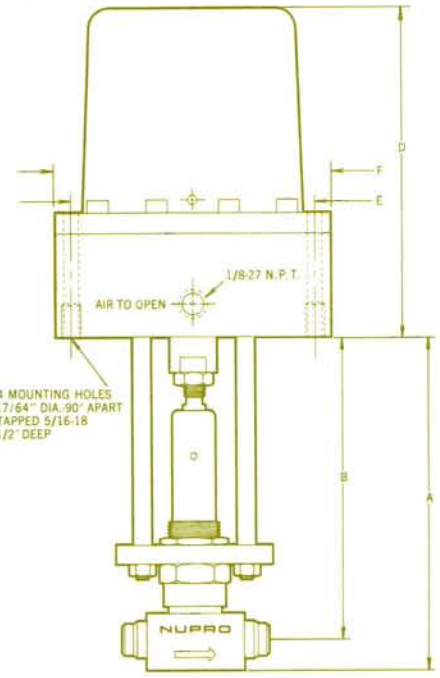
Double Acting Cylinder (-DAC) — Requires air to open and air to close. A four-way, two position hand valve such as WHITEY 43YF2 or a solenoid valve can be used to actuate one or more NUPRO -DAC valves.

Normally Closed (-NC) — Requires air to open and closes by means of a heavy duty stainless steel spring. A three-way, two position hand valve, such as a WHITEY model 42V or a solenoid valve can be used to actuate one or more -NC valves.

Normally Open (-NO) — Requires air to close and opens by means of three balanced stainless steel springs. A three-way, two position hand valve, such as a WHITEY model 42V or a solenoid valve can be used to actuate one or more -NO valves.



-DAC OR -NO



-NC

PATENTED

FEATURES

MOUNTING — All NUPRO -DAC, -NC and -NO piston type air operators are provided with four mounting holes in the air operator housing. Drilled and tapped holes are also provided in the base of each valve body. Preferably, valves should be installed vertically and securely mounted to reduce strain on system pipe or tubing. Do not depend on system pipe or tubing to support the valve.

COMPACT DESIGN — The compactness of these air operated valves allows versatility in system design through minimum air consumption, savings of space and weight, and ease of installation.

LOW PRESSURE OPERATION — The maximum pressure required to operate the -DAC or -NC is 100 psig. The -NO Air Operator requires a 125 psig maximum. See the graphs on page 3 for the minimum required air operator pressure for a given system pressure.

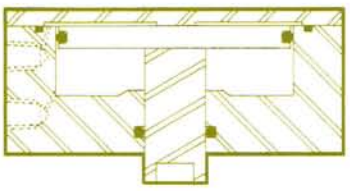
FAIL-SAFE FEATURE — The Normally Closed (-NC) operator will fail closed (closes the valve) on loss of operating air pressure. The normally open (-NO) operator will fail open (opens the valve) on loss of operating pressure. These very desirable safety features are necessary in many critical systems.

TABLE OF DIMENSIONS

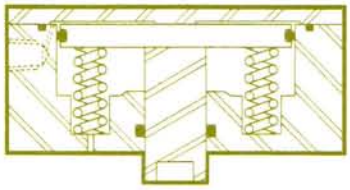
VALVE	-DAC, -NC or -NO					
	A	B	C	D	E Dia.	F Dia.
4B Series	3-23/32	3-5/32	1-11/16	4-1/4	3-1/4	3-3/4
6B-8B Series	4-3/8	3-7/8				
4T Series	4-29/32	4-11/32	1-3/4	5	3-13/16	4-1/4
6T-8T Series	5-1/32	4-17/32				
4U Series	5-31/32	5-13/32	1-3/4	5	3-13/16	4-1/4
6U-8U Series	6-1/16	5-9/16				

NOTE: For dimensions of specific valve bodies, see NUPRO Catalog N-473, "Manually Operated Bellows Valves."

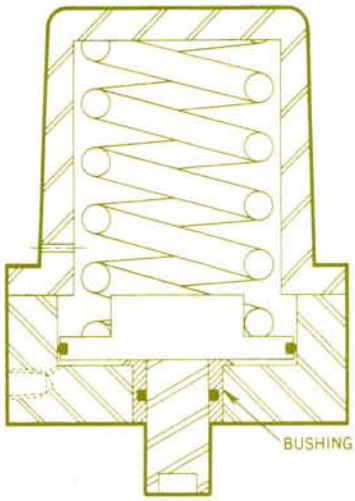
TECHNICAL DATA — AIR OPERATORS ONLY



-DAC

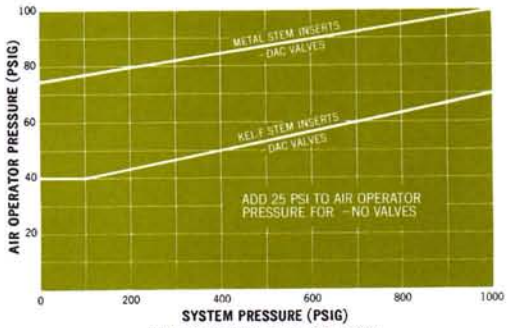


-NO

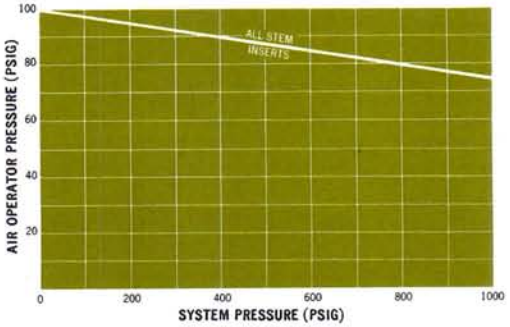


-NC

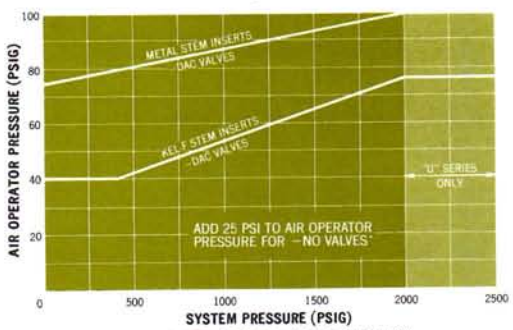
AIR OPERATOR PRESSURES —Nominal operating pressures required with NUPRO piston type air operators for various system pressures are shown in the graphs.



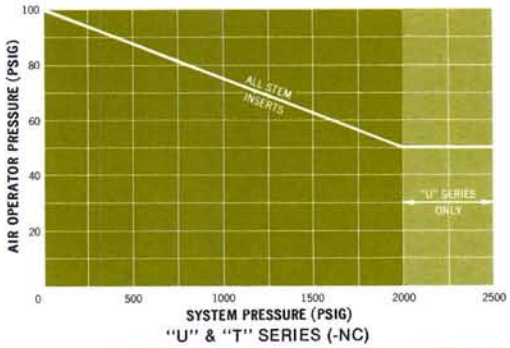
"B" SERIES (-DAC OR -NO)



"B" SERIES (-NC)



"U" & "T" SERIES (-DAC OR -NO)



"U" & "T" SERIES (-NC)

NOTE: Using the minimum air pressure required for a given system will result in lower air consumption and will promote valve life. It may be desirable in certain systems to increase air operator pressure for faster response time and tighter shut-off in the case of a -DAC and -NO. All "4-6-8, B, T & U" series Piston Type Air Operators can withstand a maximum pressure of 200 psig. Temperature limits of all the air operators are -40° to 400°F.

MATERIALS*

PART	-DAC or -NO	-NC
Housing, Cover, Piston	Aluminum	Aluminum
Actuator, Piston Rod	416 SS	416 SS
Tie Rods (3 Req'd.)	316 SS	316 SS
Hex Nuts	302 SS	302 SS
Flange	Cadmium Pltd. Steel	Cadmium Pltd. Steel
Cover Screws	Cadmium Pltd. Steel	302 SS
O-Rings	Viton	Viton
Spring(s)	17-7 PH (-NO only, 3 Req'd.)	302 SS
Bushing	—	Bronze

*Materials used in construction of the valves are shown in NUPRO Catalog N-473.

TECHNICAL DATA — AIR OPERATED VALVES

PRESSURE-TEMPERATURE LIMITS VALVES WITH PISTON TYPE AIR OPERATORS				
"B" Series Valves			"T" Series Valves	"U" Series Valves
MONEL	BRASS	STAINLESS STEEL	STAINLESS STEEL	STAINLESS STEEL
600 psi (max.) @ 70° F	1000 psi (max.) @ 70° F	1000 psi (max.) @ 70° F	2000 psi (max.) @ 600° F	2500 psi (max.) @ 650° F
500 psi @ 300° F	600 psi @ 300° F	600 psi @ 300° F	600 psi @ 900° F	600 psi @ 900° F
400 psi @ 450° F	450 psi @ 500° F (max.)	400 psi @ 600° F	250 psi @ 1200° F (max.)	250 psi @ 1200° F (max.*)
200 psi @ 600° F (max.)	—	200 psi @ 900° F (max.)	—	—

NOTES: Valves with Kel-F stem inserts and/or gaskets: +300°F. (max.). Stainless steel valves gasketed with metal O-Ring: +600°F. (max.).

*"UW" Series valves in systems with self lubricating fluids: 50 psi @ 1500°F. (max.).

STEM INSERT MATERIAL—AIR OPERATED VALVES

All soft seat valves have Kel-F stem inserts. For metal-to-metal shut-off, all stainless steel "B", "T" and "U" series valves have Stellite "6B" inserts as standard; Monel valves have hardened Monel inserts, and brass valves have stainless steel inserts. Copper stem inserts are available for specific applications.

TESTING

ENVELOPE — All NUPRO -DAC, -NC and -NO Bellows Valves are helium leak-tested at all weld connections and around the entire bellows to a rate of 0.0004 M.C.F.H. or 4.14×10^{-9} atmosphere cc/sec.

SEAT — NUPRO -DAC, -NC and -NO Bellows Valves with Kel-F stem inserts are helium leak-tested across the seat to a rate of 0.0004 M.C.F.H. or 4.14×10^{-9} atmosphere cc/sec.

NUPRO -DAC, -NC and -NO Bellows Valves with metal stem inserts are helium leak-tested across the seat to a rate of 0.008 M.C.F.H. or 8.28×10^{-8} atmosphere cc/sec.

TECHNICAL INFORMATION

Valve Series	"4B-4T-4U" Series	"6B-6T-6U" Series	"8B-8T-8U" Series
Flow Coefficient*	$C_v = .36$	$C_v = 1.0$	$C_v = 1.2$
Dead Space	0.11 cu. in. (approx.)	0.25 cu. in. (approx.)	0.27 cu. in. (approx.)
Body Orifice	0.172 inches	0.312 inches	0.312 inches
Port Orifice	0.172 inches	0.281 inches	0.312 inches

*Flow capacity data is shown on pages 11 & 16 of NUPRO Catalog N-473.

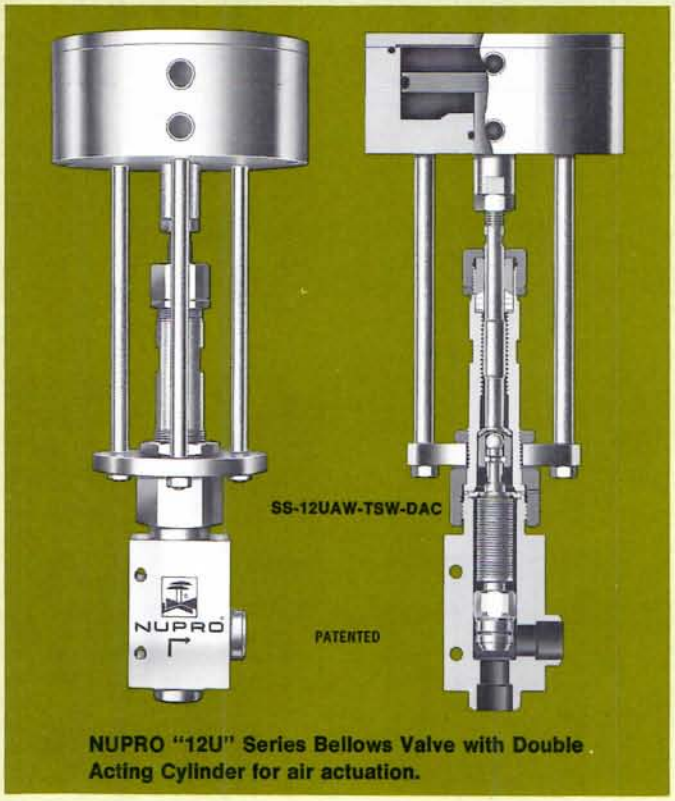
WEIGHT

Total weight of the valves including air operators varies between 3 and 7 lbs., dependent on model and size.

GENERAL NOTE

Complete valve information and ordering instructions are contained in Catalog N-473, "Manually Operated Bellows Valves." Remember to add -STE as a suffix to the valve part number for stainless steel "B" and "T" Series Air Operated Valves with Stellite stem inserts. Add -DAC, -NC or -NO as a suffix to the valve part number when air operation is desired.

NUPRO "12U" SERIES -DAC, -NC and -NO AIR OPERATED BELLOWS VALVES



NUPRO "12U" Series Bellows Valve with Double Acting Cylinder for air actuation.

PURPOSE

NUPRO "12U" Series Double Acting Cylinder (-DAC), Normally Closed (-NC) and Normally Open (-NO) Air Operated Bellows Valves are available for remote control operation in critical systems where large flow capacity, high pressure and extreme temperatures are required.

SCOPE

Positive control of system pressures up to 2500 psig can be accomplished with a maximum air operator pressure of 100 psig in the -DAC and -NC models, and 125 psig in the -NO models. The valve has a flow coefficient (Cv) of 3.1 in the straight pattern and 5.3 in the angle pattern. A variety of stem inserts is available for liquid or gas service from cryogenic to 1500°F. Available in all welded or metal gasketed models.

APPLICATIONS

Toxic, radioactive, hazardous, corrosive and expensive fluids are general applications. More specific fields of application include the chemical, petroleum, electronics and power industries and many areas of research and development in vacuum or positive pressure systems.

OPERATION

Normally Open and Normally Closed valves require air pressure only while operated, and automatically return to their normal position (fail-safe) upon loss of actuating air pressure. Double Acting Cylinder air operators require air-to-open and air-to-close.

Complete technical information on NUPRO "12U" Series Bellows Valves in manual and air operated models is available in NUPRO Technical Bulletin No. 28A.

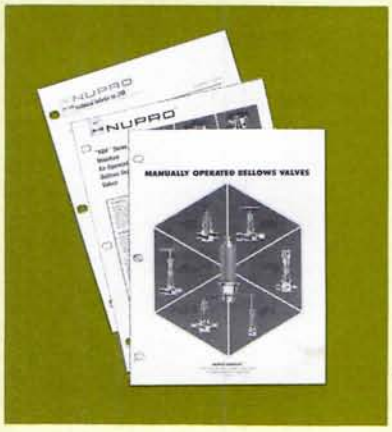
TECHNICAL DATA

VALVE SERIES	STEM TYPE	ORIFICE SIZE (INCHES)	FLOW COEFFICIENT, Cv	MAXIMUM PRESSURE RATING	MAXIMUM TEMPERATURE RATING
"12U" "12UA"	Vee Kel-F	0.625	3.1 (Straight Pattern) 5.3 (Angle Pattern)	2500 psi	"UK" 300°F "UG" 650°F "UW" 1200°F

NOTES:

1. In applications involving thermal cycling above 650°F, the "UW" Series valves are recommended.
2. For high temperature service with self-lubricating fluids such as liquid metals, ratings may be extended to 50 psi (max.) at 1500°F (max.)
3. The maximum temperature rating of "12U" Series valves with optional TFE secondary packing is +400°F.

ADDITIONAL BELLOWS VALVE LITERATURE



NUPRO Technical Bulletin No. 28A— explains in detail the "12U" Series Bellows Valves, straight and angle patterns, manual and air operated models. The higher capacity "12U" Series Bellows Valve is available for applications in pilot plants, power stations, and process instrumentation of all types. Ask for NUPRO Technical Bulletin No. 28A.

"4BK" Series Miniature Air Operated Bellows Valves Data Sheet — describes in detail the operation and application of the miniature diaphragm-style air operated "4BK" Series Bellows Valves. These compact valves find applications in instruments, sampling systems and laboratories where containment of difficult fluids is a must. This two page data sheet is included in the Master Catalog Binder. See Bellows Valve subsection.

"NUPRO Manually Operated Bellows Valves," Catalog N-473 — provides detailed technical information on several lines of bellows sealed valves, including the "H", "B", Bellows Metering, "U", "T" and "12U" Series. The Introduction to Bellows Valves compares bellows (static) seals to conventional packed (sliding) seals. A Technical Information section offers welding and brazing instructions, data on available tube extensions and a description of the helium leak testing of the bellows valves. This sixteen page catalog is included in the Master Catalog Binder. See Bellows Valve subsection.

YOUR LOCAL SALES & SERVICE REPRESENTATIVE

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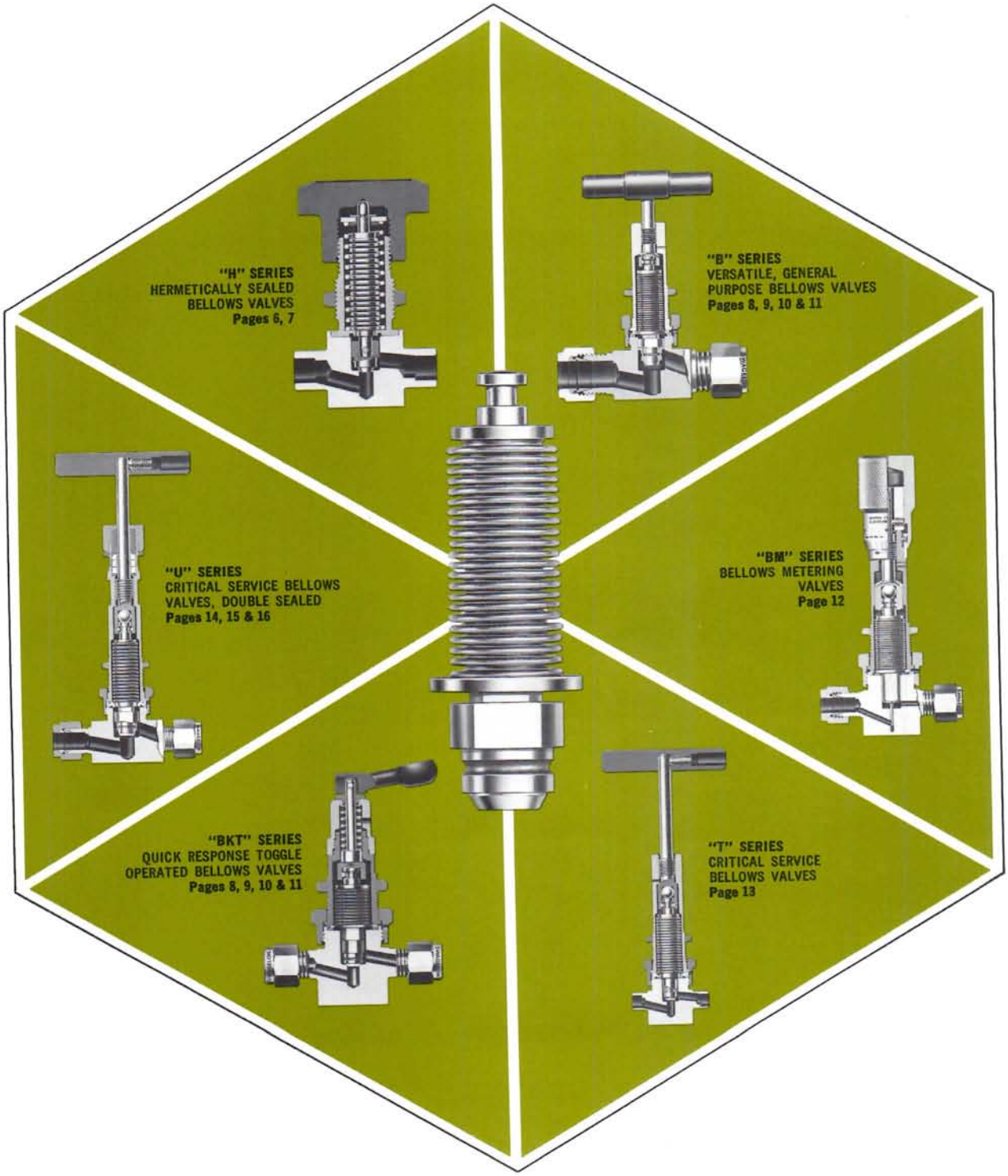
MANUALLY OPERATED BELLOWS VALVES



NUPRO COMPANY
15635 Saranac Road, Cleveland, Ohio 44110

PRODUCT LOCATOR AND SUMMARY

PAGE 4

BELLOWS VALVE INTRODUCTION

A bellows seal, when used in good valve design, permits valves to be used in extreme environments. There are no conventional packings, such as elastomers, TFE or asbestos, in contact with the fluid stream. Such packings could be degraded rapidly by high or low temperatures, corrosives, radioactive fluids or other fluids. The resulting premature valve failure could cause health or safety hazards. Typical extreme environments requiring bellows valves are liquid metal systems operating at temperatures up to 1500°F, cryogenic systems operating at liquid helium temperatures, and radioactive fluid systems.

The BELLOWS VALVE INTRODUCTION describes how the bellows seal is incorporated into a valve and compares bellows sealed valves to conventional packed valves.

WELD BODY

PAGE 5

TECHNICAL INFORMATION

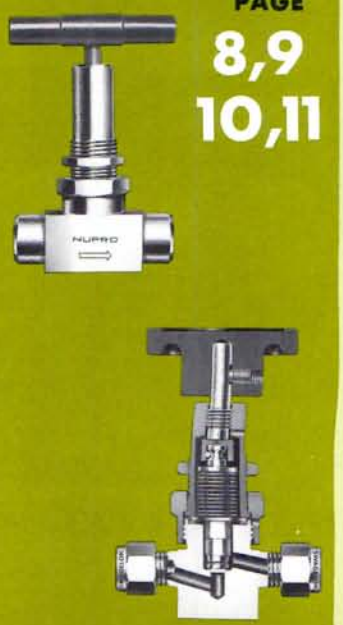
All NUPRO Bellows Valves are standard with SWAGELOK or weld ends. The weld ends offer wide versatility. Any SWAGELOK or CAJON fitting with an appropriate tube stub on one end can be socket or butt welded to a NUPRO valve. This allows any fitting to be used in a system depending upon the integrity and service requirements. Each weld body takes one size tube for socket welding and the next largest size tube for butt welding. Helium Leak Testing of NUPRO Bellows Valves is also explained in detail.

PAGE 6,7

"H" SERIES BELLOWS VALVES

Hermetically sealed bellows valves • Brass and 316 stainless steel • No sliding seals or stem threads in contact with system fluids • Used in instruments, sampling systems and laboratories • Control of hazardous, toxic, corrosive or expensive fluids at high and low positive pressures and vacuum • Weld end valves may be adapted to a variety of SWAGELOK or CAJON fittings and NUPRO Sample Cylinders. (See page 5 for welding and brazing instructions).

STEM TYPE	ORIFICE (INCHES)		FLOW COEFFICIENT, Cv	PRESSURE RATING (PSI)	MAXIMUM TEMPERATURE (°F)	STANDARD MATERIALS
	Body	Port				
Vee	0.156	0.082	0.11	Brass—Vacuum to 600 Stainless Steel—Vacuum to 1000	Brass—300 Stainless Steel—900	Brass 316 SS
		0.125	0.20			
		0.156	0.28			



PAGE 8,9 10,11

"B" SERIES BELLOWS VALVES

Replaceable bellows and stem assembly with soft or metal tips for shut-off of thin gases and non-lubricating fluids • All welded, hermetically sealed models for high temperatures or temperature cycling applications • A regulating tip is provided for flow control of various fluid media • Toggle Operated Bellows Valves can be used for quick on-off operation where lower temperature and pressure ratings are encountered • Cryogenic to high temperature service as well as vacuum to high pressure applications • Complete range of materials, flow capacities, stem types and end connections • Tube extensions available (see page 5).

STEM TYPE	ORIFICE (INCHES)	FLOW COEFFICIENT, Cv	PRESSURE RATINGS (PSI)	MAXIMUM TEMPERATURE (°F)	STANDARD MATERIALS
Kel-F tip (Toggle)	0.172	0.36	Brass, Monel or SS—Vac. to 100	Valves with Kel-F tips or gaskets—300 Other brass valves—500 Stainless steel or Monel gasketed or welded valves—600 Stainless steel welded valves with Stellite or 17-4PH stem tips—900	Brass 316 SS Monel
Regulating	0.172	0.26 (Reg) 0.36 (Kel-F & Vee)	Regulating valves Brass—Vac. to 450 Monel—Vac. to 600 SS—Vac. to 1000		
Kel-F tip	0.281 (port)	1.0 (Kel-F & Vee only)	Shut-off Valves Brass—Vac. to 1000 Monel—Vac. to 600 SS—Vac. to 1000		
Vee	0.312	1.2 (Kel-F & Vee only)			

PRODUCT LOCATOR AND SUMMARY

PAGE 12

"BM" SERIES BELLOWS METERING VALVES

Bellows metering valves are offered in all welded hermetically sealed or gasketed models with replaceable bellows assemblies • Metering of toxic, hazardous, corrosive or expensive fluids in pressurized systems at high or low temperatures • Positive dead stop to prevent over-tightening of the precision stem needle • Micrometer handle with locking screw • Positive stem return with safety back seat sealing • Metering of minute quantities of fluids into vacuum systems • Low operating torque • Fully protected threads with no sliding seals • Each valve 100% Helium Leak Tested • (See page 5 for tube extensions, welding and brazing instructions).

STEM TYPE	ORIFICE (INCHES)	FLOW COEFFICIENT, Cv	PRESSURE RATING (PSI)	MAXIMUM TEMPERATURE (°F)	STANDARD MATERIALS
Metering	0.055	0.019	Brass, gasketed—vacuum to 350	500	Brass 316 SS Monel
			Monel, gasketed or welded—vacuum to 600	600	
			Stainless steel, gasketed—vacuum to 700	600	
			Stainless steel, all welded—vacuum to 700	900	

PAGE 13

"T" SERIES BELLOWS VALVES

All of the features of the "U" Series in a single sealed bellows valve • Used at high and low pressures and temperatures with corrosive, dangerous or hazardous fluids • Supplied as standard in the all welded model • Gasketed models available • Kel-F stem insert available for repetitive soft seat shut-off • All valves have safety back seat sealing • Hardened 17-4PH stainless steel stem inserts • Stem threads out of contact with system fluid • SWAGELOK, socket or butt weld end connections • Regulating models can be supplied • Tube extensions are available on request. (See page 5 for welding and brazing instructions).

STEM TYPE	ORIFICE (INCHES)	FLOW COEFFICIENT, Cv	PRESSURE RATING (PSI)	MAXIMUM TEMPERATURE (°F)	STANDARD MATERIAL
Kel-F tip Vee	0.172	0.36	Vacuum to 2000	300 with Kel-F tips 900 with Vee tips	316 SS
	0.281 (port)	1.0			
	0.312	1.2			

PAGE 14,15 16

"U" SERIES CRITICAL SERVICE BELLOWS VALVES, DOUBLE SEALED

All welded stainless steel valves with secondary sealing for the most difficult fluid containment problems • Acme Power Transmission Threads for low operating torque and long service life handle extreme force loads transmitted in high pressure bellows valves • Cryogenic to high temperatures • High pressure as well as vacuum applications can be safely met with this valve • Toxic, radioactive, hazardous, corrosive and expensive fluids are general applications • Ported bonnets with welded tube extensions allow monitoring of bonnet conditions as well as pressurizing or pulling vacuum above primary seal to extend valve service capability • SWAGELOK, socket or butt weld end connections • Tube extensions are available on request (See page 5 for welding and brazing instructions) • Hardened 440C stainless steel actuators for maximum strength and wear resistance • Positive stem retraction • Regulating and gasketed models can be supplied.

STEM TYPE	ORIFICE (INCHES)	FLOW COEFFICIENT, Cv	PRESSURE RATING (PSI)	MAXIMUM TEMPERATURE* (°F)	STANDARD MATERIALS
Kel-F tip Vee	0.172	0.36	Vacuum to 2500	300 with Kel-F tip 400 with optional TFE secondary packing 1200 with standard Asbestos-Inconel secondary packing	316 SS
	0.281 (port)	1.0			
	0.312	1.2			

*A rating of 50 PSI @ 1500°F can be used with self-lubricating fluids such as liquid metals.

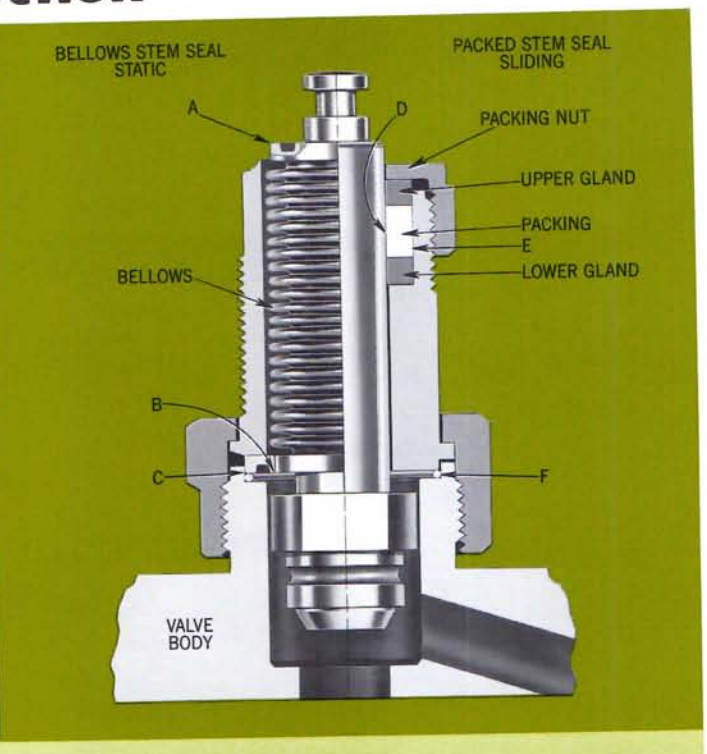
ADDITIONAL BELLOWS VALVE LITERATURE

"Air Operated Bellows Valves, B, T & U Series" Data Sheet—describes in detail, piston-style air operators in three actuation modes; normally open (-NO), normally closed (-NC) and double-acting cylinders (-DAC). These air operators permit remote actuation of the valves described in this catalog at their maximum conditions of temperature and pressure. This four page brochure is included in the Master Catalog Binder. See Bellows Valve subsection.

" '4BK' Series Miniature Air Operated Bellows Valves" Data Sheet—describes in detail the operation and application of the miniature diaphragm-style air operated "4BK" Series Bellows Valves. These compact valves find applications in instruments, sampling systems and laboratories where containment of difficult fluids is a must. This two page data sheet is included in the Master Catalog Binder. See Bellows Valve subsection.

NUPRO Technical Bulletin No. 28A—explains in detail the "12U" Series Bellows Valves, briefly described on page 16 of this catalog, along with their air operators. The higher capacity "12U" Series Bellows Valve is available for applications in pilot plants, power stations, and process instrumentation of all types. Ask for NUPRO Technical Bulletin No. 28A.

NUPRO®
BELLOWS VALVE INTRODUCTION



BELLOWS VALVES—STATIC STEM SEAL

A bellows valve is a fluid control device which incorporates a *static* stem seal that differs basically from the conventional packed valve *sliding* seal. A bellows is manufactured from thin, uniform tubing of a ductile metal. The convolutions allow flexibility during linear movement, similar to that of an accordion bellows. By sealing one end of the bellows to the stem at "A" and the other to a fixed ring at "B", linear motion of the valve stem is allowed. The bellows provides a metal barrier between the system and atmosphere which is called a *static* seal. *Sliding* seals are thus eliminated. The bellows subassembly is then joined to the valve body by welding or gasketing at area "C". Stretching or compressing the bellows allows linear motion of the stem.

PACKED VALVES—SLIDING STEM SEAL

Most packed valves require three different seals: a body-to-bonnet seal at "F", a 360° seal around the stem at "D", and a 360° seal area around the outer periphery of the packing at "E" (between the inner bonnet wall and packing O.D.). As the packing nut is tightened, compressive force is applied to the packing from the upper gland, deforming it to the confines of the stuffing box, which contains the packing, to achieve the seal. Temperature, pressure and constant movement of the stem through the packing (*sliding* seal) require periodic adjustment of the packing nut to maintain the seal. NUPRO Bellows Valves are used where greater reliability than that offered by packed valves is required. In other words, the *static* bellows stem seal is more reliable in many applications than the *sliding* stem seal in packed valves.

NUPRO BELLOWS VALVES

NUPRO COMPANY offers a wide range of bellows valves to handle the most difficult fluid containment problems. Applications include: ultra high vacuum • high purity systems • cryogenic to high temperatures • temperature cycling • highly corrosive, radioactive, toxic, hazardous, and expensive fluids. The scope of the standard NUPRO Bellows Valve line is as follows:

Pressures—Vacuum to 2500 psi.
Temperatures—Cryogenic to 1500°F.
Sizes—1/8″ through 1″ tubing.
Flow Coefficient Range—C_v=0.019 to C_v=5.3.
Materials—Brass, 316 stainless steel and Monel.
Valve Operation—Hand, toggle, air operated (refer to additional bellows valve literature referenced in the Product Locator).

SPECIAL FEATURES

- NUPRO Bellows Valves feature a positive method of stem return in many models to insure valve opening under the most adverse conditions.
- Threads are never exposed to the process fluid or uncovered to atmospheric contaminants.
- Operating torque is low, even at maximum rated pressure.
- Panel and bottom mounting are standard with all valves.
- A closely guided, non-rotating stem seats in a precision orifice for helium leak-tight shut-off.
- All welded, hermetically sealed valves are available as well as gasketed and soldered models.
- NUPRO Bellows Valves are available with SWAGELOK ends for easy, reliable connection directly to tubing, thereby eliminating the need for additional fittings.
- Socket and butt weld connections or tube extensions can also be supplied. (See page 5 for welding and brazing instructions).
- Refer to the following catalogs for various adapters and fittings which may be socket or butt welded to NUPRO Bellows Valves: **SWAGELOK Tube Fittings (1″ & under)—C-1072**
- **Weld Fittings CaC-672**
- **CAJON Vacuum Products —CA-1171**

TUBE EXTENSIONS

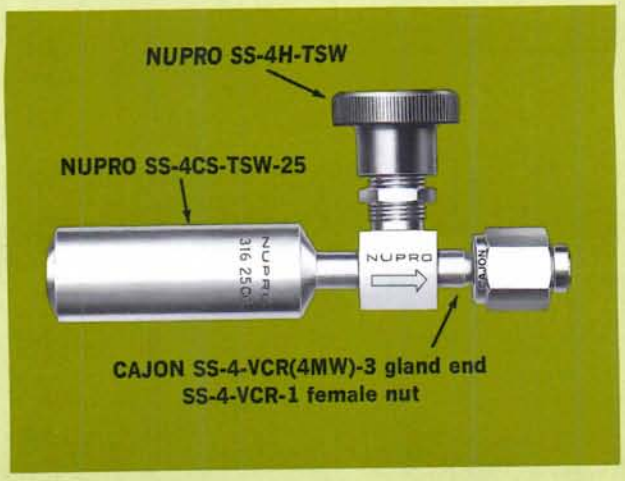
NUPRO Company offers bellows valves with tube extensions which provide the following benefits:

1. NUPRO Company certifies that all welded or brazed connections are helium leak tested. (See rates under Helium Leak Testing.)

2. Customers can weld or braze valves into their system without risking heat distortion or damage to the valve by following the "Welding or Brazing Instructions", listed below.

3. If a mistake is made on installation, the tube can be shortened and the welded or brazed joint tried again. Also, valves can be cleaned and reinstalled by shortening the extensions a small amount.

The above photo shows a "B" Series stainless steel valve with three inch tube extensions butt welded to the body. Weld beads are removed on *all* butt welds. Purchasing valves with tube extensions socket welded, butt welded or brazed, has many advantages. NUPRO Company carries a complete stock of ¼", ⅜", ½", ¾" and 1" O.D. tubing of various wall thicknesses, in rigid copper and seamless type 316 stainless steel, thus assuring prompt delivery of valves ordered with tube extensions.



The above photo shows the extreme versatility of weld-ended bellows valves. A NUPRO cylinder is butt welded to the inlet and a CAJON VCR® gland and nut assembly is socket welded to the outlet resulting in a compact, all welded sampling system.

100% HELIUM LEAK TESTING

All hand operated NUPRO Bellows Valves are helium leak tested to a rate of 0.0004 $\frac{\text{micron cu. ft.}}{\text{hr.}}$,

or 4.14×10^{-9} $\frac{\text{atmosphere c.c.}}{\text{sec.}}$, at all seals,

around the entire bellows assembly and for shut-off as a standard procedure. Note that valve seats are tested to the same sensitivity as the valve envelope.

Bellows sealed toggle valves are helium leak tested to above sensitivity at all seals, around the bellows subassembly and at the seat to a rate of $0.008 \frac{\text{micron cu. ft.}}{\text{hr.}}$ or 8.28×10^{-8} $\frac{\text{atmosphere c.c.}}{\text{sec.}}$

WELDING AND BRAZING INSTRUCTIONS

When NUPRO Bellows Valves are purchased with socket or butt weld connections, the following precautions should be followed when welding or brazing directly to the valve body:

1. Make sure the valve is in the OPEN position.

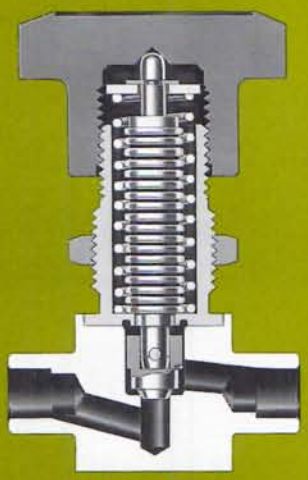
2. Valves with plastic components should be disassembled.

3. With all metal valves that are not disassembled, wrap the bonnet section with wet asbestos to protect the bellows, threads, etc.

4. Provide a heat sink, preferably a copper block placed under the valve body, for heat dissipation.

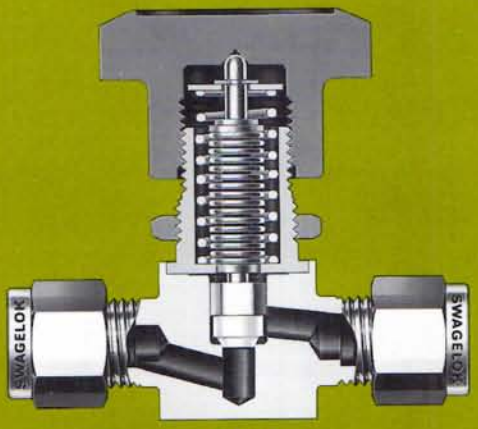
5. For maximum strength, a filler material is recommended on all socket or butt welds.

NUPRO®
"H" SERIES BELLOWS VALVES



SS-4H-TSW

SS-4H2



B-4H

Patented

6

PURPOSE

NUPRO "H" Series Bellows Valves are used where greater reliability is required than that given by conventional packed valves. The all welded stainless steel valve fills the need for a high temperature, high pressure, compact and reliable packless valve. Both brass and stainless steel models are hermetically sealed for handling difficult or dangerous fluids in vacuum or pressurized systems.

OPERATION

As the cap is screwed down, it compresses the spring and bellows and pushes the non-rotating stem into the valve seat. The spring and bellows exert an upward force on the stem insuring positive opening as the cap is backed off. Less than one full turn opens the valve to full flow. If there is danger of the stem sticking in certain applications, a "B", "U" or "T" Series Bellows Valve is recommended.

APPLICATIONS

• Use with toxic, hazardous, corrosive or expensive fluids • Stainless steel "H" Series valves can be used with high temperature sampling systems and on vacuum work where bake-out temperatures are reached • Both brass and stainless steel valves are recommended for gas analysis and sampling systems because of the very low dead space • Stainless steel valves, butt welded to NUPRO Miniature Sample Cylinders, provide leak-tight integrity for containment of important fluid samples.

SPECIAL FEATURES

• Bellows sealed for positive leak-tight containment of difficult fluids • Non-rotating stem tip to eliminate wear and galling • Low dead space to minimize trapped volumes • Each valve 100% helium leak tested • Hermetically sealed valves with protected bellows • Diverse hardness in seating to assure repetitive shut-off • Variety of end connections to ease installation • Low operating torque at maximum system pressure • Bottom and panel mounting for flexibility in installation • Compact design for use when space is at a premium • Stainless steel or brass barstock construction.

TEMPERATURE GRADIENT

WHEN VALVE SEAT IS °F	VALVE CAP IS °F
600	175
800	210
900	230

TECHNICAL DATA

SERIES	STEM TYPE	ORIFICE (INCHES)		FLOW COEFFICIENT, Cv	DEAD SPACE (CUBIC INCHES)		PRESSURE RATING		MAXIMUM TEMPERATURE RATING	
		Body	Port		Brass	SS	Brass	SS	Brass	SS
-2H	Vee	0.156	0.082	0.11	0.052 approx.	0.070 approx.	600 psi Max.	1000 psi Max.	-80°F to 300°F	900°F*
-2H2			0.125	0.20			400 psi @200°F	1000 psi @600°F		
All Other Valves			0.156	0.28			250 psi @300°F	400 psi @900°F		

*Lubricate threads on bonnet and cap approximately every 500 cycles for maximum valve life.

NUPRO®
"H" SERIES BELLOWS VALVES

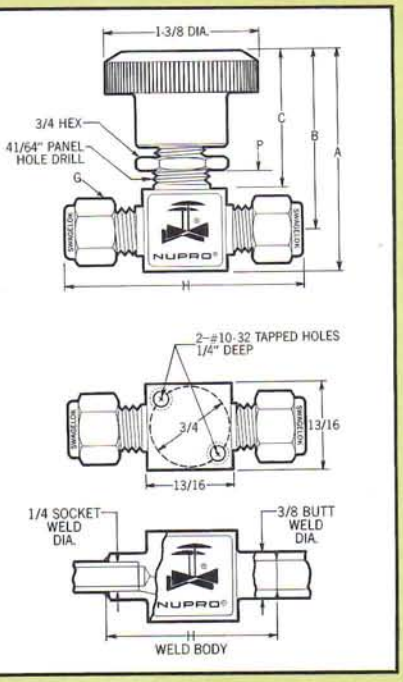
MATERIALS

PART	BRASS	STAINLESS STEEL
Stem	Silicon bronze with TFE coated stem tip	316L stainless steel
Stem Insert	N/A	Hardened 17-4PH stainless steel
Bellows	Phosphor bronze (seamless)	321 stainless steel (seamless)
Retaining Ring	Beryllium copper	15-7-MO stainless steel
Ring	Phosphor bronze	316 stainless steel
Spring	302 stainless steel	17-7PH high tensile stainless steel
Body, Bonnet	Brass	316L stainless steel
Solder (body to bonnet joint)	Tin-silver eutectic	N/A
Pin	N/A	420 stainless steel (passivated)
Cap	Hunter Green phenolic plastic	Aluminum, anodized Hunter Green
All Other Parts	Brass	316 stainless steel

TABLE OF DIMENSIONS

"H" SERIES VALVES		CONNECTION SIZE	DIMENSIONS②						
PART NUMBER	PORT① ORIFICE (INCHES)	INLET AND OUTLET	A OPEN	A CLOSED	B OPEN	C OPEN	G HEX	H	P MAX.
B-2H	0.082	1/8 SWAGELOK	2 3/32	2 3/64	1 11/16	1 9/32	7/16	2 1/8	3/16
B-2H2	0.125	1/8 Male NPT	2 3/32	2 3/64	1 11/16	1 9/32	—	1 9/16	3/16
B-2H4	0.156	1/8 Female NPT	2 3/32	2 3/64	1 11/16	1 9/32	—	1 3/4	3/16
B-4H	0.156	1/4 SWAGELOK	2 3/32	2 3/64	1 11/16	1 9/32	9/16	2 5/16	3/16
B-4H2	0.156	1/4 Male NPT	2 3/32	2 3/64	1 11/16	1 9/32	—	1 15/16	3/16
B-4H4	0.156	1/4 Female NPT	2 3/32	2 3/64	1 11/16	1 9/32	—	1 15/16	3/16
SS-2H	0.082	1/8 SWAGELOK	2 13/32	2 23/64	2	1 19/32	7/16	2 1/8	11/32
SS-2H2	0.125	1/8 Male NPT	2 13/32	2 23/64	2	1 19/32	—	1 9/16	11/32
SS-4H	0.156	1/4 SWAGELOK	2 13/32	2 23/64	2	1 19/32	9/16	2 5/16	11/32
SS-4H2	0.156	1/4 Male NPT	2 13/32	2 23/64	2	1 19/32	—	1 15/16	11/32
SS-4H4	0.156	1/4 Female NPT	2 13/32	2 23/64	2	1 19/32	—	1 15/16	11/32
③SS-4H-TSW	0.156	1/4 TSW / 3/8 MTW	2 13/32	2 23/64	2	1 19/32	—	1 1/2	11/32
B-(6MM) H	3.97MM	6MM SWAGELOK	2 3/32	2 3/64	1 11/16	1 9/32	9/16	2 5/16	3/16
SS-(6MM) H	3.97MM	6MM SWAGELOK	2 13/32	2 23/64	2	1 19/32	9/16	2 5/16	11/32

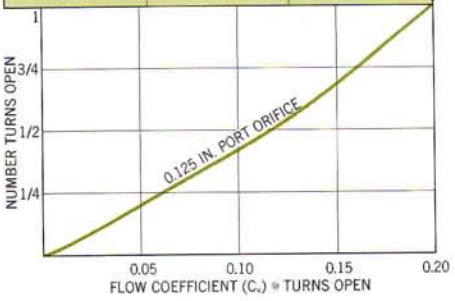
①Port orifice determines maximum flow.
②Dimensions shown with SWAGELOK nuts finger-tight, when applicable.
③Factory welded tube extensions can be supplied. (See page 5)



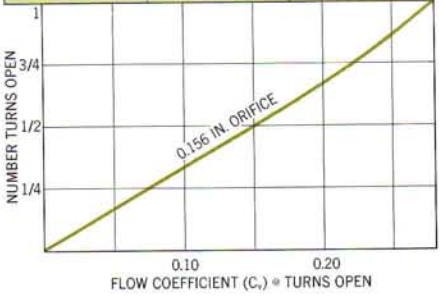
FLOW CAPACITY CURVES

MAXIMUM FLOW FOR C_v = 0.11		
PRESSURE DROP TO ATMOSPHERE (Δ P) PSI	AIR SCFM @ 70° F	WATER GPM @ 70° F
10	1.61	0.35
50	4.17	0.78
100	7.38	1.10

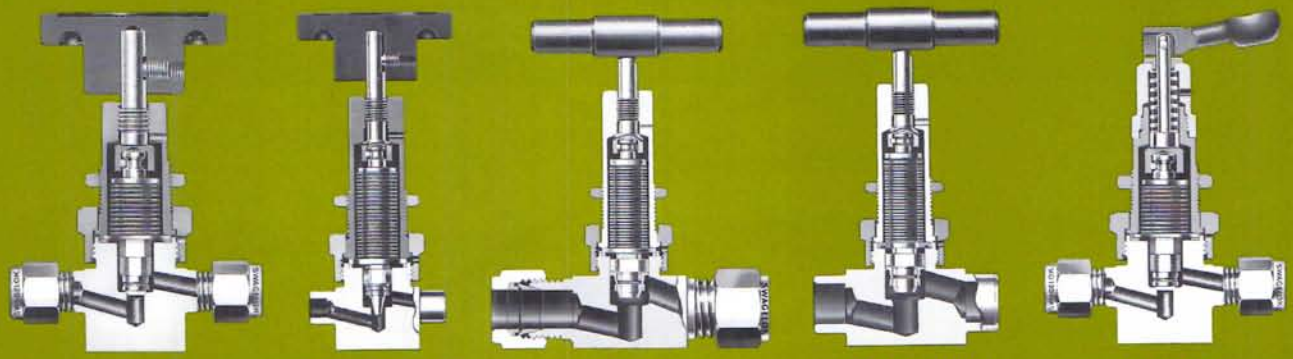
MAXIMUM FLOW FOR C_v = 0.20		
PRESSURE DROP TO ATMOSPHERE (Δ P) PSI	AIR SCFM @ 70° F	WATER GPM @ 70° F
10	2.73	0.63
50	7.57	1.41
100	13.43	2.00



MAXIMUM FLOW FOR C_v = 0.28		
PRESSURE DROP TO ATMOSPHERE (Δ P) PSI	AIR SCFM @ 70° F	WATER GPM @ 70° F
10	3.88	0.89
50	10.71	1.98
100	18.99	2.80



NUPRO®
"B" SERIES BELLOWS VALVES



SS-4BK | SS-4BRG-TSW | SS-6BG | SS-8BW-TSW | SS-4BKT

Patented

PURPOSE

NUPRO "B" Series Bellows Valves are versatile general purpose valves, adaptable to a wide range of difficult fluid handling problems. The bellows design eliminates sliding seals and offers greater reliability. Available in 316 stainless steel, Monel or brass with a variety of SWAGELOK or weld connections. A large choice of models, stem types and flow capacities offer great system flexibility.

OPERATION

Approximately two turns of the handle opens the NUPRO "4B" Series Bellows Valve to full flow, while the "4BR", "6B" and "8B" Series valves require about four turns. Quick valve actuation is achieved in the "4BKT" Series Toggle Operated Bellows Valve by lifting the handle vertically to open. Instant closure of the valve results when the toggle handle is "flipped" in the opposite direction.

APPLICATIONS

Regulating, shut-off and control of toxic, hazardous, corrosive or expensive fluids • High pressures • Vacuum systems, where bake-out temperatures are reached • Rare or high purity gases • Sampling systems and gas analysis • Cryogenic to high temperature • Vacuum to high pressure • Laboratories • Power plants • Aircraft industries • Ocean systems • Experimental and research facilities • Wherever the most difficult fluid containment problems are encountered.

SPECIAL FEATURES

The **"BK" Series** is a general purpose, soft seat bellows valve for repetitive shut-off service, featuring a replaceable bellows and stem assembly using a Kel-F gasket and stem insert. The Kel-F insert in all valves is supported over its entire length by a replaceable metal stem adapter. The soft seat design is excellent on vacuum work or pressurized systems where dead tight shut-off must be maintained.

The **"BR" Series** Bellows Regulating Valves are designed to broaden the flow control range of bellows sealed valves. Having a 0.172" orifice, these valves offer high flow capacity with excellent control and may be used for shut-off service. Gasketed models ("BRG") are available with replaceable bellows and stem assemblies using a metal stem insert and a precision metal O-Ring. Valves are available in 316 stainless steel, brass or Monel. All welded models ("BRW"), available in 316 stainless steel or Monel, are recommended for severe service applications where high temperatures are encountered.

The **"BG" Series** is a bellows valve with a replaceable bellows and stem assembly featuring a metal stem or stem insert. A precision metal O-Ring seals the bellows and stem assembly to the valve body. The "BG" Series, with its all metal construction, is recommended for higher temperatures or applications where plastics cannot be used.

The **"BW" Series** is an all welded, hermetically sealed valve using a metal stem or stem insert. The bellows and stem assembly are not replaceable. The all welded design is excellent for temperature cycling applications. Stellite or 17-4PH stem inserts are available to extend the temperature range of "BW" Series valves beyond that of soft tip or gasketed models.

"BKT" Series Toggle Operated Bellows Valves provide quick, positive, soft seat shut-off in vacuum or pressurized systems. They feature replaceable bellows and stem assemblies with soft Kel-F stem insert and gasket.

NUPRO Toggle Operated Bellows Valves cannot be damaged by heavy handed operators. Swivel joint design allows handle to be rotated to any desired position without damaging the bellows or Kel-F stem insert. Colored handles are available for easy coding of panels.

Additional Features—Positive stem retraction is insured by the actuator/stem joint design on all NUPRO "B" Series Bellows Valves. Some bellows valves tend to stick shut because of the fluids and temperatures encountered in extremely clean systems. In NUPRO "B" Series Bellows Valves, the pin engages a shoulder on the stem and lifts it free if sticking occurs • Safety back seat sealing is accomplished by turning the valve handle to the fully open position. This prevents the escape of fluid in the event of a bellows rupture. The back seating is below the helium test port • 100% helium leak tested • Union bonnet design • Panel and bottom mounting • Low operating torque • Protected threads • Heli-arc welded • Non-rotating stem • On special order a variety of stem inserts can be supplied; copper, hardened 17-4PH and Stellite #6B are available • 316 stainless steel, brass and Monel construction.

NUPRO®
"B" SERIES BELLOWS VALVES

TECHNICAL DATA
General:

CATALOG NUMBER	STEM TYPE	BODY ORIFICE SIZE (INCHES)	FLOW COEFFICIENT, Cv	MAXIMUM PRESSURE RATING @ 70°F (PSI)			MAXIMUM TEMPERATURE RATING (°F)		
				Brass③	316 SS	Monel	Brass	316 SS	Monel
				Vacuum to . . .					
-4BG-	Vee	0.172	0.36	1000	1000	600	500	600	600
-4BK-	Kel-F	0.172	0.36	1000	1000	600	300	300	300
-4BKT-	Kel-F	0.172	0.36	100	100	100	300	300	300
-4BW-	Vee	0.172	0.36	N/A	1000	600	N/A	600①	600
-4BRG-	Reg.	0.172	0.26	450	1000	600	500	600	600
-4BRW-	Reg.	0.172	0.26	N/A	1000	600	N/A	600	600
-6BG-	Vee	0.281②	1.0	1000	1000	600	500	600	600
-6BK-	Kel-F	0.281②	1.0	1000	1000	600	300	300	300
-6BW-	Vee	0.281②	1.0	N/A	1000	600	N/A	600①	600
-8BG-	Vee	0.312	1.2	1000	1000	600	500	600	600
-8BK-	Kel-F	0.312	1.2	1000	1000	600	300	300	300
-8BW-	Vee	0.312	1.2	N/A	1000	600	N/A	600①	600

Pressure Ratings at Temperature:

SERIES	BRASS "B"	BRASS "BR"	STAINLESS "B & BR"	MONEL "B & BR"
Pressure Rating (PSI @ 70°F)	1000③	450	1000	600
Pressure Rating (PSI @ 500°F)	150	150	450	325
Pressure Rating (PSI @ 600°F)	—	—	400	200
Pressure Rating (PSI @ 900°F)	—	—	200①	—

①900°F maximum temperature for stainless steel "BW" Series all welded valves with Stellite or 17-4PH stem inserts.
②Port Orifice. ③Due to the strength of brass threads, the cycle life of brass valves will be limited when operated frequently at pressures above 450 psi.

Dead Space:

SERIES	DEAD SPACE (approx.)
"4B"	0.1 cu. in.
"4BKT"	0.1 cu. in.
"4BR"	0.11 cu. in.
"6B"	0.24 cu. in.
"8B"	0.26 cu. in.

Temperature Gradient:

WHEN VALVE SEAT IS °F	VALVE HANDLE IS °F
600	195
900	275

MATERIALS
Common Parts:

PART NAME	VALVE SERIES		
	"4B & 4BR"	"6B & 8B"	"4BKT" TOGGLE
Handle	Phenolic (round)	Aluminum (bar)	Nylon
Pin	420 SS	420 SS	420 SS
Actuator	416 SS	416 SS	303 SS

Individual Parts:

PART NAME MODEL	BASIC VALVE MATERIAL		
	Brass	Stainless Steel	Monel
Body			
BK	B	316L SS	Monel 400
BG	B	316L SS	Monel 400
BW	N/A	316L SS	Monel 400
Stem			
BK	316L SS	316L SS	Monel 400
BG	316L SS	316L SS	Monel 400
BW	N/A	316L SS	Monel 400
Bellows			
BK	321 SS	321 SS	Monel 400
BG	321 SS	321 SS	Monel 400
BW	321 SS	321 SS	Monel 400
Ring			
BK	316L SS	316L SS	Monel 400
BG	316L SS	316L SS	Monel 400
BW	N/A	316L SS	Monel 400
Stem Insert			
BK	Kel-F	Kel-F	Kel-F
4BG	N/A	N/A	Monel 502
4BW	N/A	N/A	Monel 502
4BRG or 4BRW	316 SS	316 SS	Monel R-405
6BG-8BG	316 SS	316 SS	Monel R-405
6BW-8BW	N/A	316 SS	Monel R-405
Adapter			
BK	316 SS	316 SS	Monel R-405
4BG	N/A	N/A	N/A
4BW	N/A	N/A	N/A
4BRG or 4BRW	316 SS	316 SS	Monel R-405
6BG-8BG	316 SS	316 SS	Monel R-405
6BW-8BW	N/A	316 SS	Monel R-405
Gasket or O-Ring			
BK	Kel-F	Kel-F	Kel-F
BG	Aluminum	316 SS O-Ring	Monel 400 O-Ring
All Other Parts*	Brass	316 SS	Monel R-405

*Toggle Valves ("4BKT" Series)—All valves have Nylon Glands, 17-7PH Springs and 302 SS Handle Pins. Stainless valves use 303 SS Bonnet Adapters. Monel valves use 303 SS Bonnets and Bonnet Adapters.

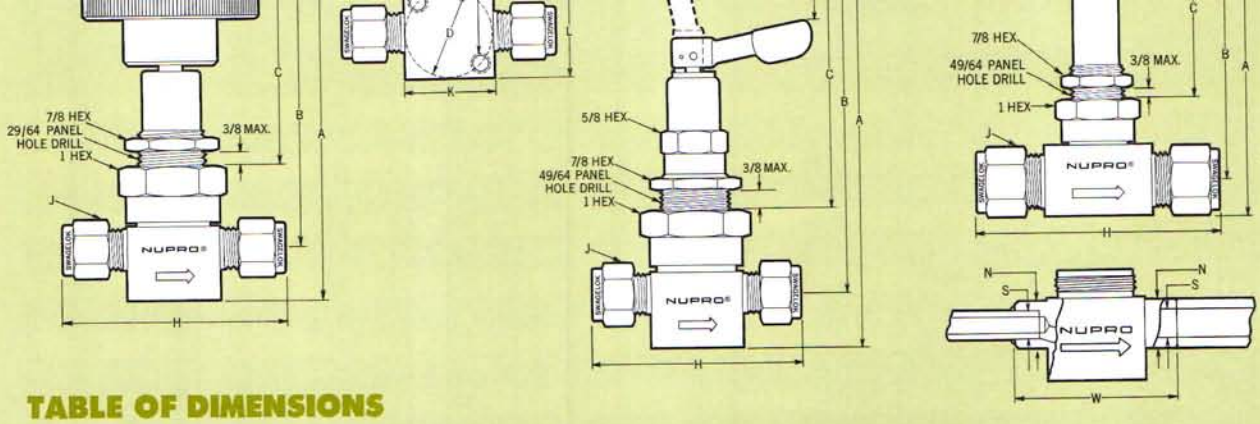


TABLE OF DIMENSIONS

"B" SERIES VALVES		CONNECTION SIZE	DIMENSIONS②												
CATALOG NUMBER①	ORIFICE (INCHES)	INLET AND OUTLET	A OPEN	A CLOSED	B OPEN	C OPEN	D	E	H	J	K	L	N BUTT WELD DIAM.	S SOCKET WELD DIAM.	W
-4BG -4BK -4BW	0.172	¼ SWAGELOK	3 21/32	3 19/32	3 3/32	2 7/32	1	1 7/8	2½	9/16	1	1	—	—	—
-4BRG -4BRW	0.172	¼ SWAGELOK	4 5/32	4 1/16	3 17/32	2 23/32	1	1 7/8	2½	9/16	1	1	—	—	—
-4BG-TSW③ -4BK-TSW -4BW-TSW	0.172	¼ TSW / ⅜ MTW	3 21/32	3 19/32	3 3/32	2 7/32	1	1 7/8	—	—	1	1	⅜	¼	1 11/16
-4BRG-TSW③ -4BRW-TSW	0.172	¼ TSW / ⅜ MTW	4 5/32	4 3/32	3 17/32	2 23/32	1	1 7/8	—	—	1	1	⅜	¼	1 11/16
-4BKT	0.172	¼ SWAGELOK	4½	3 17/32	3 15/16	3 1/16	1	—	2½	9/16	1	1	—	—	—
-6BG -6BK -6BW	0.281 (port)	⅜ SWAGELOK	4 3/16	4 3/32	3 11/16	2⅝	1⅛	2½	3⅛	11/16	1½	1⅛	—	—	—
-6BG-TSW③ -6BK-TSW -6BW-TSW	0.281 (port)	⅜ TSW / ½ MTW	4 3/16	4 3/32	3 11/16	2⅝	1⅛	2½	—	—	1½	1⅛	½	⅜	2¼
-8BG -8BK -8BW	0.312	½ SWAGELOK	4 3/16	4 3/32	3 11/16	2⅝	1⅛	2½	3 5/16	⅞	1½	1⅛	—	—	—
-8BG-TSW③ -8BK-TSW -8BW-TSW	0.312	½ TSW / ¾ MTW	4 3/16	4 3/32	3 11/16	2⅝	1⅛	2½	—	—	1½	1⅛	¾	½	2¼
-(6MM) BKT	4.37MM	6MM SWAGELOK	4½	3 17/32	3 15/16	3 1/16	1	—	2½	9/16	1	1	—	—	—
-(6MM) BG -(6MM) BK -(6MM) BW	4.37MM	6MM SWAGELOK	3 21/32	3 19/32	3 3/32	2 7/32	1	1 7/8	2½	9/16	1	1	—	—	—
-(10MM) BG -(10MM) BK -(10MM) BW	7.14MM (port)	10MM SWAGELOK	4 3/16	4 3/32	3 11/16	2⅝	1⅛	2½	3⅛	¾	1½	1⅛	—	—	—
-(12MM) BK -(12MM) BW	7.92MM	12MM SWAGELOK	4 3/16	4 3/32	3 11/16	2⅝	1⅛	2½	3 5/16	⅞	1½	1⅛	—	—	—

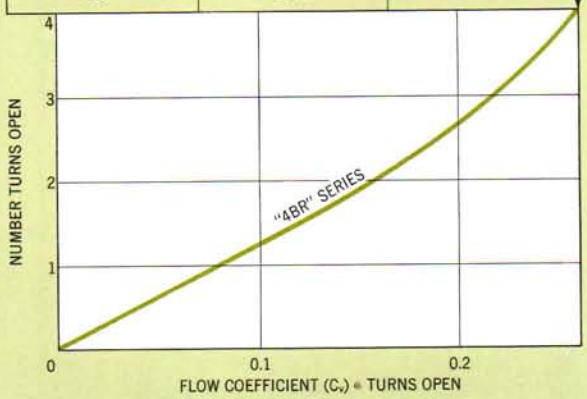
①For a complete ordering number, add B for brass,SS for 316 stainless steel or M for Monel as a prefix to the catalog number. EXAMPLE: B-4BK, M-4BRG, SS-8BW-TSW, SS-(6MM)BKT. Brass valves available in gasketed models only.

②Dimensions shown with SWAGELOK nuts finger-tight, when applicable.

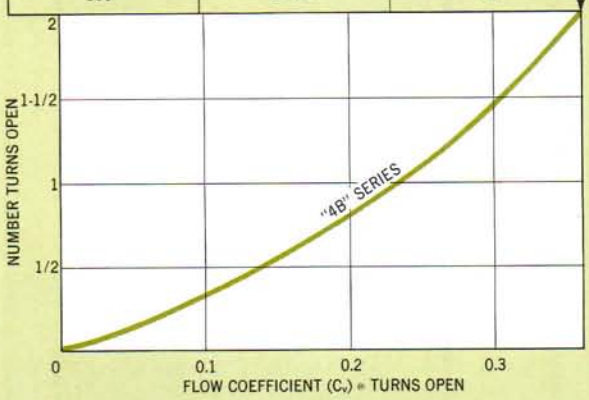
③Factory welded tube extensions can be supplied. (See page 5)

FLOW CAPACITY CURVES

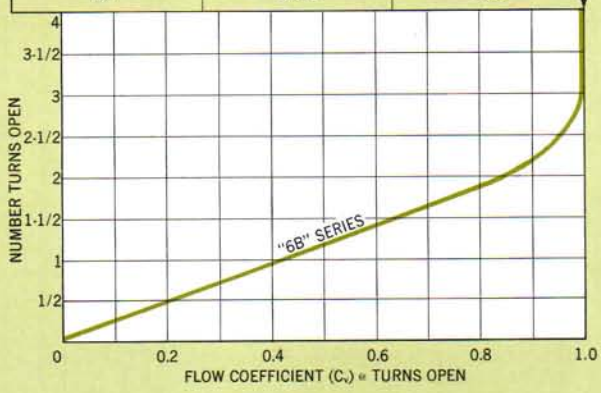
MAXIMUM FLOW FOR $C_v = 0.26$		
PRESSURE DROP TO ATMOSPHERE (ΔP) PSI	AIR SCFM @ 70° F	WATER GPM @ 70° F
10	3.60	0.82
50	9.95	1.84
100	17.63	2.60



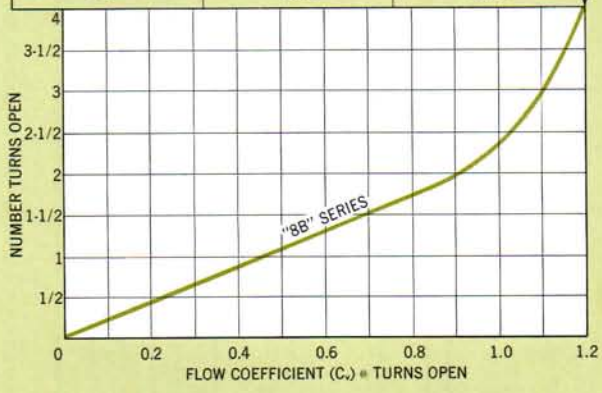
MAXIMUM FLOW FOR $C_v = 0.36$		
PRESSURE DROP TO ATMOSPHERE (ΔP) PSI	AIR SCFM @ 70° F	WATER GPM @ 70° F
10	4.98	1.14
50	13.77	2.55
100	24.41	3.60



MAXIMUM FLOW FOR $C_v = 1.0$		
PRESSURE DROP TO ATMOSPHERE (ΔP) PSI	AIR SCFM @ 70° F	WATER GPM @ 70° F
10	13.84	3.16
50	38.25	7.07
100	67.21	10.00



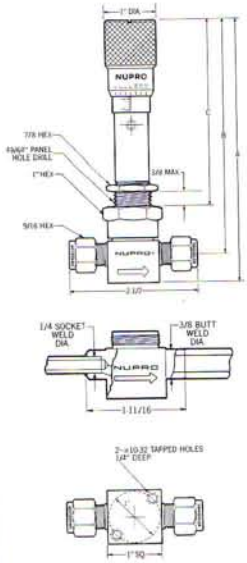
MAXIMUM FLOW FOR $C_v = 1.2$		
PRESSURE DROP TO ATMOSPHERE (ΔP) PSI	AIR SCFM @ 70° F	WATER GPM @ 70° F
10	16.69	3.79
50	45.44	8.49
100	80.55	12.00



"BM" SERIES BELLOWS METERING VALVES

Patented

SS-4BMG



TECHNICAL DATA

BELLOWS METERING VALVES	PRESSURE & TEMPERATURE
Stainless Steel "4BMW" Series (all welded)	700 psi (max.) @ 70°F 300 psi @ 600°F 100 psi @ 900°F (max.)
Stainless Steel "4BMG" Series (gasketed)	700 psi (max.) @ 70°F 300 psi @ 600°F (max.)
Monel "4BMG", "4BMW" (gasketed or welded)	600 psi (max.) @ 70°F 200 psi @ 600°F (max.)
Brass "4BMG" Series (gasketed)	350 psi (max.) @ 70°F 100 psi @ 500°F (max.)

BODY ORIFICE—0.055 inches (0.172″ on special order)
FLOW COEFFICIENT—Cv = 0.019
STEM TAPER—3° included angle
PORT ORIFICE—0.093 inches
DEAD SPACE—0.07 cu. in. (approx.)
FACTORY SETTING*—5 scc./min. air or less with 50 psi pressure drop with micrometer handle dead stopped at zero.

*Factory setting and field adjustment setting is detailed in a pamphlet supplied with each valve.

Temperature Gradient

WHEN VALVE SEAT IS °F	MICROMETER HANDLE IS °F
600	250
900	325

PURPOSE

NUPRO Bellows Metering Valves are used in critical service applications to provide extremely fine flow control of various fluid media over a broad temperature range. A long tapered metering tip is used, mechanically guided into a precision orifice by a micrometer handle for precise, repeatable flow settings. The NUPRO "4BM" Series fills the need for a reliable, small orifice, all metal bellows metering valve.

OPERATION

Approximately 6 turns of the micrometer handle opens the valve to maximum flow. The micrometer handle measures the stem position and can be read in 0.001″ increments. The dead stop feature protects the precision metering tip from damage by overtightening.

APPLICATIONS

Toxic, hazardous, corrosive or expensive fluids • Pressurized systems at high or low temperatures • Metering of minute quantities of fluids into vacuum systems • Monel Bellows Metering Valves are available for highly corrosive applications such as sea water, dilute sulfuric acid, fluorine, other halogens and strong caustic solutions.

SPECIAL FEATURES

The **"BMG" Series,** available in brass, 316 stainless steel and Monel, has a replaceable bellows assembly, sealed to the body by a solid metal O-Ring • The **"BMW" Series** is an all welded, hermetically sealed valve, available in 316 stainless steel and Monel. The bellows assembly is not replaceable • A **larger 0.172″ orifice valve** is available for regulating and shut-off applications in an all welded or gasketed model • 100% helium leak tested • Positive stem return • Safety back seat sealing • Threads fully protected from atmospheric and system contaminants • Micrometer handle with locking screw • Screw driver slot • Low operating torque • Heli-arc welded • SWAGELOK or weld connections • Bottom and panel mounting.

MATERIALS

Body—Type 316L stainless steel, brass or Monel 400.
Actuator—Hardened type 416 stainless steel.
Pins—Hardened 420 stainless steel.
Micometer Handle, Barrel, Bushing—300 series stainless steel.
Locking Screw—Type 303 stainless steel.
Stem, Ring—Type 316L stainless steel for stainless and brass valves; Monel 400 in Monel valves.
O-Ring—Type 316 stainless steel; aluminum gasket in brass valves; Monel 400 O-Ring in Monel valves ("BMG" Series only).
Bearing—Type 440C stainless steel.
Bellows—Type 321 seamless stainless steel in brass and stainless valves; Monel 400 in Monel valves.
Bonnet, Jam Nut, Bonnet Nut—Type 316 stainless steel in stainless and Monel valves; brass in brass valves.
All Other Parts—Type 316 stainless steel, brass or Monel R-405.

TABLE OF DIMENSIONS

BELLOWS METERING VALVES		CONNECTION SIZE	DIMENSIONS③			
CATALOG① NUMBER②	ORIFICE (INCHES)	INLET AND OUTLET	A OPEN	A CLOSED	B OPEN	C OPEN
-4BMG -4BMW	0.055	¼ SWAGELOK	5 3/16	5 1/64	4 5/8	3¾
-4BMG-TSW④ -4BMW-TSW	0.055	¼TSW / ⅜MTW	5 3/16	5 1/64	4 5/8	3¾

① For a complete ordering number, add B for brass, SS for 316 stainless steel or M for Monel as a prefix to the catalog number. Example: B-4BMG, M-4BMW, SS-4BMW-TSW. Brass valves available in gasketed models only.
② The larger 0.172″ orifice valve can be ordered by adding the orifice size as a suffix to the catalog number. Example: SS-4BMW (.172). The above dimensions would apply to the 0.172″ orifice valves.
③ Dimensions shown with SWAGELOK nuts finger-tight, when applicable.
④ Factory welded tube extensions can be supplied. (See page 5)

FLOW CAPACITY CURVE

MAXIMUM FLOW FOR C_v = 0.019		
PRESSURE DROP TO ATMOSPHERE (ΔP) PSI	AIR SCFM @ 70°F	WATER GPM @ 70°F
10	0.26	0.06
50	0.73	0.13
100	1.29	0.19

NUPRO®
"T" SERIES BELLOWS VALVES

PURPOSE

NUPRO "T" Series Bellows Valves are designed for use on critical fluid handling applications, where high temperatures and pressures are present, but a secondary sealing system is not required.

APPLICATIONS

Cryogenic to high temperatures • Critical vacuum to high pressures • Toxic, radioactive, hazardous, corrosive and expensive fluids.

SPECIAL FEATURES

The "T" Series Bellows Valve has all the special features associated with the "U" Series Bellows Valve, except the secondary sealing system and monitoring bonnet features are omitted • NUPRO "T" Series valves are supplied in the all welded design ("TW" Series) as standard • The bellows assembly can be sealed to the body using a solid 316 stainless steel O-Ring ("TG" Series) • A Kel-F stem insert and gasket ("TK" Series) could also be furnished • A regulating and shut-off valve ("4TR" Series) in a gasketed or all welded design is available (ask for NUPRO Technical Bulletin No. 27) • Safety backseat sealing is accomplished by turning the valve handle to the full open position • Positive stem retraction • 100% helium leak tested • Union bonnet design • Panel and bottom mounting • Low operating torque • Protected threads • Heli-arc welded • Non-rotating stem tip • SWAGELOK or weld connections.

MATERIALS

All materials are the same as listed for "U" Series valves on page 15, except that "T" Series stem inserts are 17-4PH stainless steel.

The "T" Series Bellows Valve is available with an Inconel bellows which substantially improves cycle life, especially at high pressures and temperatures. Some applications requiring Inconel's outstanding corrosion resistance would be boiling water, heavy water, and pressurized water reactor systems. Specify an Inconel bellows when ordering.

TECHNICAL DATA
General Note

Operation, temperature gradients, flow coefficients, flow capacity curves, dead space, body and port orifices are the same as shown for the "U" Series Bellows Valves on pages 15 & 16.

Pressure and Temperature Ratings

"TW" SERIES	"TG" SERIES	"TK" SERIES
Vacuum to: 2000 psi (max.) @ 600°F 600 psi @ 900°F 250 psi @ 1200°F (max.)*	Vacuum to: 2000 psi (max.) @ 600°F (max.)	Vacuum to: 2000 psi (max.) @ 300°F (max.)

*NUPRO "T" Series Bellows Valves can be supplied in a high temperature model (-STE-HT) for temperatures between 900°F and 1200°F. The high temperature model is available in the all welded design with Stellite #6B stem insert. For ordering instructions, see note 2 under Table of Dimensions.

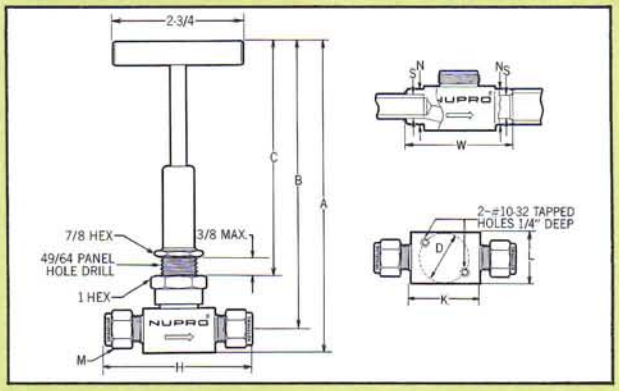
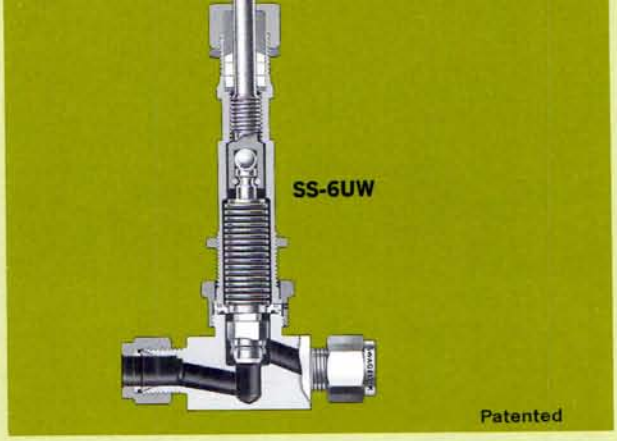


TABLE OF DIMENSIONS

"T" SERIES VALVES		CONNECTION SIZE	DIMENSIONS③											
PART NUMBER①②	ORIFICE (INCHES)	INLET AND OUTLET	A OPEN	A CLOSED	B OPEN	C OPEN	D DIA.	H SWAGE-LOK	K	L	M HEX	N BUTT WELD DIA.	S SOCKET WELD DIA.	W
SS-4TW	0.172	¼ SWAGELOK	6 31/64	6 13/32	5 59/64	5 1/32	1	2 1/2	1	1	9/16	—	—	—
SS-4TW-TSW④	0.172	¼ TSW / ⅜ MTW	6 31/64	6 13/32	5 59/64	5 1/32	1	—	1	1	—	⅜	¼	1 11/16
SS-6TW	0.281 (port)	⅜ SWAGELOK	6 5/8	6 33/64	6 1/8	5 1/32	1 1/8	3 1/8	1 1/2	1 1/8	11/16	—	—	—
SS-6TW-TSW④	0.281 (port)	⅜ TSW / ½ MTW	6 5/8	6 33/64	6 1/8	5 1/32	1 1/8	—	1 1/2	1 1/8	—	½	⅜	2 1/4
SS-8TW	0.312	½ SWAGELOK	6 5/8	6 33/64	6 1/8	5 1/32	1 1/8	3 5/16	1 1/2	1 1/8	⅞	—	—	—
SS-8TW-TSW④	0.312	½ TSW / ¾ MTW	6 5/8	6 33/64	6 1/8	5 1/32	1 1/8	—	1 1/2	1 1/8	—	¾	½	2 1/4
SS-(6MM) TW	4.37MM	6MM SWAGELOK	6 31/64	6 13/32	5 59/64	5 1/32	1	2 1/2	1	1	9/16	—	—	—

①NUPRO "T" Series Bellows Valves are available in regulating models, "4TR" Series (Ask for NUPRO Technical Bulletin No. 27), gasketed models, "TG" Series, and soft-tip models, "TK" Series. ②To order "T" Series valves for high temperature applications, suffix the part number with -STE-HT. Example: SS-4TW-STE-HT.
③Dimensions shown with SWAGELOK nuts finger-tight, when applicable. ④Factory welded tube extensions can be supplied. (See page 5)



PURPOSE

The NUPRO "U" Series Bellows Valve, with its many optional features, offers versatility of application to the most difficult fluid handling problems. Bellows valves are used in critical service where reliability greater than that given by sliding seals is required. The "U" Series design with the secondary sealing system, fills the need for a safe, reliable, double sealed valve for service at cryogenic or high temperatures, high vacuum or pressures with corrosive, dangerous, radioactive, hazardous or toxic fluids.

OPERATION

NUPRO "U" Series Bellows Valves are operated by simply turning the bar handle. Approximately 1¾ turns on the "4U" and 2¼ turns on the "6U" and "8U" Series will open the valves to full flow.

APPLICATIONS

Containment and control of toxic, radioactive, hazardous, corrosive and expensive fluids are general applications. • Cryogenics • High pressures and temperatures • Liquid metals • High vacuum systems • Power plants • Ultrapure systems • Instrumentation systems and panels • Critical sampling systems.

SPECIAL FEATURES

Positive stem retraction is provided by the ball joint, double pin design which insures positive lifting of the stem. In certain very clean, high temperature systems, valves may tend to stick in the closed position. In the "U" Series design, the double pins engage a shoulder on the stem, lifting the stem tip free should sticking occur.

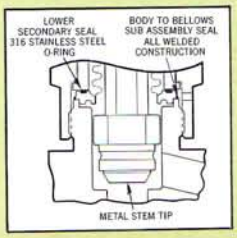
Secondary sealing system prevents leakage to atmosphere in the event of a bellows rupture due to over-pressurization. Leakage past the bonnet ring joint is contained by a 316 stainless steel O-Ring. Leakage past the actuator is contained by a three-piece Asbestos-Inconel packing (optional TFE). A jam nut is provided for locking the upper packing nut.

Acme power transmission threads are used on the bonnet and actuator because of the extreme force loads transmitted to the threads in a high pressure bellows valve. This eliminates normal thread problems of galling, seizing, short life and high operating torques. The Acme threads are not in contact with the process fluid and are protected from atmospheric contaminants by the secondary packing. Thread lubricant is also contained by the secondary packing, even at high temperatures.

operating torque (25 in. lbs. at maximum operating pressure) • Replaceable stem adapters in the "6U" and "8U" gasketed models • Bellows sealed for long service life • Reliable union bonnet construction • Safety back seat sealing is standard in all "U" Series valves • 100% helium leak testing of every valve across the seat and at potential leak points • Choice of SWAGELOK, socket or butt weld end connections to ease installation • A variety of tube extensions can be welded to the valves on request as described on page 5 • A bellows regulating valve, "4UR" Series, is available for those applications requiring fluid control and the additional feature of metal-to-metal shut-off.

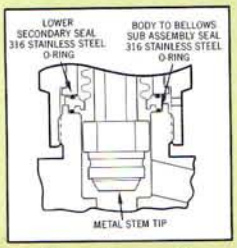
Choice of models:

"UW" SERIES



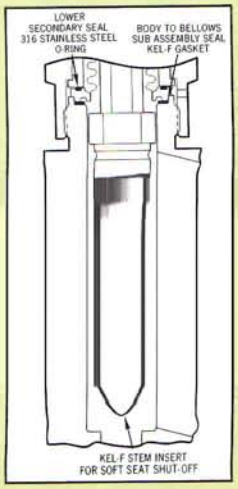
In the NUPRO **"UW" Series** Bellows Valve, the bellows-to-stem, bellows-to-ring, and bellows assembly-to-body seals are HELI-ARC welded providing an all metal, hermetically sealed valve. The all welded design, with SWAGELOK, socket or butt weld end connections, is primarily used in critical fluid systems where leakage cannot be tolerated. Applications include vacuum, extremely high pressures and temperatures with dangerous or hazardous fluids, where in the event of leakage, safety to personnel and surrounding equipment is the primary concern.

"UG" SERIES



The NUPRO **"UG" Series** valve offers the same leak-tight integrity as the all welded model except the body-to-bellows subassembly seal is maintained by a solid 316 stainless steel O-Ring. Suggested applications for the metal gasketed model are vacuum, high pressures and temperatures with a variety of difficult fluid media. The "UG" Series valves offer additional savings to the user by providing replaceable stem tips or bellows subassemblies in the event of damage through normal or extended use.

"UK" SERIES



The NUPRO **"UK" Series** valve offers the same benefits as the "UG" model but Kel-F soft seat shut-off is featured for specialized applications such as cryogenics, vacuum, or pressurized systems at moderate temperatures. The body-to-bellows subassembly seal is also maintained by a Kel-F gasket.

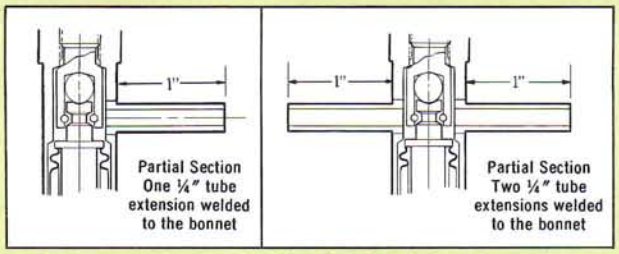
Bonnet Port (optional)

As shown, a bonnet having a ¼" tube extension welded to it can be used for carrying fluid back to a reservoir, or to activate an alarm in the event of a bellows rupture.

Another use would be to provide a vacuum insulation above the bellows during cryogenic service, or to pressurize the outside of the bellows for higher pressure service. A bonnet having two ¼" tube extensions welded to it may be useful during high temperature operation to pass an inert cooling

NUPRO®
"U" SERIES BELLOWS VALVES

fluid through the upper bonnet tubes. Continuous heat dissipation would help extend valve life. Add -T1 or -T2 as a suffix to the valve part number when ordering valves with monitoring bonnets.



NOTE: When pressurizing above the bellows through the bonnet port or ports, system or bellows internal pressure must be greater than the external bellows pressure before the valve is operated. The maximum pressure rating above the bellows is 1000 psi. 60% of the pressure supplied above the bellows may be added to the internal or system pressure ratings. This proportion factor is necessary because of force distribution and areas within the valve.

TECHNICAL DATA

VALVE SERIES	STEM TYPE	ORIFICE SIZE (INCHES)	FLOW COEFFICIENT, Cv	MAXIMUM PRESSURE RATING	MAXIMUM TEMPERATURE RATING	DEAD SPACE (APPROX.)
"4U"	Vee Kel-F	0.172	0.36	2500 psi	"UK" 300°F "UG" 650°F "UW" 1200°F	0.11 cu. in.
"6U"		0.281 (port)	1.0			0.25 cu. in.
"8U"		0.312	1.2			0.27 cu. in.

Pressure and Temperature Ratings (Internal)

"UW" SERIES	"UG" SERIES	"UK" SERIES
2500 psi (max.) @ 650°F 600 psi @ 900°F 250 psi @ 1200°F (max.)	2500 psi @ 650°F	2500 psi @ 300°F

NOTES:

1. In applications involving thermal cycling above 650°F, the "UW" Series valves are recommended.
2. For high temperature service with self-lubricating fluids such as liquid metals, ratings may be extended to 50 psi (max.) at 1500°F (max.). (Use -HT model).
3. For applications above 900°F, "UW" Series valves can be supplied in a factory prepared High Temperature (-HT) model. For ordering instructions, see Note 2 under Table of Dimensions.
4. The maximum temperature rating of "U" Series valves with optional TFE secondary packing is +400°F.

Temperature Gradient

WHEN VALVE SEAT IS °F	VALVE HANDLE IS °F
600	135
900	140
1200	150

MATERIALS

Bar Handle—Anodized aluminum, Hunter Green with cadmium plated steel set screw.
Pins—Hardened type 416 stainless steel (solid).
Ball Bearing, Actuator, Stem Extension—Hardened 440C stainless steel.
Bellows*—347 seamless stainless steel.
Body, Ring, Stem—316L stainless steel.
Upper Secondary Packing—Asbestos-Inconel (TFE optional on special order). TFE standard in "UK" Series.
Lower Secondary O-Ring Seal—316 stainless steel.
Stem Insert—Solid Stellite #6B.
All Other Parts—Type 316 stainless steel.

*On special order, the "U" Series Bellows Valve is available with an Inconel bellows which substantially improves cycle life, especially at high pressures and temperatures. Some applications requiring Inconel's outstanding corrosion resistance would be boiling water, heavy water, and pressurized water reactor systems. Specify an Inconel bellows when ordering.

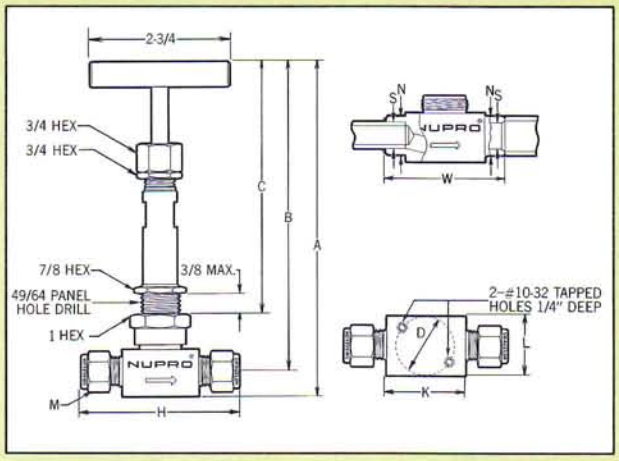
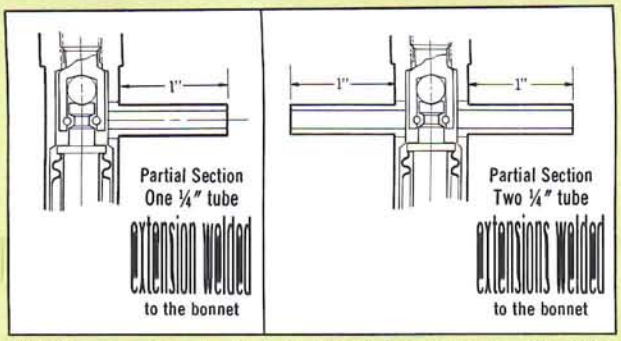


TABLE OF DIMENSIONS

"U" SERIES VALVES		CONNECTION SIZE	DIMENSIONS③											
PART NUMBER①②	ORIFICE (INCHES)	INLET AND OUTLET	A OPEN	A CLOSED	B OPEN	C OPEN	D DIA.	H SWAGE-LOK	K	L	M HEX	N BUTT WELD DIA.	S SOCKET WELD DIA.	W
SS-4UW	0.172	¼ SWAGELOK	6 31/64	6 13/32	5 59/64	5 1/32	1	2½	1	1	9/16	—	—	—
SS-4UW-TSW④	0.172	¼TSW / ⅜MTW	6 31/64	6 13/32	5 59/64	5 1/32	1	—	1	1	—	⅜	¼	1 11/16
	0.281													

NUPRO® "U" SERIES BELLOWS VALVES

fluid through the upper bonnet tubes. Continuous heat dissipation would help extend valve life. Add -T1 or -T2 as a suffix to the valve part number when ordering valves with monitoring bonnets.



NOTE: When pressurizing above the bellows through the bonnet port or ports, system or bellows internal pressure must be greater than the external bellows pressure before the valve is operated. The maximum pressure rating above the bellows is 1000 psi. 60% of the pressure supplied above the bellows may be added to the internal or system pressure ratings. This proportion factor is necessary because of force distribution and areas within the valve.

TECHNICAL DATA

VALVE SERIES	STEM TYPE	ORIFICE SIZE (INCHES)	FLOW COEFFICIENT, Cv	MAXIMUM PRESSURE RATING	MAXIMUM TEMPERATURE RATING	DEAD SPACE (APPROX.)
"4U"	Vee Kel-F	0.172	0.36	2500 psi	"UK" 300°F "UG" 650°F "UW" 1200°F	0.11 cu. in.
"6U"		0.281 (port)	1.0			0.25 cu. in.
"8U"		0.312	1.2			0.27 cu. in.

Pressure and Temperature Ratings (Internal)

"UW" SERIES	"UG" SERIES	"UK" SERIES
2500 psi (max.) @ 650°F 600 psi @ 900°F 250 psi @ 1200°F (max.)	2500 psi @ 650°F	2500 psi @ 300°F

NOTES:

1. In applications involving thermal cycling above 650°F, the "UW" Series valves are recommended.
2. For high temperature service with self-lubricating fluids such as liquid metals, ratings may be extended to 50 psi (max.) at 1500°F (max.). (Use -HT model).
3. For applications above 900°F, "UW" Series valves can be supplied in a factory prepared High Temperature (-HT) model. For ordering instructions, see Note 2 under Table of Dimensions.
4. The maximum temperature rating of "U" Series valves with optional TFE secondary packing is +400°F.

Temperature Gradient

WHEN VALVE SEAT IS °F	VALVE HANDLE IS °F
600	135
900	140
1200	150

MATERIALS

Bar Handle—Anodized aluminum, Hunter Green with cadmium plated steel set screw.

Pins—Hardened type 416 stainless steel (solid).

Ball Bearing, Actuator, Stem Extension—Hardened 440C stainless steel.

Bellows*—347 seamless stainless steel.

Body, Ring, Stem—316L stainless steel.

Upper Secondary Packing—Asbestos-Inconel (TFE optional on special order). TFE standard in "UK" Series.

Lower Secondary O-Ring Seal—316 stainless steel.

Stem Insert—Solid Stellite #6B.

All Other Parts—Type 316 stainless steel.

*On special order, the "U" Series Bellows Valve is available with an Inconel bellows which substantially improves cycle life, especially at high pressures and temperatures. Some applications requiring Inconel's outstanding corrosion resistance would be boiling water, heavy water, and pressurized water reactor systems. Specify an Inconel bellows when ordering.

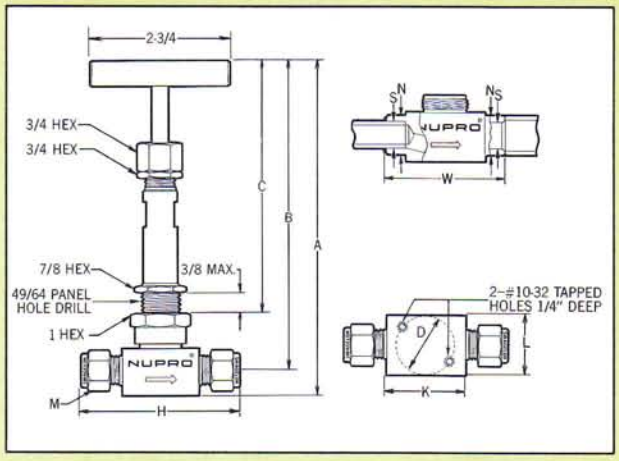


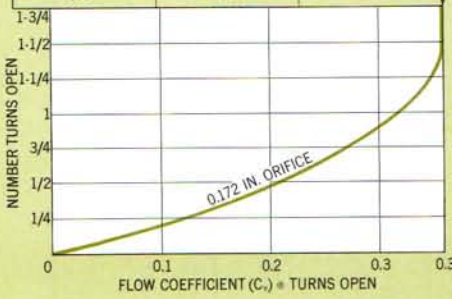
TABLE OF DIMENSIONS

"U" SERIES VALVES		CONNECTION SIZE	DIMENSIONS③											
PART NUMBER①②	ORIFICE (INCHES)	INLET AND OUTLET	A OPEN	A CLOSED	B OPEN	C OPEN	D DIA.	H SWAGE-LOK	K	L	M HEX	N BUTT WELD DIA.	S SOCKET WELD DIA.	W
SS-4UW	0.172	¼ SWAGELOK	6 31/64	6 13/32	5 59/64	5 1/32	1	2½	1	1	9/16	—	—	—
SS-4UW-TSW④	0.172	¼ TSW / ⅜ MTW	6 31/64	6 13/32	5 59/64	5 1/32	1	—	1	1	—	⅜	¼	1 11/16
SS-6UW	0.281 (port)	⅜ SWAGELOK	6⅝	6 33/64	6⅛	5 1/32	1⅛	3⅛	1½	1⅛	11/16	—	—	—
SS-6UW-TSW④	0.281 (port)	⅜ TSW / ½ MTW	6⅝	6 33/64	6⅛	5 1/32	1⅛	—	1½	1⅛	—	½	⅜	2¼
SS-8UW	0.312	½ SWAGELOK	6⅝	6 33/64	6⅛	5 1/32	1⅛	3 5/16	1½	1⅛	⅞	—	—	—
SS-8UW-TSW④	0.312	½ TSW / ¾ MTW	6⅝	6 33/64	6⅛	5 1/32	1⅛	—	1½	1⅛	—	¾	½	2¼
SS-(6MM) UW	4.37MM	6MM SWAGELOK	6 31/64	6 13/32	5 59/64	5 1/32	1	2½	1	1	9/16	—	—	—
SS-(10MM) UW	7.14MM (port)	10MM SWAGELOK	6⅝	6 33/64	6⅛	5 1/32	1⅛	3⅛	1½	1⅛	¾	—	—	—

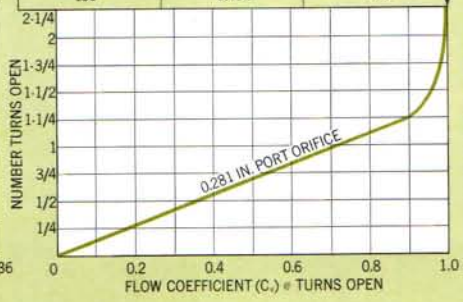
NUPRO®
"U" SERIES BELLOWS VALVES

FLOW CAPACITY CURVES

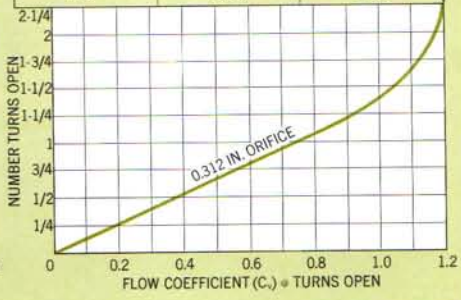
MAXIMUM FLOW FOR C_v = 0.36		
PRESSURE DROP TO ATMOSPHERE (Δ P) PSI	AIR SCFM @ 70° F	WATER GPM @ 70° F
10	4.98	1.14
50	13.77	2.54
100	24.41	3.60



MAXIMUM FLOW FOR C_v = 1.0		
PRESSURE DROP TO ATMOSPHERE (Δ P) PSI	AIR SCFM @ 70° F	WATER GPM @ 70° F
10	13.84	3.16
50	38.25	7.07
100	67.81	10.00



MAXIMUM FLOW FOR C_v = 1.2		
PRESSURE DROP TO ATMOSPHERE (Δ P) PSI	AIR SCFM @ 70° F	WATER GPM @ 70° F
10	16.69	3.79
50	45.44	8.49
100	80.55	12.00



"12U" SERIES BELLOWS VALVES

PURPOSE

NUPRO "12U" Series Bellows Valves offer higher flow capacity in an inverted bellows design to meet the most critical fluid handling requirements. The large capacity, compact design is safety engineered with all of the fine features of the smaller "4U-6U-8U" Series NUPRO Bellows Valves.

OPERATION

NUPRO "12U" Series Bellows Valves are operated by simply turning the handle. Approximately 2½ turns will open the valve to full flow. Operating torque is very low, even at maximum rated pressure.

APPLICATIONS

Liquified gases • Pilot plants • High temperature systems • Vacuum systems • Super heated steam • Feedwater and coolant sampling • Rod controls (Nuclear) • Cryogenic systems • Radioactive or explosive gases, toxic fluids • Liquid metal systems.

SCOPE

The NUPRO "12U" Series Bellows Valves are designed to increase the service capability of double sealed bellows valves in the larger flow ranges. This has been accomplished by inverting the longer bellows to eliminate "slinking," or distortion, while increasing stability and cycle life. The "12U" Series valves provide the following additional features: Welded or gasketed models • Non-rotating stem tip • Positive stem retraction • Secondary sealing system • Safety back seat sealing • Bonnet port • Choice of mountings • Straight or angle patterns • Union bonnet construction • Long service life • Protected threads • Low operating torque • Acme power transmission threads • Socket or butt weld end connections • 100% helium leak tested.

TECHNICAL DATA

VALVE SERIES	STEM TYPE	ORIFICE SIZE (INCHES)	FLOW COEFFICIENT, Cv	MAXIMUM PRESSURE RATING	MAXIMUM TEMPERATURE RATING
"12U" "12UA"	Vee Kel-F	0.625	3.1 (Straight Pattern) 5.3 (Angle Pattern)	2500 psi	"UK" 300°F "UG" 650°F "UW" 1200°F

NOTES:

1. In applications involving thermal cycling above 650°F, the "UW" Series valves are recommended.
2. For high temperature service with self-lubricating fluids such as liquid metals, ratings may be extended to 50 psi (max.) at 1500°F (max.).
3. The maximum temperature rating of "12U" Series valves with optional TFE secondary packing is +400°F.
4. Complete technical data for NUPRO "12U" Series Bellows Valves is supplied in NUPRO Technical Bulletin No. 28A.

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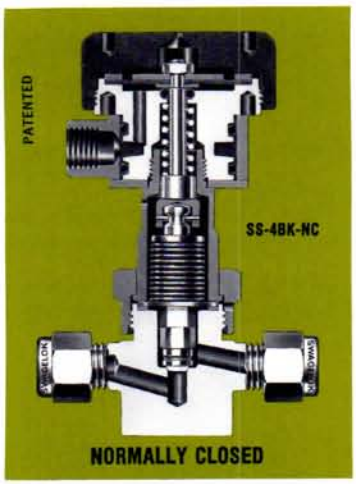
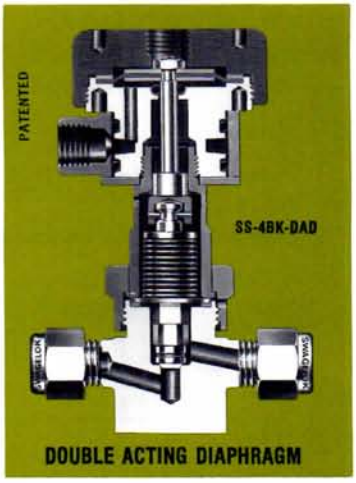
"4BK" Series Miniature Air Operated Bellows Sealed Valves





PURPOSE

NUPRO "4BK" Series Miniature Air Operated Bellows Valves, designed for remote control applications, eliminate the fire and explosion hazards normally encountered with electrically operated devices. The bellows seal of the stem section provides reliability and long service by eliminating sliding seals. *(See "Bellows Valve Introduction," page 4 of NUPRO Bellows Valve Catalog N-473.)*

OPERATION

Normally Open and Normally Closed valves can be actuated with a 50 to 150 psi air supply. Simply connect a shop air supply to the -NO or -NC air operator inlet port. Compact design of the air operator and valve portion reduces air consumption to a minimum and insures rapid response.

Normally Open and Normally Closed valves require air pressure only while operated, and automatically return to their normal position (fail-safe) on loss of actuating air pressure. An excellent valve for actuating the -NO and -NC Air Operated Valves is the WHITEY 2-Way Ball Valve, featuring special porting to provide a downstream vent. When the ball valve is in the "on" position, air pressure is applied to the air operator inlet port. As the handle is switched to the vent position, downstream pressure from the air operator is relieved to atmosphere through a side port in the valve body. The upstream port is closed to air flow. *(See WHITEY Technical Bulletin No. 25 and page 8 of WHITEY Catalog W-371A for various ball valve selections.)*

WHITEY 2-Way Ball Valve with downstream vent used to actuate -NO or -NC Air Operated Bellows Valve.

Valves supplied with a double acting diaphragm air operator (-DAD) may be used to control system pressures up to 500 psi. The -DAD Air Operators require air to open and air to close and may be actuated by a 50 to 150 psi air supply. Simply connect a shop air supply to the air operator as shown on the diagram, through a 4-Way, 2 position valve. The WHITEY 4-Way Ball Valve is an excellent choice. *(See WHITEY Technical Bulletin #25 and WHITEY Catalog W-371A for Ball Valve selections.)*

WHITEY 4-Way Ball Valve used to actuate -DAD Air Operated Bellows Valve.

APPLICATIONS

Remote control of difficult-to-handle fluid systems • Purge gases • High vacuum • Etching solutions • Furnace gas control • Epitaxial reactors • Corrosives • Toxic, dangerous or hazardous fluids • Pressurized fluid systems • Acid handling • High purity gases • Moisture sensitive systems.

FEATURES

Compact valve and air operator for use where space is at a premium • Soft seat for repetitive shut-off • Non-rotating stem eliminates galling • Three actuation modes; -NO, -NC or -DAD • Bottom mounted for flat surfaces or relay racks • SWAGELOK or weld end connections • Brass, stainless steel or Monel • Normally Closed and "DAD" valves have a 360° swivel-type air inlet connection for ease of installation • Replaceable bellows and stem assembly offer maximum valve service life • Tube extensions available for all welded systems • Positive stem retraction eliminates sticking • No stem threads in the system • Quiet, safe actuation by air pressure eliminates explosion hazard • Minimum dead space • 100% helium leak tested.

NUPRO COMPANY

15635 Saranac Road • Cleveland, Ohio 44110

MATERIALS

Air Operator Components:

Air Operator Cap, Bonnet, Turret, Washer—Anodized aluminum.
Diaphragm—Fairprene rubber with fabric center.
Air Operator Seals—Buna "N" O-Rings and nylon retaining rings.
Spring— -NO valves; 302 stainless steel, TFE coated.
-NC valves; 17-7PH stainless steel.
Nut—Brass, cadmium plated.

Valve Components:

Actuator—303 stainless steel.
Pin—Hardened 420 stainless steel.
Stem Insert, Gasket—Kel-F.
Stem Ring—Type 316L stainless steel or Monel 400.
Stem Adapter—Type 316 stainless steel or Monel R-405.
Body—Type 316L stainless steel, brass or Monel 400.
Bonnet, Bonnet Nut, Jam Nut—Type 316 stainless steel or brass.
Bellows—Type 321 stainless steel or Monel 400.
Nuts, Ferrules—Type 316 stainless steel, brass or Monel R-405.
Note: Monel valves use 316 stainless steel exterior trim.

TECHNICAL DATA

"4BK" SERIES		NORMALLY OPEN	NORMALLY CLOSED	DOUBLE ACTING DIAPHRAGM
PRESSURE RATINGS	AIR OPERATOR INLET	50 psi min.—150 psi max.		
	VALVE	vacuum to 350 psi	vacuum to 100 psi	vacuum to 500 psi
TEMPERATURE RATINGS	AIR OPERATOR	+150°F max.		
	VALVE (internal)	−40°F to 300°F		
ORIFICE SIZE		0.172 inches		
DEAD SPACE		0.1 cu. in. (approx.)		
FLOW COEFFICIENT		$C_V = 0.36$		
HELIUM LEAK TEST—ALL VALVES		Bellows Assembly & Gasket Seal—0.0004 M.C.F.H. (4.14×10^{-9} atm. cc/sec.) Seat—0.008 M.C.F.H. (8.28×10^{-6} atm. cc./sec.)		

AIR OPERATOR PRESSURE VS SYSTEM PRESSURE

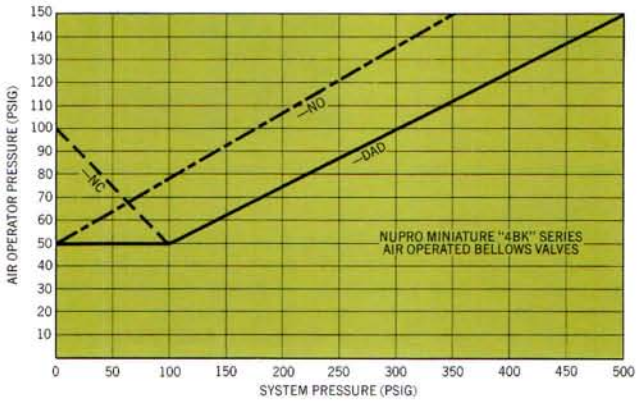
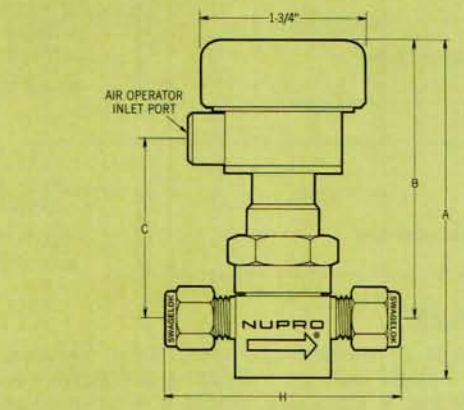
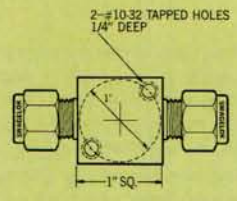
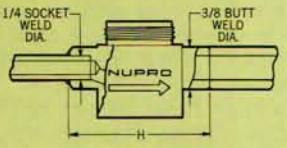


TABLE OF DIMENSIONS







FLOW CAPACITY

MAXIMUM FLOW FOR $C_V = 0.36$		
PRESSURE DROP TO ATMOSPHERE (△P) PSI	AIR SCFM @ 70°F	WATER GPM @ 70°F
10	4.98	1.14
50	13.80	2.55
100	24.41	3.60

MINIATURE AIR OPERATED VALVES	CONNECTION SIZE ②	DIMENSIONS ③			
CATALOG NUMBER ①	INLET & OUTLET	A	B	C	H
-4BK-DAD	¼ SWAGELOK	3½	2 15/16	1 29/32	2½
-4BK-NC		3½	2 15/16	1 29/32	2½
-4BK-NO		3 5/8	3 1/16	N/A	2½
-4BK-TSW-DAD	¼ SOCKET WELD OR ④	3½	2 15/16	1 29/32	1 11/16
-4BK-TSW-NC		3½	2 15/16	1 29/32	1 11/16
-4BK-TSW-NO	⅜ BUTT WELD	3 5/8	3 1/16	N/A	1 11/16

① For complete ordering number, add B for brass, SS for 316 stainless steel and M for Monel as a prefix to the catalog number. Example: B-4BK-NO, SS-4BK-TSW-NC.

② Air operator inlet ports are ⅛" Female NPT.

③ Dimensions shown with SWAGELOK nuts finger-tight, when applicable.

④ Tube extensions can be supplied on special order. See page 5 of NUPRO Bellows Valve Catalog N-473 for welding, brazing and technical information.

17-7PH, TM Armco Steel • Monel, TM International Nickel • Kel-F, TM Minnesota Mining & Mfg.

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12-73-125M-125M-BL

For a complete range of vacuum products for systems using Bellows Valves, see Vacuum Products subsection.

CHECK AND RELIEF VALVES

NUPRO "CP" SERIES CHECK VALVE

PURPOSE

Check valves allow virtually unrestricted flow in one direction, and no flow in the opposite direction. Relief valves are set to open at a pre-set pressure to protect sensitive gauges, instruments and systems from over-pressurization.

OPERATION

Upstream pressure, P_1, pushes the poppet to the open position when P_1 is greater than downstream pressure, P_2, plus spring resistance. In some valves, such as WHITEY Lift Check Valves, there is no spring and the valve is open whenever P_1 is greater than P_2.

TYPES OF PRESSURE RATINGS

There are three types of pressure ratings:
WORKING PRESSURE is the maximum internal system pressure allowed, using adequate safety factors.
BACK PRESSURE is the maximum differential system pressure allowable when P_2 is greater than P_1. Reduced back pressure ratings are primarily to prevent over-squeeze and extrusion of soft O-Rings.
CRACKING PRESSURE is the lowest differential pressure at which flow will occur through a check valve in the normal flow direction (P_1 greater than P_2). It is always a differential pressure and can be varied by changing or adjusting a spring.

DIFFERENCES AMONG CHECK, IN-LINE RELIEF and POPOFF RELIEF VALVES

A CHECK VALVE prevents backflow and allows free flow in the other direction. Check valves have either no spring (WHITEY Lift Check), or a very low opening pressure spring such as the ⅓ or 1 psi in NUPRO Check Valves.
AN IN-LINE RELIEF VALVE opens at a pre-set pressure and directs fluid through an in-line discharge port to a different location in the system. Application could be the actuation of a control, or as a safety device to prevent overpressure.
A POPOFF RELIEF VALVE discharges directly to atmosphere at a pre-set pressure.

"4CP" Series Check Valves
Pages 2 & 3

Union Bonnet Lift Check Valves
Page 6

"8CPA" Series Adjustable In-Line Relief Valves
Pages 2 & 3

"R" Series Safety Relief Valves
Page 7

"2C" thru "10C" Series Check Valves
Pages 4 & 5

"CA" Series Adjustable In-Line Relief Valves
Pages 4 & 5

"12C" thru "16C" Series Check Valves
Page 6

"P" Series Purge Valves
Page 8

SERIES	SEE PAGE	CHECK	IN-LINE RELIEF	POPOFF TO ATMOSPHERE RELIEF	ADJUST-ABLE	LIQUIDS	GASES	END CONNECTIONS
"C"	4-5-6	X	X	X		X	X	SWAGELOK, Male & Female NPT
"CA"	4-5	X	X	X	X	X	X	SWAGELOK, Male & Female NPT
"CP"	2	X	X	X		X	X	Male to Female NPT Male to Male NPT
"CPA"	3	X	X	X	X	X	X	Male NPT only
"R"	7			X	X	X	X	SWAGELOK, Male & Female NPT
53,56,58	6	X				X		SWAGELOK, Female NPT
"P"	8	MANUAL PURGE OR VENT				X	X	SWAGELOK, Straight tube, Male & Female NPT

"CP" & "CPA" SERIES PIPE ENDED CHECK, ADJUSTABLE RELIEF & POPOFF RELIEF VALVES

SS-4CPA2-25-DC

"4CP" SERIES CHECK VALVES

"4CPA" SERIES ADJUSTABLE RELIEF VALVES

"8CPA" SERIES ADJUSTABLE IN-LINE RELIEF VALVES

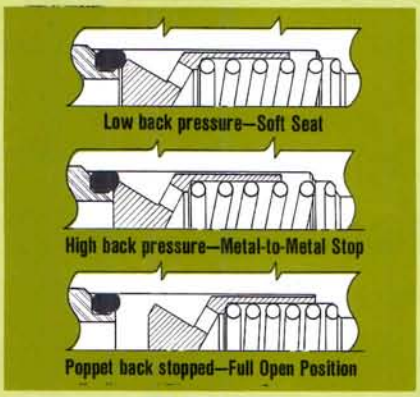
SS-4CP5-1

Patent Pending

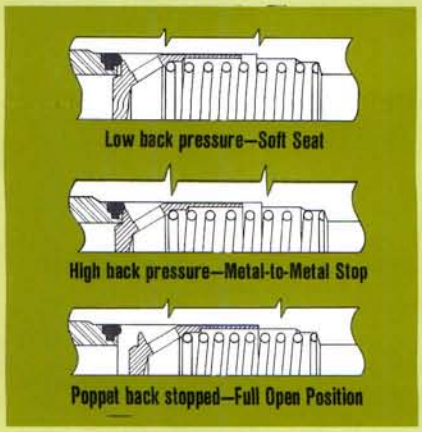
PURPOSE

NUPRO "CP" Series Check and "CPA" Series Adjustable In-line Relief Valves fill the need for improved, compact, inexpensive, pipe ended check and relief valves.

OPERATION



"4CP-4CPA" SERIES



"8CP-8CPA" SERIES

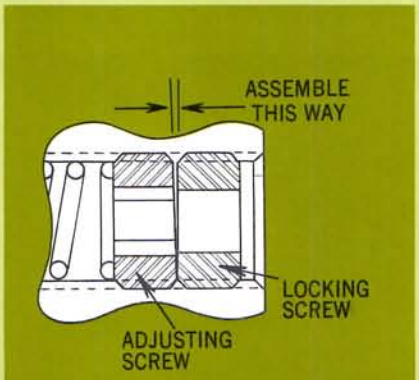
APPLICATIONS

Unidirectional flow control of liquids and gases • Wide variety of industrial, laboratory and process control systems • Prevention of undesirable mixing of two fluid streams • Protection against over-pressurization • Vacuum breaker.

SPECIAL FEATURES

Soft, resilient O-Ring gently stops poppet • Large seating area provides sensitive opening pressures and leak-tight sealing • Contained O-Ring eliminates O-Ring blowout • O-Ring is easily replaced • Metal-to-metal stop prevents over-squeeze of O-Ring and eliminates sticking • No leak path to atmosphere with one piece body • Dual hex distinguishes valves from hex pipe nipples • Smooth floating poppet and soft O-Ring permit chatter-free operation • Smooth flow path provides minimum pressure drop • O-Ring removed from main flow path • Backstopped poppet prevents overstressing spring.

ADJUSTMENT



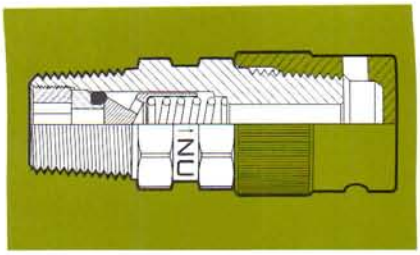
To adjust "CPA" Relief Valves:

- Insert a standard hex key wrench into the locking screw.
- Break locking screw counterclockwise until the hex key wrench slides into the adjusting screw.
- Turn both screws to the desired cracking pressure. (Clockwise increases opening pressure).
- Retract hex key wrench into the locking screw.
- Lock against adjusting screw by turning clockwise.

NUPRO®

"CP" & "CPA" SERIES PIPE ENDED CHECK, ADJUSTABLE RELIEF & POPOFF RELIEF VALVES

DEFLECTOR CAP



The green polyethylene Deflector Cap is available for valves used as popoff-to-atmosphere relief valves. It deflects the flow from direct contact with personnel and prevents atmospheric contaminants from entering the valve. The Deflector Cap easily screws on a standard male NPT pipe thread. To order separately, the part number is P_G-4CP4 for ¼" male NPT; P_G-8CP4 for ½" male NPT.

FLOW CAPACITY

"4CP-4CPA" SERIES MAXIMUM FLOW FOR C_v=0.35		
PRESSURE DROP TO ATMOSPHERE (△P) PSI	AIR SCFM @70°F	WATER GPM @70°F
10	4.82	1.11
50	13.25	2.48
100	23.49	3.50

"8CP - 8CPA" SERIES MAXIMUM FLOW FOR C_v=1.2		
PRESSURE DROP TO ATMOSPHERE (△P) PSI	AIR SCFM @70°F	WATER GPM @70°F
10	16.69	3.79
50	45.44	8.49
100	80.55	12.00

MATERIALS

Body—Brass, anodized aluminum, 316 stainless steel, cadmium plated carbon steel.

Spring—302 stainless steel.

O-Ring—Buna "N" is standard in all valves. Many different types of elastomer O-Rings are stocked by NUPRO Company for specialized applications.

Insert, Poppet—Same material as body except steel valves use 316 stainless steel.

Insert Lock Screw ("4CP-4CPA" Series)—Same material as body. ("8CP-8CPA" Series)—Brass in brass valves, 316 stainless steel in all other valves.

Adjusting Screw, Lock Screw ("4CPA")—316 stainless steel. ("8CPA")—316 stainless steel except brass valves (-3; -50) use brass and (-150; -350) use 316 stainless steel adjusting screw and brass lock screw.

TECHNICAL DATA

ITEM	"CP" SERIES	"CPA" SERIES
STANDARD CRACKING PRESSURE (PSI)	1	not applicable
ADJUSTABLE RANGE (PSI)	not applicable	3 to 50 50 to 150 150 to 350 350 to 600
WORKING PRESSURE RATING @70°F (PSI)	2500	2500
BACK PRESSURE RATING @70°F (PSI)	2500	2500
FLOW COEFFICIENT, C_v	0.35 ("4CP" Series) 1.2 ("8CP" Series)	0.35 ("4CPA" Series) 1.2 ("8CPA" Series)
TEMPERATURE RATINGS	BUNA "N": General; -40°F to 300°F With Alkalies; -40°F to 158°F	

TABLE OF DIMENSIONS

CATALOG① NUMBER	NOMINAL CRACKING PRESSURE RANGE (PSI)	END CONNECTIONS		OVERALL LENGTH	HEX SIZE
		INLET	OUTLET		
-4CP2-1	1	¼ Male NPT	¼ Male NPT	1⅝	9/16
-4CP5-1	1	¼ Male NPT	¼ Female NPT	1¾	¾
-4CPA2-3	3 to 50	¼ Male NPT	¼ Male NPT	1⅝	9/16
-4CPA2-50	50 to 150	¼ Male NPT	¼ Male NPT	1⅝	9/16
-4CPA2-150	150 to 350	¼ Male NPT	¼ Male NPT	1⅝	9/16
-4CPA2-350	350 to 600	¼ Male NPT	¼ Male NPT	1⅝	9/16
-8CP2-1	1	½ Male NPT	½ Male NPT	2 9/32	⅞
-8CP5-1	1	½ Male NPT	½ Female NPT	2¾	1 1/16
-8CPA2-3	3 to 50	½ Male NPT	½ Male NPT	2 9/16	⅞
-8CPA2-50	50 to 150	½ Male NPT	½ Male NPT	2 9/16	⅞
-8CPA2-150	150 to 350	½ Male NPT	½ Male NPT	2 9/16	⅞
-8CPA2-350	350 to 600	½ Male NPT	½ Male NPT	2 9/16	⅞

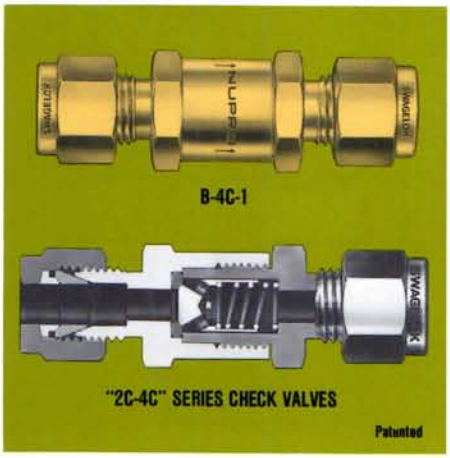
① For a complete ordering number:

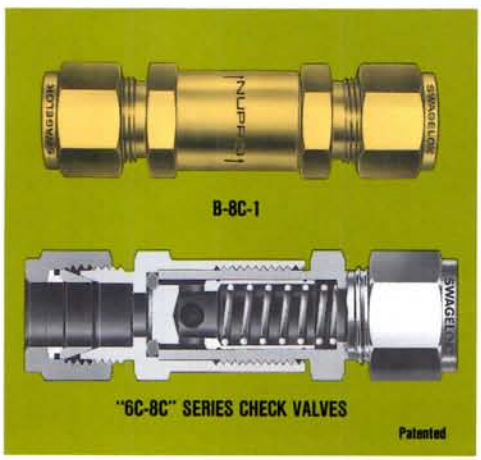
a. Prefix B for brass, SS for 316 stainless steel, A for aluminum, and S for carbon steel.

b. To order valves with Deflector Cap installed, suffix the catalog number with -DC. To order Deflector Caps separately, the part number is P_G-4CP4 for ¼" male NPT; P_G-8CP4 for ½" male NPT.

c. Special springs from ⅓ to 100 psi cracking pressure are available for "CP" Series valves. To order, change the -1 suffix to -⅓, -10, etc.

"C" & "CA" SERIES CHECK & ADJUSTABLE IN-LINE RELIEF VALVES





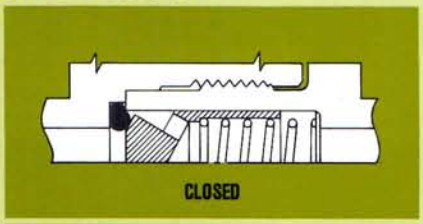
PURPOSE

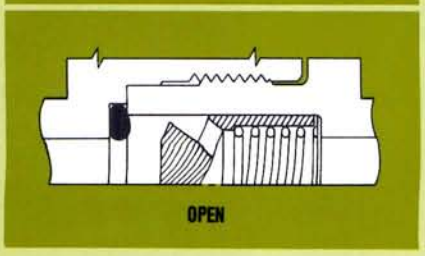
NUPRO "C" Series Check and "CA" Series In-line Adjustable Relief Valves are available with integral SWAGELOK Tube Fittings for safe, reliable connection directly to tubing, eliminating the need for additional fittings and connections. The soft O-Ring seat and smooth flow poppet design provides leak-tight sealing and large flow capacity in a compact valve.

APPLICATIONS

NUPRO Check Valves are used for unidirectional flow and as in-line or popoff relief valves. They can be used in gas or liquid service of all types as determined by the O-Ring chemical resistance and metal properties.

OPERATION





When upstream pressure overcomes the forces exerted by the spring and system back pressure, the poppet opens allowing full flow through the valve. NUPRO Check Valves seal leak-tight with little or no back pressure.

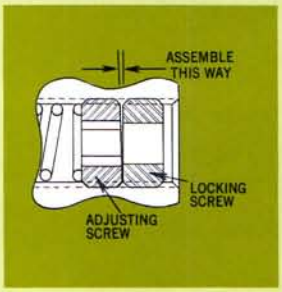
SPECIAL FEATURES

Soft, resilient O-Ring gently stops poppet • Large seating areas provide sensitive opening pressures and leak-tight sealing • O-Ring easily replaced • Smooth floating poppet allows chatter-free operation • Smooth flow path minimizes pressure drop • Back stopped poppet prevents overstressing spring • Fixed spring ("C" Series) and adjustable models ("CA" Series) available • Variety of SWAGELOK, male and female pipe connections and combinations minimizes the need for additional fittings and reduces installation time.

ADJUSTMENT

To adjust "CA" Series Relief Valves:

- Insert standard 5/32" hex key wrench into the locking screw.
- Break locking screw counter-clockwise until the hex wrench slides into the adjusting screw.
- Turn both screws to the desired cracking pressure. (Clockwise increases opening pressure.)
- Retract hex key wrench into the locking screw.
- Lock against adjusting screw by turning clockwise.



TECHNICAL DATA

ITEM	"C" SERIES	"CA" SERIES
STANDARD CRACKING PRESSURES* (PSI)	⅓, 1, 10, 25	not applicable
ADJUSTABLE RANGE (PSI)	not applicable	▲ 3 to 50 50 to 150 150 to 350 350 to 600
PRESSURE RATINGS @ 70°F (PSI)	⅓ to 9 PSI cracking pressures Working pressure–3000 Back pressure–1000 All other cracking pressures Working pressure–3000 Back pressure–3000	3000
FLOW COEFFICIENT, C_v	"2C"–0.16 "4C"–0.47	0.37
	"6C"–1.47 "8C"-"10C"–1.66	not applicable
TEMPERATURE RATINGS	Buna "N": General; -40°F to 300°F With Alkalies; -40°F to 158°F	

* Springs with opening pressures to 100 psi can be supplied.
▲5 psi is the minimum cracking pressure if resealing is to be accomplished without back pressure. Adjustment to lower cracking pressures is possible for use as a CHECK VALVE with back pressure for sealing.

NUPRO
"C" & "CA" SERIES CHECK & ADJUSTABLE IN-LINE RELIEF VALVES

FLOW CAPACITY

"2C" SERIES MAXIMUM FLOW FOR C_v=0.16		
PRESSURE DROP TO ATMOSPHERE (△P) PSI	AIR SCFM @70°F	WATER GPM @70°F
10	2.21	0.51
50	6.12	1.13
100	10.85	1.60

"4C" SERIES MAXIMUM FLOW FOR C_v=0.47		
PRESSURE DROP TO ATMOSPHERE (△P) PSI	AIR SCFM @70°F	WATER GPM @70°F
10	6.50	1.49
50	17.98	3.32
100	31.87	4.70

"6C" SERIES MAXIMUM FLOW FOR C_v=1.47		
PRESSURE DROP TO ATMOSPHERE (△P) PSI	AIR SCFM @70°F	WATER GPM @70°F
10	20.33	4.65
50	56.23	10.39
100	99.68	14.70

"8C - 10C" SERIES MAXIMUM FLOW FOR C_v=1.66		
PRESSURE DROP TO ATMOSPHERE (△P) PSI	AIR SCFM @70°F	WATER GPM @70°F
10	22.96	5.25
50	63.49	11.74
100	112.56	16.60

"CA" SERIES MAXIMUM FLOW FOR C_v=0.37		
PRESSURE DROP TO ATMOSPHERE (△P) PSI	AIR SCFM @70°F	WATER GPM @70°F
10	5.14	1.17
50	14.01	2.62
100	24.84	3.70

MATERIALS

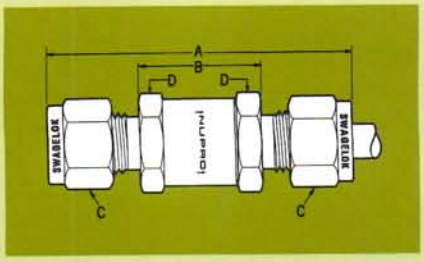
Body, Poppet, Nuts & Ferrules—Brass, 316 stainless steel, Monel, and anodized aluminum.

Spring—Type 302 stainless steel in all valves, except Monel valves use Monel springs.

Gasket ("CA" Series only)—TFE

O-Ring—Buna "N" is standard in all valves. Many different types of elastomer O-Rings are stocked by NUPRO Company for specialized applications. Due to the hardness of TFE, O-Rings of this material will not seal leak-tight except with very high back pressure. TFE O-Rings are useful on cycling pump applications where gas tight sealing is not required and pressure surges are common.

Adjusting Screw, Lock Screw ("CA" Series Only)—316 stainless steel in all valves, except Monel valves use Monel.



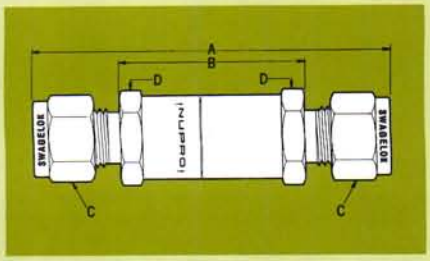


TABLE OF DIMENSIONS

CHECK & RELIEF VALVES		END CONNECTIONS		DIMENSIONS②			
CATALOG NUMBER①	ORIFICE (INCHES)	INLET	OUTLET	A	B	C	D
-2C-	.094	⅛ SWAGELOK	⅛ SWAGELOK	2 7/32	31/32	7/16	5/8
-2C2-	.125	⅛ Male NPT	⅛ Male NPT	1 23/32	31/32	—	5/8
-2C4-	.187	⅛ Female NPT	⅛ Female NPT	1 21/32	—	—	5/8
-2CA4-	.156	⅛ Female NPT	⅛ Female NPT	2 9/32	—	—	5/8
-4C-	.187	¼ SWAGELOK	¼ SWAGELOK	2 13/32	31/32	9/16	5/8
-4C1-	.187	¼ Male NPT	¼ SWAGELOK	2¼	31/32	9/16	5/8
-4C2-	.187	¼ Male NPT	¼ Male NPT	2 3/32	31/32	—	5/8
-4C4-	.187	¼ Female NPT	¼ Female NPT	2 5/32	—	—	¾
-4CA-	.156	¼ SWAGELOK	¼ SWAGELOK	3 7/32	1 25/32	9/16	5/8
-4CA1-	.156	¼ Male NPT	¼ SWAGELOK	3 1/16	1 25/32	9/16	5/8
-4CA2-	.156	¼ Male NPT	¼ Male NPT	2⅛	1	—	5/8
-4CA4-	.156	¼ Female NPT	¼ Female NPT	2 25/32	—	—	¾
-6C-	.281	⅜ SWAGELOK	⅜ SWAGELOK	3 7/32	1 21/32	1 1/16	⅞
-6C2-	.359	⅜ Male NPT	⅜ Male NPT	2 25/32	1 21/32	—	⅞
-6C4-	.359	⅜ Female NPT	⅜ Female NPT	2 27/32	—	—	⅞
-8C-	.359	½ SWAGELOK	½ SWAGELOK	3 7/16	1 11/16	⅞	⅞
-8C2-	.359	½ Male NPT	½ Male NPT	3 5/32	1 21/32	—	⅞
-8C4-	.359	½ Female NPT	½ Female NPT	3 13/32	—	—	1 1/16
-10C-	.359	⅝ SWAGELOK	⅝ SWAGELOK	3 9/16	1 13/16	1	1 5/16

① For a complete ordering number:

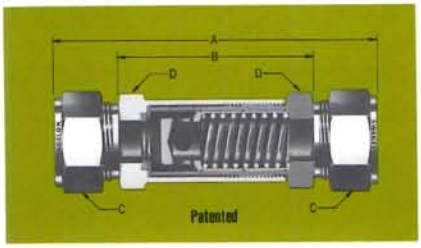
a. Add B for brass, SS for 316 stainless steel, A for aluminum and M for Monel as a prefix to the catalog number.

b. For "C" Series valves, add ⅓, 1, 10 or 25 as a suffix to the catalog number for the desired cracking pressure. Special springs to 100 psi cracking pressures are available.

c. For "CA" Series valves, add 3 for 3 to 50 psi cracking pressures, 50 for 50 to 150 psi, 150 for 150 to 350 psi, or 350 for 350 to 600 psi as a suffix to the catalog number for the desired cracking range. Example: B-4C-1, SS-4CA2-3.

② Dimensions shown with SWAGELOK nuts finger-tight, when applicable.

NUPRO COMPANY • 15635 Saranac Road • Cleveland, Ohio 44110



PURPOSE
These valves provide reliable, soft seat, leak-tight shut-off in systems where a high capacity check or in-line relief valve is needed.

APPLICATIONS
Check or in-line relief • Industrial gas supplies • Hydraulics • Shop air • Laboratories • Many other industrial and research facilities.

SPECIAL FEATURES
Smooth floating poppet provides stability • Compact design with large seating area allows sensitive cracking pressures • O-Ring contained by a precision metal gasket prevents blowout • O-Ring is easily replaced • Smooth flow path for minimal pressure drop • Back stopped poppet prevents overstressing spring • Variety of SWAGELOK, male and female pipe end connections.

TECHNICAL DATA

Standard Cracking Pressures (PSI)	⅓, 1, 10 & 25
Working Pressure Rating @70°F (PSI)	Brass – 1500 Stainless Steel –2000
Back Pressure Rating @70°F (PSI)	1000
Temperature Ratings	Buna "N": General; -40°F to 300°F With Alkalies; -40°F to 158°F

FLOW CAPACITY

MAXIMUM FLOW FOR C_v=4.68		
PRESSURE DROP TO ATMOSPHERE [△P] PSI	AIR SCFM @70°F	WATER GPM @70°F
10	64.76	14.79
50	179.00	33.09
100	317.34	46.80

MATERIALS
Body, Poppet, Nuts & Ferrules—Brass and 316 stainless steel.
Spring—Type 302 stainless steel.
Gasket—Aluminum in brass; annealed type 316 stainless steel in stainless.
O-Ring—Buna "N" is standard in all valves (See Page 5 for options.)

TABLE OF DIMENSIONS

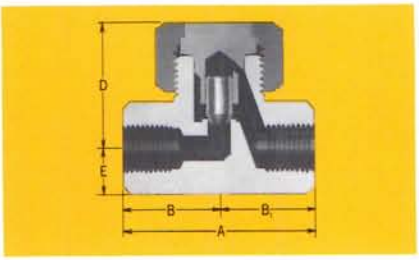
CHECK VALVES		END CONNECTIONS		DIMENSIONS▲			
CATALOG NUMBER*	ORIFICE (INCHES)	INLET	OUTLET	A	B	C	D
-12C-	.594	¾ SWAGELOK	¾ SWAGELOK	4 11/32	2 19/32	1⅛	1 3/16
-12C2-	.594	¾ Male NPT	¾ Male NPT	4 3/32	2 19/32	–	1 3/16
-12C4-	.594	¾ Female NPT	¾ Female NPT	4 3/32	–	–	1¼
-14C-	.594	⅞ SWAGELOK	⅞ SWAGELOK	4 11/32	2 19/32	1¼	1 3/16
-16C-	.594	1 SWAGELOK	1 SWAGELOK	4 23/32	2 21/32	1½	1⅜
-16C2-	.594	1 Male NPT	1 Male NPT	4 17/32	2 21/32	–	1⅜
-16C4-	.594	1 Female NPT	1 Female NPT	4 27/32	–	–	1⅝

* For a complete ordering number, add B for brass or SS for 316 stainless steel, as a prefix to the catalog number. Add ⅓, 1, 10, or 25 as a suffix to the catalog number for the desired cracking pressure. Example: B-12C-⅓, SS-16C2-10.

▲Dimensions shown with SWAGELOK nuts finger-tight, when applicable.

WHITEY®

UNION BONNET LIFT CHECK VALVES (53, 56 & 58 Series)



PURPOSE
WHITEY Lift Check Valves are used where a compact, all metal valve is needed. Mount horizontally with the union nut on top. Used primarily for liquid service.

OPERATION
Forward flow lifts the metal plug, opening the valve. Reverse flow is checked by the fluid pressure, sealing the plug against the orifice. Internal porting permits instantaneous fluid back pressure behind the plug.

APPLICATIONS
Corrosive service • High temperatures • Cryogenics • Food processing • Beverages • High pressures.

SPECIAL FEATURES
Union bonnet, all-metal construction • Only one moving part • Hardened 17-4PH stainless steel guided plugs in all valves • Metal-to-metal seals • High and low temperatures • Pressures to 6000 psi • Easily cleaned • SWAGELOK and female pipe connections.

TECHNICAL DATA

ORIFICE SIZE (INCHES)	FLOW COEFFICIENT, C_v	PRESSURE RATING @70°F	TEMPERATURE RANGE
0.156	0.30	6000 psi	Cryogenic to 900°F
0.250	0.74		
0.437	2.2		

MATERIALS
Lift Plug—17-4PH stainless steel.
All Other Parts—Type 316 stainless steel.

FLOW CAPACITY

MAXIMUM FLOW FOR C_v=0.30		
PRESSURE DROP TO ATMOSPHERE [△P] PSI	AIR SCFM @70°F	WATER GPM @70°F
10	4.15	0.95
50	11.47	2.12
100	20.34	3.0

MAXIMUM FLOW FOR C_v=0.74		
PRESSURE DROP TO ATMOSPHERE [△P] PSI	AIR SCFM @70°F	WATER GPM @70°F
10	10.24	2.34
50	28.30	5.23
100	50.18	7.40

MAXIMUM FLOW FOR C_v=2.2		
PRESSURE DROP TO ATMOSPHERE [△P] PSI	AIR SCFM @70°F	WATER GPM @70°F
10	30.66	6.96
50	83.30	15.56
100	147.68	22.00

TABLE OF DIMENSIONS

LIFT CHECK VALVES		END CONNECTIONS	DIMENSIONS▲			
PART NUMBER	ORIFICE (INCHES)	INLET AND OUTLET	A	B	D	E
SS-53F2	0.156	⅛ Female NPT	1 13/16	29/32	1 3/32	3/8
SS-53F4	0.156	¼ Female NPT	2 1/16	1 1/32	1 3/32	3/8
SS-53S4	0.156	¼ SWAGELOK	2 7/16	1 7/32	1 3/32	3/8
SS-56F4	0.250	¼ Female NPT	2¼	1⅛	1 11/32	½
SS-56S6	0.250	⅜ SWAGELOK	2⅞	1 7/16	1 11/32	½
SS-58F6	0.437	⅜ Female NPT	3	1½	1 13/16	5/8
SS-58F8	0.437	½ Female NPT	3	1½	1 13/16	5/8
SS-58S8	0.437	½ SWAGELOK	3 13/16	1 29/32	1 13/16	5/8
SS-58S12	0.437	¾ SWAGELOK	3 13/16	1 29/32	1 13/16	5/8

▲Dimensions shown with SWAGELOK nuts finger-tight, when applicable.

NUPRO®
"R" SERIES SAFETY RELIEF VALVES

PURPOSE
NUPRO "R" Series Safety Relief Valves are adjustable popoff-to-atmosphere relief valves designed to protect sensitive gauges, instruments and systems from overpressure.

APPLICATIONS
Automatic venting of gas or liquid systems from overpressure • Manual actuation for blow-down or flushing of gas systems • Purging of unwanted gas or liquid from an instrument line • Protection of storage tanks against a pressure build up due to heat.

OPERATION
Adjust the knurled bonnet nut to the desired cracking pressure by advancing it toward the valve seat, increasing opening pressure. Then tighten the lock nut against the bonnet nut and the valve is ready for operation. DO NOT interchange different size springs between valves. Additional changes are involved in the various pressure ranges to obtain optimum operation.

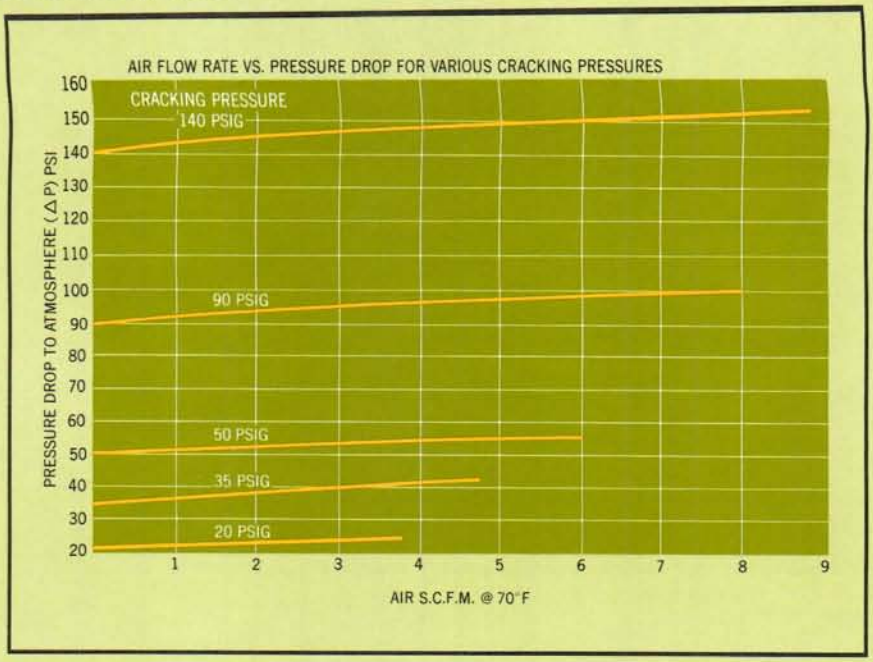
SPECIAL FEATURES
Instant response • Quiet action due to the quad ring vibration damper • Five turn adjustment range • Compact • Protected spring • Large flow area • Variety of connections • Three cracking pressure ranges • Manual override.

TECHNICAL DATA
Temperature Rating—All valves with standard seals:
General; -40°F to 300°F
With Alkalies; -40°F to 158°F

CRACKING PRESSURES

SPRING PART NO. SUFFIX	ADJUSTABLE CRACKING PRESSURE RANGE	APPROXIMATE CHANGE IN OPENING PRESSURE PER TURN
-10	10 PSI to 50 PSI	8 PSI
-50	50 PSI to 150 PSI	20 PSI
-100	100 PSI to 200 PSI	20 PSI

FLOW CAPACITY



MATERIALS
Body—Brass or 316 stainless steel.
Cap—Bright red phenolic plastic with tapped brass insert.
Springs—10 to 50 psi, type 302 stainless steel; 50 to 150 psi and 100 to 200 psi, 17-7PH stainless steel.
O-Ring—Buna "N" in brass and stainless steel with 10 to 50 psi spring; Neoprene O-Ring used with 50 to 150 and 100 to 200 psi spring.
Quad Ring—Buna "N" in all valves.
All Other Parts—Same material as body.

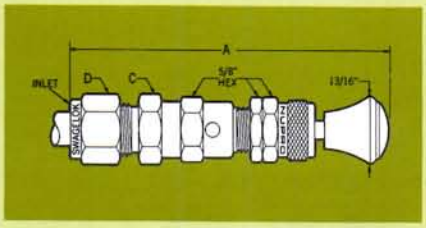
TABLE OF DIMENSIONS

SAFETY RELIEF VALVES	END CONNECTION	DIMENSIONS②		
CATALOG NUMBER①	INLET	A CLOSED③	C HEX	D HEX
-6R-4-	¼ SWAGELOK	3 11/16	5/8	9/16
-6R-6-	3/8 SWAGELOK	3¾	5/8	11/16
-6R-2F-	⅛ Female NPT	3¼	5/8	—
-6R-4F-	¼ Female NPT	3 7/16	¾	—
-6R-6F-	3/8 Female NPT	3½	⅞	—
-6R-2M-	⅛ Male NPT	3 1/32	5/8	—
-6R-4M-	¼ Male NPT	3 7/32	5/8	—
-6R-6M-	3/8 Male NPT	3 7/32	11/16	—

① For complete ordering number, add B for brass or SS for 316 stainless steel as a prefix to the catalog number. Add -10, -50, or -100 as a suffix to the catalog number for the desired cracking range. Example: B-6R-2M-10, SS-6R-4F-50.

② Dimensions shown with SWAGELOK nuts finger-tight, when applicable.

③ Add 5/32" for A open dimension.



NUPRO
"P" SERIES PURGE VALVES

PURPOSE
NUPRO "P" Series Purge Valves are intended to be used as manual bleed, vent, or drain valves for numerous instruments and systems.

OPERATION
One-quarter turn with a wrench from finger-tight should be used to obtain a leak-tight closure on first make-up. After that, snugging with a wrench will insure closure to the rated pressure. Purge valves using a TFE ball require only finger pressure for leak-tight shut-off.

APPLICATIONS
Bleed or vent gases or liquids from gauges, instruments and pressurized containers • Vent air from high points in hydraulic systems • Bleed liquid from low points in gas or steam systems.

SPECIAL FEATURES
Compact • Quarter turn operation • Safety engineered • Discharge directed away from operator • Variety of materials • Large choice of end connections • Repetitive, leak-tight shut-off • Valves with TFE balls have a removable cap for easy ball replacement • Higher pressure all-metal valves have the knurled cap permanently assembled.

TECHNICAL DATA

VALVE MATERIAL	PRESSURE RATING PSI @70°F	MAXIMUM TEMPERATURE RATING °F
316 stainless steel	4000	600
Brass	3000	500
Monel	4000	450
Aluminum	2000	400
Carbon Steel	3000	600
Nylon (Zytel)	300	180
Valves with TFE ball	200	350

FLOW CAPACITY

MAXIMUM FLOW FOR C_v=0.043		
PRESSURE DROP TO ATMOSPHERE (△P) PSI	AIR SCFM @70°F	WATER GPM @70°F
10	0.60	0.14
50	1.64	0.30
100	2.92	0.43

Orifice size of discharge port: 1/16"

MATERIALS
Body, Cap, Nut and Ferrules—Brass, 316 stainless steel, Monel, aluminum, carbon steel and nylon.
Ball—Type 316 stainless steel in all valves, except stainless steel valves use a 316 stainless steel poppet and Monel valves use a Monel ball.
Spring—Type 302 stainless steel in all valves except Monel valves use a Monel spring.
NOTE: Any NUPRO Purge Valve may be supplied with a TFE ball on request.

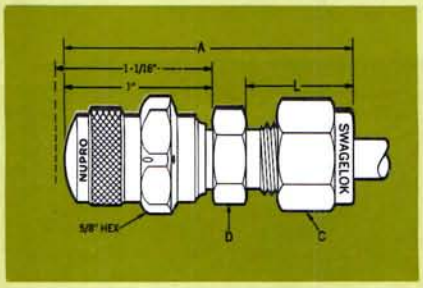
TABLE OF DIMENSIONS

PURGE VALVES	END CONNECTION	DIMENSIONS③			
CATALOG NUMBER①②	INLET	A CLOSED	C HEX	D HEX	L
-4P-2	1/8 SWAGELOK	1 27/32	7/16	1/2	5/8
-4P-4	1/4 SWAGELOK	1 15/16	9/16	1/2	23/32
-4P-6	3/8 SWAGELOK	2 1/32	11/16	5/8	25/32
-4P-2F	1/8 Female NPT	1 17/32	—	9/16	17/32
-4P-4F	1/4 Female NPT	1 23/32	—	3/4	23/32
-4P-2M	1/8 Male NPT	1 19/32	—	1/2	3/8
-4P-4M	1/4 Male NPT	1 25/32	—	9/16	9/16
-4P-6M	3/8 Male NPT	1 13/16	—	11/16	9/16
-4P-4T	1/4 Straight Tube	1 27/32	—	1/2	5/8
-4P-6T	3/8 Straight Tube	1 29/32	—	1/2	11/16

① For a complete ordering number, add B for brass, SS for 316 stainless steel, M for Monel, A for aluminum, S for carbon steel, or NY for nylon as a prefix to the catalog number. Example: S-4P-4M, B-4P-4.

② Add—TFE as a suffix if a TFE ball is needed. Example: SS-4P-4M-TFE.

③ Dimensions shown with SWAGELOK nuts finger-tight, when applicable.



MONEL, TM International Nickel • 17-4PH & 17-7PH, TM Armco Steel

YOUR LOCAL SALES & SERVICE REPRESENTATIVE:

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11-73-125M-125M-CL

WHITEY®

WHITEY BALL VALVES

Ball Valves
for on-off service
PAGE 2

3-Way Ball Valves
for switching flow or pressure
PAGE 4

FEATURES:

- MAXIMUM FLOW CAPACITY.
- VERY COMPACT one-piece body eliminates multiple seal points.
- QUICK OPERATION—1/4 turn to open or close.
- ATTRACTIVE DIRECTIONAL HANDLE indicates valve position.
- UNIQUE ONE-PIECE BALL STEM eliminates backlash.
- TFE PACKING adjustable with valve in service.
- POSITIVE SEALING over the entire pressure range.
- NO INTERNAL CAVITIES to trap process fluids.
- ELIMINATES VALVE OVER-TIGHTENING.
- NO SEAT OR THREAD GALLING PROBLEMS.

TABLE OF CONTENTS:

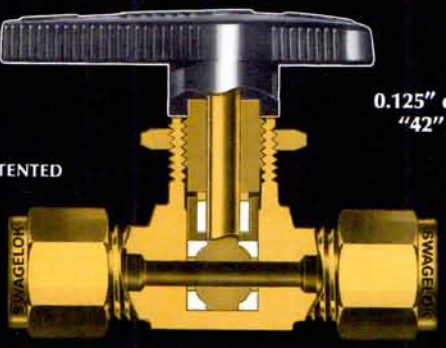
4-Way Ball Valves
for the crossover of two streams
PAGE 6

5-Way Ball Valves
for selecting streams
PAGE 6

WHITEY COMPANY • 5679 Landregan Street • Oakland, California 94662

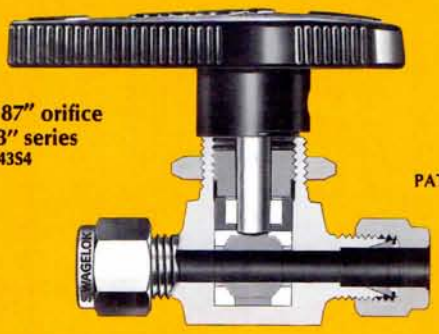
BALL VALVES FOR ON-OFF SERVICE

0.093" orifice
"41" series
SS-41S2



0.125" orifice
"42" series
B-42S4

PATENTED



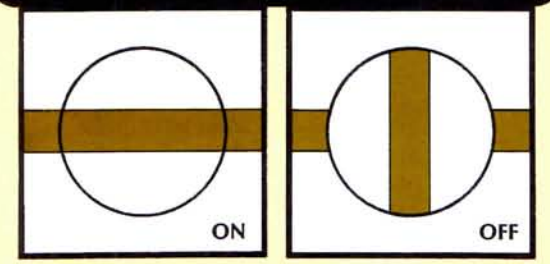
0.187" orifice
"43" series
SS-43S4

PATENTED

0.281" orifice
"44" series
B-44F6

0.406" orifice
"45" series
SS-45S8

TOP VIEW OF DIRECTIONAL HANDLE



DESIGN

WHITEY Ball Valves provide the ultimate in corrosion resistance and reliability in a quick-acting, full-flow design. The unique top-loaded TFE packing seals gas-tight at high or low operating pressures. System pressure is not needed to make the seal. Since the TFE packing fills all voids within the valve body, there are no threads or internal cavities to trap process fluids. This prevents fluids and contaminants from being carried over when cleaning or changeover of the system is required. Metal retaining rings prevent the TFE packing from cold flowing into the valve ports. Ball valves should only be used wide open or fully closed.

APPLICATIONS

All types of instruments • Laboratories and shops • Refineries • Hydraulic and pneumatic piping • Chromatography • Shop air • Gauge shut-off and vent • Control panels • Moderate vacuum systems • High purity systems • Vacuum equipment • Chemical research • Pilot plants • Food processing • High pressure systems • Gas analysis • Test stands • Many other areas of instrumentation and research.

SPECIAL FEATURES

Very low pressure drop for full flow • One-quarter turn from open to closed • Positive machined stops at open and closed positions • Compact, rugged one-piece bar stock body • No internal cavities to trap process fluid • Easily cleaned—Roddable • TFE packing adjustable* without removing valve from system • Color coded, directional handles • Universal mounting nut standard on all valves • SWAGELOK end connections (1/8" thru 1") • Female pipe connections (1/8", 1/4", 3/8" and 1/2") • 100% factory tested.

TECHNICAL DATA

Valve Series	Orifice Size (Inches)	Flow Coefficient, C_v	Pressure Rating @ 70°F	Temperature Rating
41	0.093	0.21	2500 psi	+50 to 150°F
42	0.125	0.40		
43	0.187	1.2	3000 psi	
44	0.281	5.6	2500 psi	
45	0.406	9.8		

*Packing adjustment is shown on Page 8.

BALL VALVES FOR ON-OFF SERVICE

"41" Series 0.093" Orifice		
Maximum Flow for C_V = 0.21		
Pressure Drop to Atmosphere (△P) PSI	Air SCFM @ 70°F	Water GPM @ 70°F
10	2.91	0.66
50	8.03	1.48
100	14.24	2.10

"42" Series 0.125" Orifice		
Maximum Flow for C_V = 0.40		
Pressure Drop to Atmosphere (△P) PSI	Air SCFM @ 70°F	Water GPM @ 70°F
10	5.54	1.26
50	15.30	2.83
100	27.12	4.00

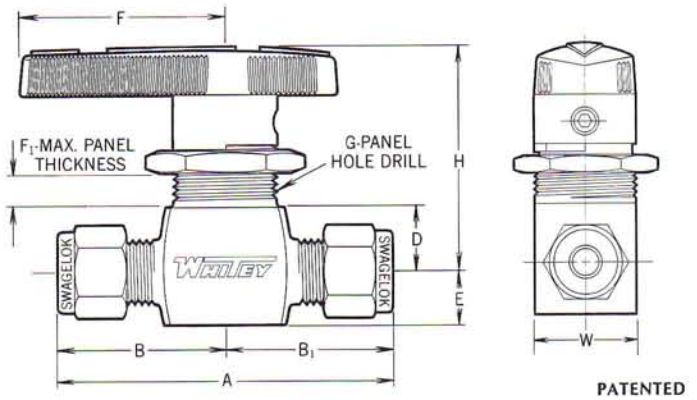
"43" Series 0.187" Orifice		
Maximum Flow for C_V = 1.2		
Pressure Drop to Atmosphere (△P) PSI	Air SCFM @ 70°F	Water GPM @ 70°F
10	16.69	3.79
50	45.44	8.49
100	80.55	12.00

"44" Series 0.281" Orifice		
Maximum Flow for C_V = 5.6		
Pressure Drop to Atmosphere (△P) PSI	Air SCFM @ 70°F	Water GPM @ 70°F
10	77.50	17.71
50	214.20	39.60
100	379.73	56.00

"45" Series 0.406" Orifice		
Maximum Flow for C_V = 9.8		
Pressure Drop to Atmosphere (△P) PSI	Air SCFM @ 70°F	Water GPM @ 70°F
10	135.62	30.99
50	374.84	69.30
100	664.52	98.00

MATERIALS

BODY, STEM—Brass or type 316 stainless steel.
HANDLE—Black nylon with metal position stops is standard; available in optional colors of red, yellow, green and blue.
PACKING—Pure, high-density TFE machined from extruded solid rod.
SUPPORT RINGS—TFE coated 316 stainless steel or TFE coated brass.
ALL OTHER PARTS—Same material as body.



PATENTED

TABLE OF DIMENSIONS

Ball Valves		Connection Size		Dimensions▲									
Catalog Number*	Orifice (Inches)	Inlet	Outlet	A	B	B_1	D	E	F	F_1	G	H	W
-41S2	0.093	1/8 SWAGELOK	1/8 SWAGELOK	2-1/16	1-1/32	1-1/32	11/32	9/32	1-1/8	1/4	19/32	1-11/32	9/16
-42F2	0.125	1/8 Female NPT	1/8 Female NPT	1-5/8	13/16	13/16	11/32	9/32	1-1/8	1/4	19/32	1-11/32	9/16
-42S4	0.125	1/4 SWAGELOK	1/4 SWAGELOK	2-1/4	1-1/8	1-1/8	11/32	9/32	1-1/8	1/4	19/32	1-11/32	9/16
-43F2	0.187	1/8 Female NPT	1/8 Female NPT	2	1	1	7/16	3/8	1-17/32	1/4	25/32	1-9/16	3/4
-43F4	0.187	1/4 Female NPT	1/4 Female NPT	2-1/16	1-1/32	1-1/32	7/16	7/16	1-17/32	1/4	25/32	1-9/16	3/4
-43M4-S4	0.187	1/4 Male NPT	1/4 SWAGELOK	2-7/32	1	1-7/32	7/16	3/8	1-17/32	1/4	25/32	1-9/16	3/4
-43S4	0.187	1/4 SWAGELOK	1/4 SWAGELOK	2-7/16	1-7/32	1-7/32	7/16	3/8	1-17/32	1/4	25/32	1-9/16	3/4
-43S6	0.187	3/8 SWAGELOK	3/8 SWAGELOK	2-5/8	1-5/16	1-5/16	7/16	3/8	1-17/32	1/4	25/32	1-9/16	3/4
-44F4	0.281	1/4 Female NPT	1/4 Female NPT	2-1/2	1-1/4	1-1/4	9/16	9/16	2	3/8	1-1/8	2-1/16	1-1/8
-44F6	0.281	3/8 Female NPT	3/8 Female NPT	2-1/2	1-1/4	1-1/4	9/16	9/16	2	3/8	1-1/8	2-1/16	1-1/8
-44S6	0.281	3/8 SWAGELOK	3/8 SWAGELOK	3-1/8	1-9/16	1-9/16	9/16	9/16	2	3/8	1-1/8	2-1/16	1-1/8
-45F8	0.406	1/2 Female NPT	1/2 Female NPT	3-1/8	1-9/16	1-9/16	11/16	25/32	3	3/8	1-1/2	2-7/16	1-1/2
-45S8	0.406	1/2 SWAGELOK	1/2 SWAGELOK	3-15/16	1-31/32	1-31/32	11/16	25/32	3	3/8	1-1/2	2-7/16	1-1/2
-45S12	0.406	3/4 SWAGELOK	3/4 SWAGELOK	3-15/16	1-31/32	1-31/32	11/16	25/32	3	3/8	1-1/2	2-7/16	1-1/2

*For a complete ordering number, add B for brass or SS for 316 stainless steel as a prefix to the catalog number. Example: SS-42S4, B-45F8.
▲Dimensions shown with SWAGELOK nuts finger-tight, when applicable.

Angle pattern WHITEY Ball Valves are available for drain valves on tanks or drums, manifolds, panel boards, etc., or where unique piping arrangements indicate a need for the angle pattern, such as near corners or walls. They have the same pressure and temperature ratings and C_V as the 3-Way Ball Valves shown on pages 4 and 5.

To order, add -A as a suffix to the straight pattern ball valve part number. Example: SS-43F4-A.

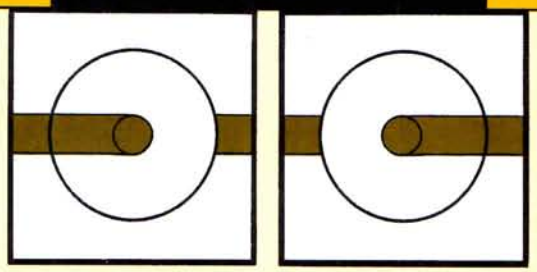
PATENTED

3-WAY BALL VALVES FOR SWITCHING SERVICE

0.125" orifice
"42" series
SS-42XF2

0.187" orifice
"43" series
SS-43XS4

0.281" orifice
"44" series
SS-44XF6



4

PURPOSE

WHITEY 3-Way Ball Valves provide quick operation and full flow on systems where flow needs to be switched.

APPLICATIONS

This design is excellent for either single inlet, double outlet or double inlet, single outlet applications involving corrosive fluids, high or low pressure gases or liquids, slurries and moderate vacuum applications. • Switching manifolds • Parallel-bypass systems • Sampling systems • Fluid mixing • Two sensor read-out systems • Wide range of applications in fluid control and instrumentation.

SPECIAL FEATURES

TFE CAPSULE PACKING—provides a zero dead space body cavity. No internal voids or threads to trap process fluid. Easy system changeover and cleaning. • ADJUSTABLE PACKING—top loaded packing can be adjusted while the valve is on stream, though seldom required. Adjustment can be made without disassembly. See instructions on page 8. • Integral bonnet • Color coded, directional handles • Positive machined stops at both port positions • Universal mounting nut standard • Low pressure drop • 100% factory tested.

TECHNICAL DATA

Valve Series	Orifice Size (Inches)	Flow Coefficient, C_v	Pressure Rating @ 70°F	Temperature Rating
41X	0.093	0.12	2500 psi	+50 to 150°F
42X	0.125	0.32		
43X	0.187	0.75		
44X	0.281	2.0	1500 psi	
45X	0.406	4.2		

"41X" Series 0.093" Orifice		
Maximum Flow for C_v = 0.12		
Pressure Drop to Atmosphere (△P) PSI	Air SCFM @ 70°F	Water GPM @ 70°F
10	1.66	0.38
50	4.54	0.85
100	8.06	1.20

"42X" Series 0.125" Orifice		
Maximum Flow for C_v = 0.32		
Pressure Drop to Atmosphere (△P) PSI	Air SCFM @ 70°F	Water GPM @ 70°F
10	4.43	1.01
50	12.23	2.26
100	21.70	3.20

3-WAY BALL VALVES FOR SWITCHING SERVICE

"43X" Series 0.187" Orifice		
Maximum Flow for C_v = 0.75		
Pressure Drop to Atmosphere (△P) PSI	Air SCFM @ 70°F	Water GPM @ 70°F
10	10.38	2.37
50	28.69	5.30
100	50.86	7.50

"44X" Series 0.281" Orifice		
Maximum Flow for C_v = 2.0		
Pressure Drop to Atmosphere (△P) PSI	Air SCFM @ 70°F	Water GPM @ 70°F
10	27.68	6.32
50	76.50	14.14
100	135.62	20.00

"45X" Series 0.406" Orifice		
Maximum Flow for C_v = 4.2		
Pressure Drop to Atmosphere (△P) PSI	Air SCFM @ 70°F	Water GPM @ 70°F
10	58.12	13.28
50	160.65	29.70
100	284.80	42.00

MATERIALS

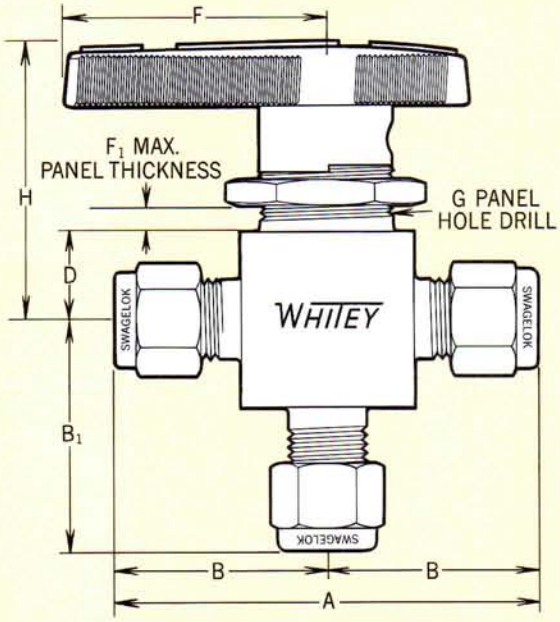
BODY, STEM—Brass or type 316 stainless steel.

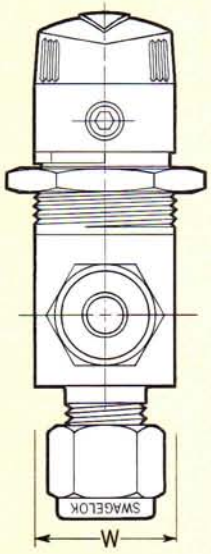
HANDLE—Black nylon with metal position stops is standard; available in optional colors of red, yellow, green and blue.

PACKING—Pure, high-density TFE machined from extruded solid rod.

SUPPORT RINGS—TFE coated 316 stainless steel or TFE coated brass.

ALL OTHER PARTS—Same material as body.





PATENTED

TABLE OF DIMENSIONS

3-Way Ball Valves		Connection Size		Dimensions▲								
Catalog Number*	Orifice (Inches)	Side Ports	Bottom Port	A	B	B_1	D	F	F_1	G	H	W
-41XS2	0.093	1/8 SWAGELOK	1/8 SWAGELOK	2-1/16	1-1/32	1-1/32	11/32	1-1/8	1/4	19/32	1-11/32	9/16
-42XF2	0.125	1/8 Female NPT	1/8 Female NPT	1-5/8	13/16	13/16	11/32	1-1/8	1/4	19/32	1-11/32	9/16
-42XS4	0.125	1/4 SWAGELOK	1/4 SWAGELOK	2-1/4	1-1/8	1-1/8	11/32	1-1/8	1/4	19/32	1-11/32	9/16
-43XF4	0.187	1/4 Female NPT	1/4 Female NPT	2-1/16	1-1/32	1-1/32	7/16	1-17/32	1/4	25/32	1-11/16	3/4
-43XS4	0.187	1/4 SWAGELOK	1/4 SWAGELOK	2-7/16	1-7/32	1-7/32	7/16	1-17/32	1/4	25/32	1-11/16	3/4
-43XS4-S4-M4	0.187	1/4 SWAGELOK	1/4 Male NPT	2-7/16	1-7/32	1-1/32	7/16	1-17/32	1/4	25/32	1-11/16	3/4
-44XF4	0.281	1/4 Female NPT	1/4 Female NPT	2-1/2	1-1/4	1-1/4	9/16	2	3/8	1-1/8	2-1/16	1-1/8
-44XF6	0.281	3/8 Female NPT	3/8 Female NPT	2-1/2	1-1/4	1-1/4	9/16	2	3/8	1-1/8	2-1/16	1-1/8
-44XS6	0.281	3/8 SWAGELOK	3/8 SWAGELOK	2-15/16	1-15/32	1-15/32	9/16	2	3/8	1-1/8	2-1/16	1-1/8
-45XF8	0.406	1/2 Female NPT	1/2 Female NPT	3-1/8	1-9/16	1-9/16	11/16	3	3/8	1-1/2	2-7/16	1-1/2
-45XS8	0.406	1/2 SWAGELOK	1/2 SWAGELOK	3-1/2	1-3/4	1-3/4	11/16	3	3/8	1-1/2	2-7/16	1-1/2
-45XS12	0.406	3/4 SWAGELOK	3/4 SWAGELOK	3-1/2	1-3/4	1-3/4	11/16	3	3/8	1-1/2	2-7/16	1-1/2

*For a complete ordering number, add B for brass or SS for 316 stainless steel as a prefix to the catalog number. Example: B-42XS4, SS-43XF4.
▲Dimensions shown with SWAGELOK nuts finger-tight, when applicable.

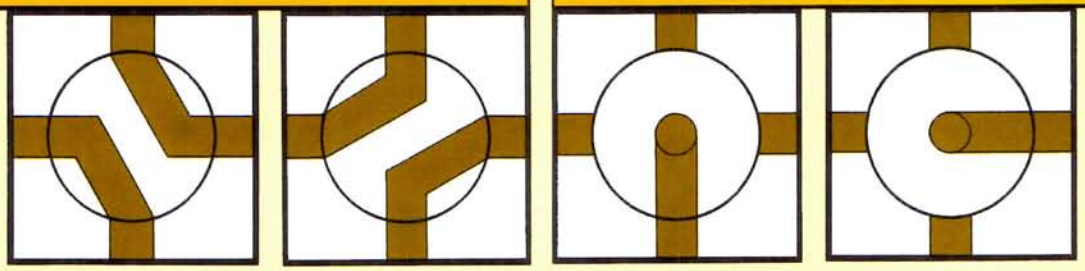
MULTI-PORT BALL VALVES

4-Way Ball Valve
"43Y" Series
SS-43YF2

PATENTED

5-Way Ball Valve
"43Z" Series
SS-43ZF2

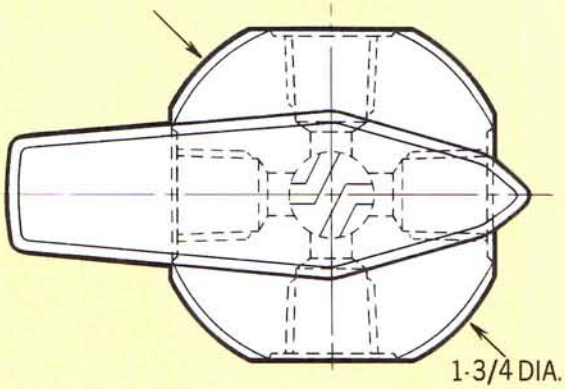
PATENTED

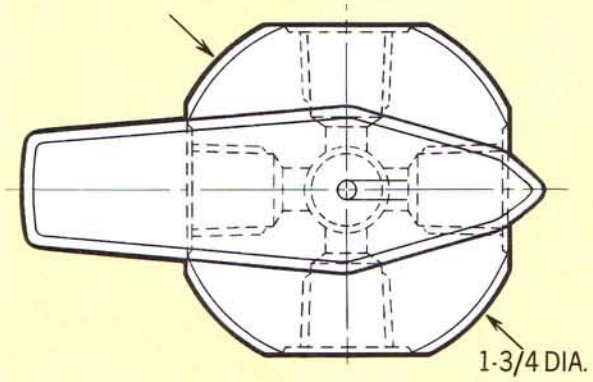


PURPOSE

4-Way and 5-Way Ball Valves provide the ability to direct a number of flows or pressures through a single valve. The unique WHITEY BALL Valve design makes reliable control possible in an extremely compact and versatile package.

WHITEY multi-port valves are dependable on the most critical applications with pressurized gases, liquids and corrosives. They may also be used on moderate vacuum applications since system pressure *is not* required to seal the valve.





APPLICATIONS

4-Way

The WHITEY 4-Way Ball Valve has a double-ported ball and is used for the crossover of two streams. Operation of a double-acting cylinder is a typical example. This valve can be used in place of a three valve manifold in equalizing pressure across many instruments.

5-Way

The WHITEY 5-Way Ball Valve has an angle-ported ball and is used as a selector valve. Pressure or fluid in the bottom port can be directed to any of four different outlets. Another application is where four fluids, pressures or a combination of liquids and gases need to be selected individually and directed toward a common outlet.

OPERATION

Rotate the directional handle in 90° increments to select the desired port with the 5-Way valve. With the spring loaded detent, you can feel and hear when the handle is properly positioned, even when the valve body is behind a panel. The 4-Way valve has built-in stops since only a 90° rotation of the handle is required for switching.

NOTE: Other porting configurations for both the 4-Way and 5-Way valves are available on special order. Ask for *WHITEY Technical Bulletin No. 25* for additional information.

SPECIAL FEATURES

ONE PIECE BAR STOCK BODY — the integral bonnet construction combines strength and compactness with a minimum of seal points. • TFE CAPSULE PACKING — the one piece ball stem is completely encapsulated in TFE to provide a zero dead space body cavity. This prevents trapped fluids and contaminants from being carried over when cleaning or changeover of system is required. • COLOR-CODED HANDLES — black nylon directional handle is standard. Optional colors of red, yellow, green and blue are available for coded panels. • HANDLE STOPS — a machined insert providing a positive 90° stop is standard on the 4-Way Ball Valve. A spring loaded detent for proper handle positioning is standard on all 5-Way Ball Valves. Neither design interferes with mounting the valve. • TOP LOADED PACKING — this unique feature allows packing adjustment while the valve is on stream. • DIRECTIONAL NAME PLATES — a real asset with panel board installations, these directional name plates are furnished as standard with all WHITEY 4-Way and 5-Way Ball Valves. The plates are supplied with a washer which allows mounting on the valve, and with an adhesive back for direct adhesion to a panel board. The plates have a matte surface for writing instructions or attaching a label or decal. • MOUNTING NUT — a universal mounting nut is standard for simple, convenient mounting of the valve to a panel or bracket. • 100% FACTORY TESTED — each valve is tested at the factory to be leak-tight at all seals. • END CONNECTIONS — all valves have 1/8" female NPT pipe threads. The ends are faced off to allow the use of SWAGELOK Pipe Thread O-Seal Adapters or Connectors which provide a selection of SWAGELOK Tube Fitting ends for 1/16" through 3/8" O.D. tubing. On special order, 1/8" female SWAGELOK connections can be supplied for applications such as chromatography.

TECHNICAL DATA

Valve Series	Orifice Size (Inches)	Flow Coefficient, C_v	Pressure Rating @ 70°F	Temperature Rating
43Y 4-Way	0.062	0.077	2500	+50 to 150°F
43Z 5-Way		0.070		

"43Y" Series 0.062" Orifice		
Maximum Flow for C_v = 0.077		
Pressure Drop to Atmosphere (△P) PSI	Air SCFM @ 70°F	Water GPM @ 70°F
10	1.07	0.24
50	2.94	0.54
100	5.22	0.77

"43Z" Series 0.062" Orifice		
Maximum Flow for C_v = 0.070		
Pressure Drop to Atmosphere (△P) PSI	Air SCFM @ 70°F	Water GPM @ 70°F
10	0.97	0.22
50	2.68	0.49
100	4.74	0.70

MATERIALS

BODY, STEM—Brass or type 316 stainless steel.

HANDLE—Black nylon is standard; available in optional colors of red, yellow, green and blue.

PACKING—Pure, high-density TFE machined from extruded solid rod.

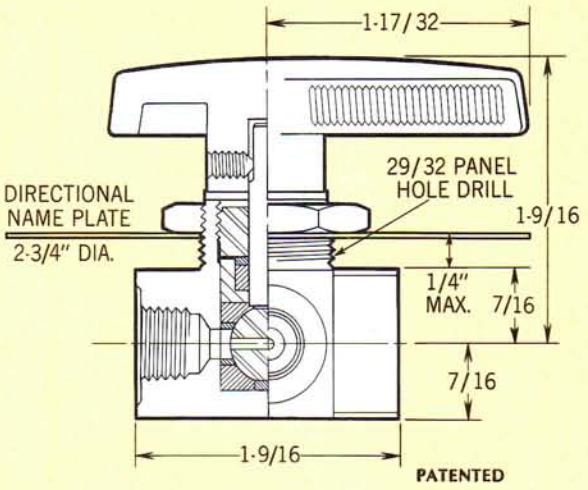
SUPPORT RINGS—TFE coated 316 stainless steel or TFE coated brass.

DETENT—Spring; music wire—all other parts stainless steel.

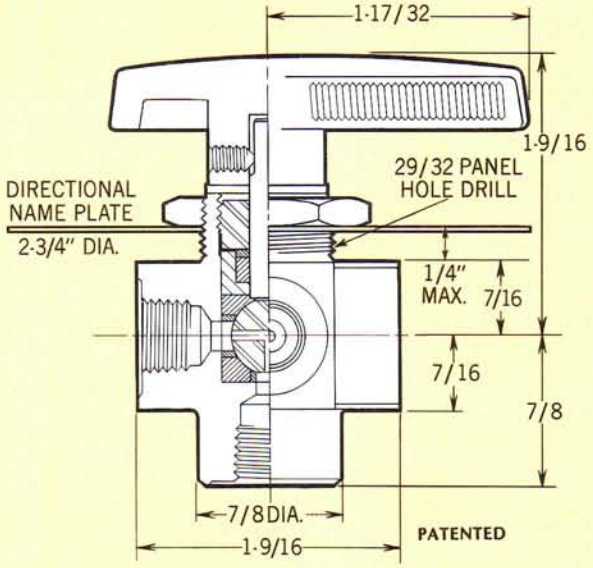
DIRECTIONAL NAME PLATES—Aluminum (black on silver).

ALL OTHER PARTS—Same material as body.

DIMENSIONS



4-Way
-43YF2*



5-Way
-43ZF2*

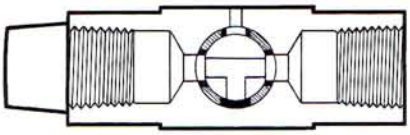
*Prefix B for brass and SS for 316 stainless steel.

BALL VALVES WITH DOWNSTREAM VENT

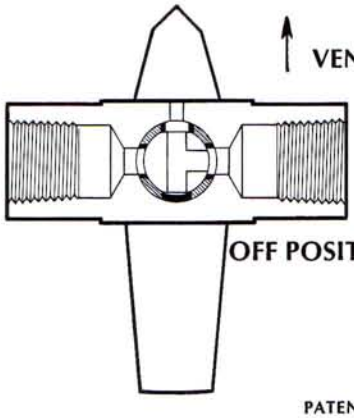
WHITEY brass & 316 stainless steel Ball Valves can be supplied with special porting to provide a "downstream vent" as shown in the illustrations. When the valve is in the "on" position, pressure is applied to the gauge or instrument. As soon as the handle is switched to the vent position, downstream pressure from the gauge or instrument is automatically vented to atmosphere through a side port in the valve body. The upstream port is closed to fluid flow.

The downstream vent is used with air or an inert gas to relieve pressure prior to removal of an instrument, to vent a gauge prior to taking a new pressure reading or in series with a check valve to prevent mixing of fluids.

To order WHITEY Ball Valves with downstream vent, simply insert a "V" in the part number. Example: B-41VS2, SS-42VS4, SS-43VF4.



FLOW → ON POSITION



PATENTED

TECHNICAL DATA

BALL PORTING: All standard orifice sizes.

VENT PORT: Same as Ball Porting.

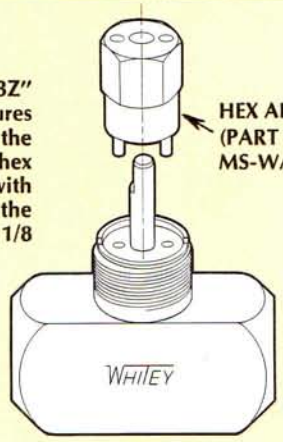
PRESSURE RATING: 500 psi.

TEMPERATURE RATING: +50 to 150°F.

AVAILABLE WITH: All WHITEY standard orifice size brass and 316 stainless steel Ball Valves.

PACKING ADJUSTMENT

For the "43, 43A, 43X, 43Y and 43Z" Series Ball Valves, WHITEY manufactures a special hex adapter for use with the valve handle removed. Use a 3/32" hex key to remove the handle. Tighten with a wrench in 1/8 turn increments until the valve has resealed. Usually, the first 1/8 turn is sufficient.



For all other WHITEY Ball Valves, packing adjustment can be accomplished by simply removing the handle and turning the PACKING BOLT clock-wise. Wrench sizes and nominal torque values are shown in the table below.

Valve Series	Orifice (Inches)	Nominal Packing Bolt Torque (In. Lbs.)		Handle Hex Key Size (In.)	Packing Screw or Hex Adapter Wrench Size (In.)
		Brass	316 Stainless Steel		
41, 41V, 41X	0.093	10	15	1/16	5/16
42, 42V, 42X	0.125	10	15	1/16	5/16
43, 43A, 43X	0.187	50	70	3/32	9/16
43Y, 43Z	0.062	50	70	3/32	9/16
44, 44X	0.281	65	125	3/32	1/2
45, 45X	0.406	150	225	1/8	5/8

NOTE: Torque values given are for 1,000 psi service. For higher pressure, adjust packing in 1/8 turn increments until leak-tight as with conventional stem packings. Excessive overtightening may shorten valve life.

ADDITIONAL BALL VALVE LITERATURE


WHITEY technical bulletin no.25

WHAT'S NEW IN WHITEY BALL VALVES?

Ask for WHITEY Technical Bulletin No. 25 for complete additional information on: Other patterns with vents • Different stem drilling configurations • 6 and 7-Way patterns • Directional name plates.

8

Your Local Sales & Service Representative:

10-73-125M-100M-CL

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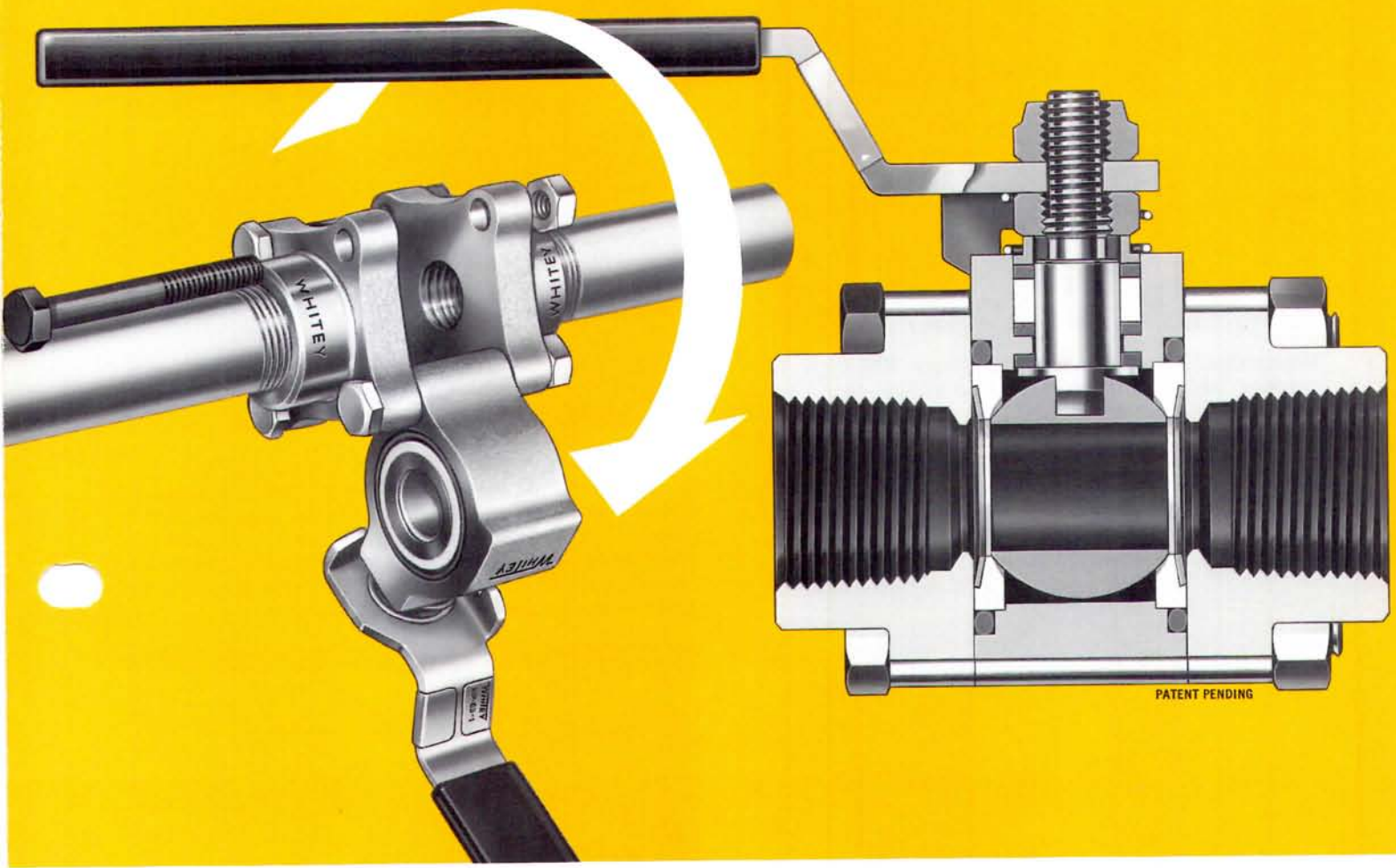
WHITEY® "63" SERIES SWING-OUT BALL VALVES



PURPOSE

The WHITEY "63" Series Swing-Out Ball Valve fills the need for a compact, reliable, full flow ball valve adaptable to a variety of piping systems. The new three-piece design offers a simple swing-out feature for fast, easy, low-cost maintenance. The special seat design provides leak-tight sealing at both high and low pressures.

APPLICATIONS

Applications are found in all types of on-off service where high capacity and quick, positive shut-off are required. Chemical plants, refineries, power plants, laboratories and most manufacturing plants are typical users of the WHITEY "63" Series Swing-Out Ball Valve. Applications in the process industries include latex lines, acid lines, treated water lines, inert gas lines and glue lines. Other industrial applications include natural gas, steam lines, paint lines, sprinkler systems, use on tankers, gas manifolds, and hydraulic and air lines of all types.

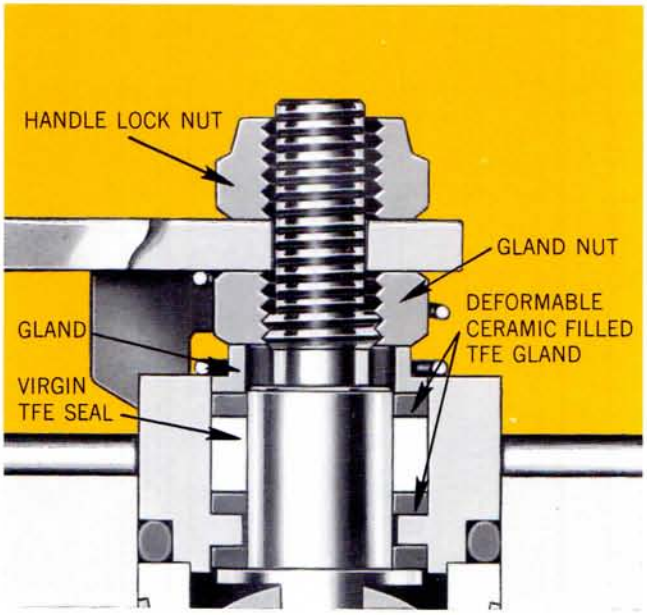
OPERATION

Rotate the directional handle 1/4 turn from full open to full leak-tight closure. Operating torque is low at all service pressures. The rugged handle stops against the body to maintain alignment of the ball and achieve full flow through the valve.

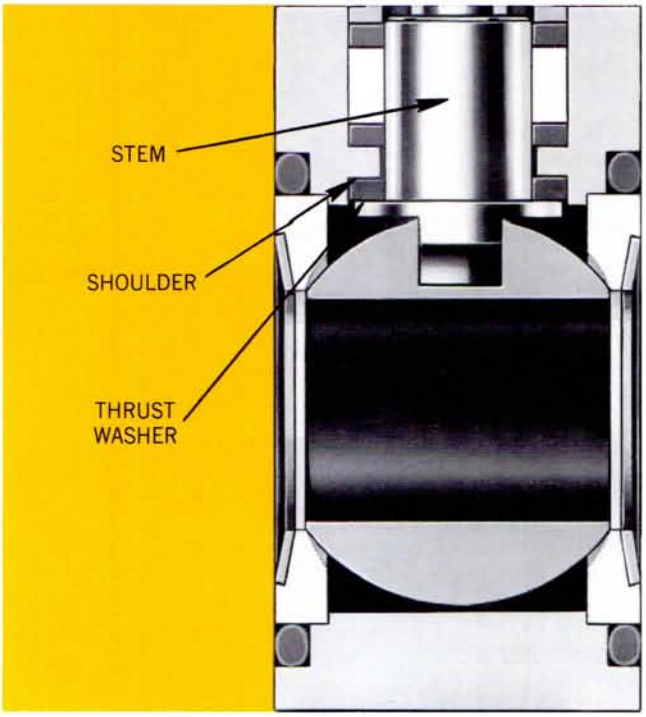
SPECIAL FEATURES

Engineered for Easy Maintenance

Fast, Swing-out Design – Maintenance is quick and simple and can be accomplished without removing the valve from the system. Remove the **one black bolt** and loosen the other three nuts. Swing the body (center section) out and perform the required maintenance of the seats or cleaning. Swing the body back in and replace the **black bolt** and tighten all nuts. Note that the flange faces are flat so all maintenance can be done without moving the piping. Each valve is a union. (Complete maintenance information is covered on the "Service Instructions" sheet supplied with each valve).



Adjustable Three-piece Stem Packing – The virgin TFE packing seal is supported top and bottom by ceramic filled TFE deformable glands. This system prevents extrusion of the virgin TFE seal and promotes long cycle life. The packing is easily adjusted with the valve on-stream. Simply hold the stem with the handle, loosen the lock nut and adjust the gland nut. Retighten the lock nut.



Blowout Proof Stem – The stem is installed from the inside of the body. A shoulder on the stem rides against a thrust washer which is supported by a shoulder in the body. Thus the stem cannot be blown out by internal pressure surges, nor can it be removed accidentally by removing external nuts or fasteners. This provides an extra margin of safety in critical systems.

Seal Service Kit – WHITEY TFE-6-63KIT Seal Service Kits can be used on either brass or stainless steel valves to reduce user inventories. This kit contains replacements for all wearing parts; the ball seats, stem packing and flange seals. A spare flange nut and two coned disc springs are included for convenience. Other spare parts are available upon request.

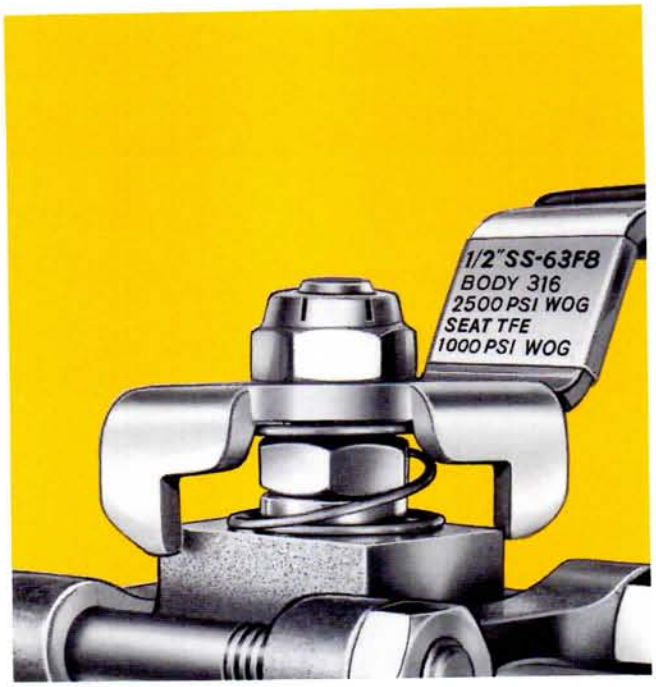
Engineered for Safety

Burst Proof Body – The flange joints are designed to yield and relieve excess pressure well below the burst pressure of the body. Joints are designed to withstand five times the maximum rated pressure of the valve before yielding.

Clamping Bolts Exposed for Safety – High tensile bolts clamp the flanges to the body. Three of the plated bolts are exposed to permit inspection for environmental corrosion. Of the three, only the **black bolt** need be removed when maintenance is required. The exposed bolts are protected from installation damage by a wrench pad on the body.

WHITEY® "63" SERIES SWING-OUT BALL VALVES

Color Coded Handles — Black vinyl sleeves are standard. Four other bright colors are available for system indentification.



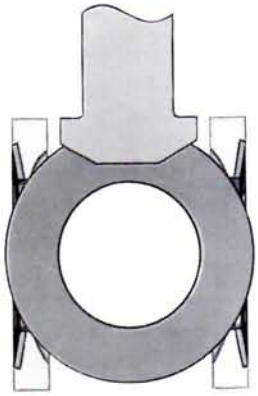
Grounded Stem — A stainless steel spring assures electrical contact between the stem and body, preventing sparks which can occur in ungrounded valves. This is standard on all "63" Series valves.

Engineered for Reliability

Full Porting — The compact "63" Series valves feature a 0.516" orifice. Flow restriction is minimized and the valve can be rodded-out for easy cleaning, using a 1/2" diameter rod.

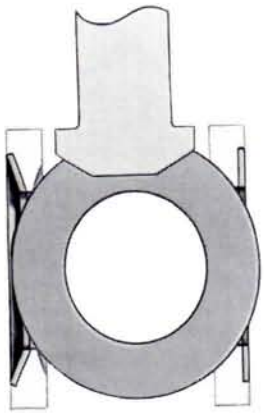
Three Piece Body — The three body pieces are machined from high quality extruded bar stock, providing the greatest material strength and safety margins.

Unique Seat Design — The seats in the WHITEY "63" Series valves are supported by a small stainless steel coned disc spring. This provides a positive sealing force at low pressure and elasticity to the sealing system. It also resists creep or cold flow of the seal member.



LOW PRESSURE OR VACUUM

At **low pressure,** the spring provides enough force to form a narrow line contact seal between the ball and the plastic seat. Both upstream and downstream seats are sealed. Operating torque is low and wear is minimized because of the low sealing force.



HIGH PRESSURE

At **high pressure,** the spring supporting the downstream seat flexes so that the entire seal area of the plastic seat supports the high force generated by pressure on the ball. Since the upstream plastic seat lightly contacts the ball, wear and operating torque are minimized.

This unique seat design results in a ball valve seat which seals reliably at **all** pressures and automatically compensates for wear and thermal expansion. This design overcomes the weakness of ordinary ball valve seats caused by poor elasticity and high creep of plastics. The standard TFE seating surfaces provide the outstanding characteristics of low friction and universal chemical resistance.

Contained Flange Seals — The flanges are sealed to the center body section with O-Rings which are fully contained and seal independently of the ball seat.

Self-lubricating Thrust Washer — The stem rides on a molybdenum disulphide filled TFE thrust washer, providing lower operating torques and longer life.

Broad Temperature Range — The valve may be used at system temperatures from -20°F to +450°F. (See Pressure vs Temperature Curve).

100% Factory Tested — Each valve is individually tested after assembly for leak tightness at the ball seats, stem packing and at all flange joints.

Special Packaging — All valves are sealed in polyethylene bags to prevent dirt and contamination from entering the valves.

MATERIALS

PART	316 SS VALVES	BRASS VALVES
Body, Flanges, Ball, Stem, Gland	316 SS	Brass
Stem Packing	TFE	
Deformable Glands	Ceramic filled TFE	
Stem Thrust Washer	Molybdenum disulphide filled TFE	
Ball Seats	TFE	
Coned Disc Springs	316 SS	
Flange Seals	Viton O-Rings	
Flange Bolts and Nuts, Gland Nut, Handle Nut and Handle	Steel, cadmium plated*	
Grounding Spring, Nameplate	302 SS	
Handle Grip	Vinyl; black, standard; red, yellow, green and blue, optional.	

*Corrosion resistant exterior component kits are available on special order.

WHITEY® "63" SERIES SWING-OUT BALL VALVES

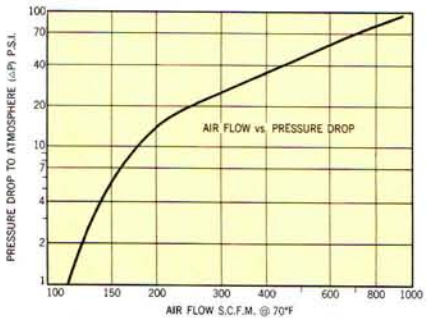
TECHNICAL DATA

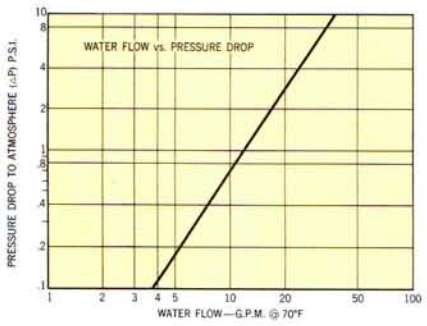
RATINGS	316 SS	Brass
Orifice size (inches)	0.516	0.516
Flow coefficient, Cv	12	12
Body and flange assembly ratings		
Working pressure @ 100°F	2500 psi (max)	1500 psi (max)
Hydrostatic test pressure ①	3750 psi (max)	2250 psi (max)
Burst pressure ②	12,500 psi (min)	7500 psi (min)
Vacuum	10^{-3} torr	10^{-3} torr
TFE seat ratings		
Working pressure @ 100°F ③	1000 psi (max)	1000 psi (max)
Working pressure (saturated steam)	150 psi (max)	150 psi (max)
Vacuum	1 torr	1 torr
Temperature °F	-20 to +450	-20 to +400

Maximum Flow for Cv = 12		
Pressure Drop to Atmosphere (△P) PSI	Air SCFM @ 70°F	Water GPM @ 70°F
10	165	38
50	460	85
100	815	120

① Test pressure with valve half open.
② Minimum pressure at which flange joints will yield and relieve internal pressure.
③ Valve seat rating is the maximum differential pressure across the valve, fully closed.

FLOW CAPACITY CURVES





PRESSURE TEMPERATURE RATINGS

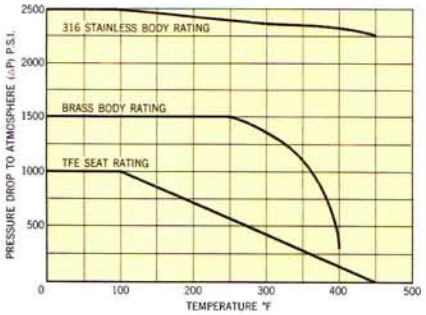
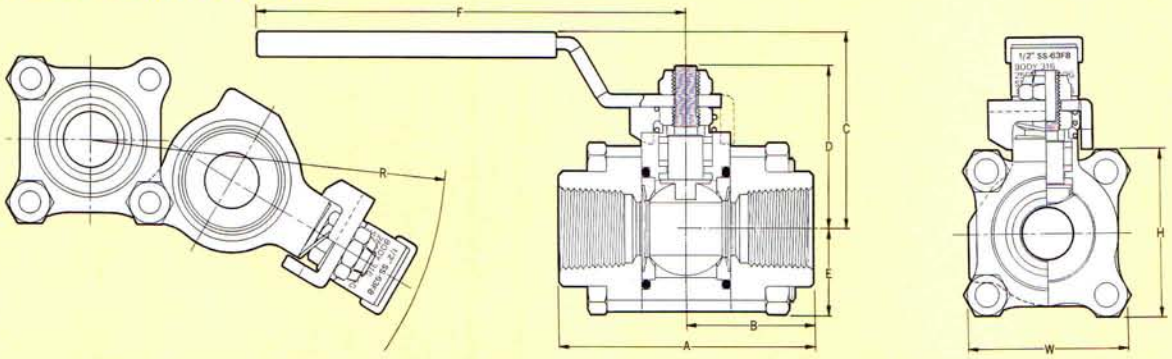


TABLE OF DIMENSIONS



SWING-OUT BALL VALVES		CONNECTION SIZE	DIMENSIONS								
Catalog Number*	Orifice (inches)	Inlet and Outlet	A	B	C	D	E	F	H	R	W
-63F8	0.516	1/2 Female NPT	2-11/16	1-11/32	2-1/16	1-3/4	7/8	4-9/16	1-3/4	3-13/16	1-3/4

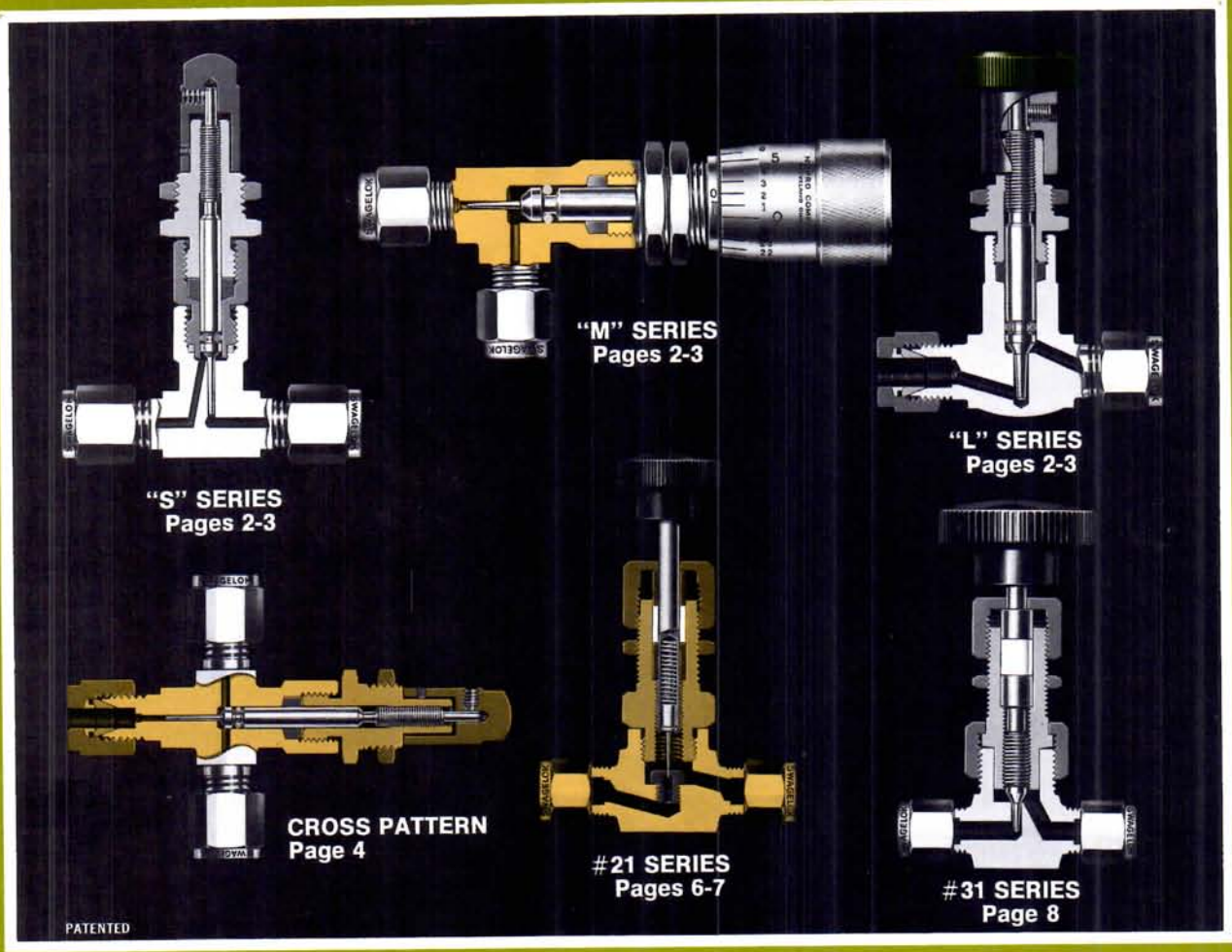
*For a complete ordering number, add B for brass or SS for 316 stainless steel as a prefix to the catalog number. Example: B-63F8, SS-63F8

VITON—T.M. DuPont

WHITEY COMPANY 5679 Landregan Street, Oakland, California 94662
YOUR LOCAL SALES & SERVICE REPRESENTATIVE

PRINTED IN U.S.A.
4-74-100M-125M-CL

FINE METERING VALVES



GENERAL FEATURES

- Accurate, Repeatable Flow Adjustment
- No Initial Flow Surge
- Integral SWAGELOK Tube Fitting Connections
- Compact, Low Dead Space Designs
- Vacuum to 5000 PSI
- 100% Factory Tested
- Temperatures to 450°F
- Vernier Handles
- Ease of Mounting
- Variety of:
  - Materials
  - Flow Capacities
  - Connection Sizes
  - Models and Patterns

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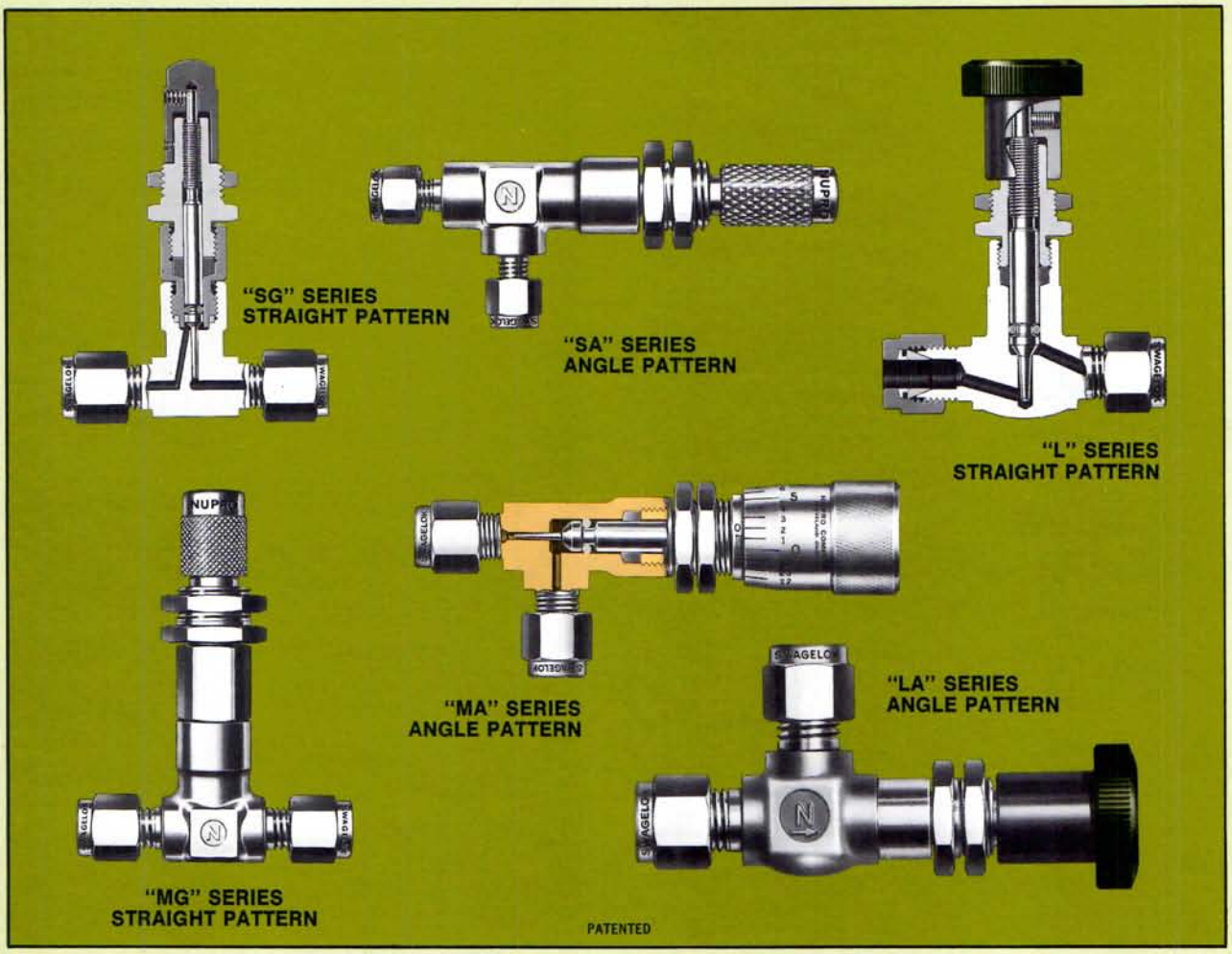


PURPOSE

NUPRO stabilized "S", "M", and "L" Series Fine Metering Valves are designed to control gas and liquid flow rates precisely in laboratory and other critical processes. Special consideration has been given to easy, accurate setting and maintaining given flow conditions using a minimum number of turns. The simplicity of the NUPRO design assures extremely low dead space with internal voids reduced to an absolute minimum.

OPERATION

VERNIERS

All NUPRO Fine Metering Valves are operated simply by turning the knurled handle. Vernier handles are available for all series and patterns to provide repeatable flow adjustment when desired. *(See Page 4 for complete information.)*

"S" SERIES DEAD STOP

A dead-stopped handle is standard on all patterns of the "S" Series Very Fine Metering Valves. This prevents damage to the small tapered needle and 0.031″ orifice. Operating instructions are included with each valve.

STABILITY

All NUPRO Fine Metering Valves are equipped with a glass filled TFE guide ring which improves stability in setting flows. The small gap between the bonnet and body or body extension is intentional. After many working cycles, you can renew the valve stability just by retightening the bonnet hex. Complete instructions are included with each valve.

MOUNTING

Panel or bracket mounting is effected without removing the valve cap on "S" and "M" series. ("L" series valves require handle removal.) Simply remove the jam nut and push the valve through a hole in the panel or bracket. The correct hole size is shown on *Page 5.* Next, slip the jam nut over the cap in front of the panel or bracket and tighten.

APPLICATIONS

Carrier gas control on gas chromatographs • Fluid control in analyzers and sampling systems • Gravity feed systems in laboratories • Variable orifice devices to protect sensitive instruments and gauges from pressure surges • Burettes in chemical and medical research • Speed control on pneumatic and hydraulic systems • Clean rooms • Bleeds into vacuum systems • Gas mixing • Flow control in sensing instruments • Gas control in medical and dental equipment • Inert gas leak valve for sputtering equipment • Fluid control in pollution monitoring devices • Feed systems on mass spectrometers • Any fluid system requiring fine flow control.

SPECIAL FEATURES

Excellent flow control—no initial flow surge • Minimum dead space • Valve stability assured • Easy mounting • Threads removed from system • Stainless steel stems in all valves • Fine pitch threads never uncovered • Safety back stop • Dust-proof cap • Lock screw on "S" and "M" series • SWAGELOK connections • Vernier handles • Choice of materials, flow capacities and patterns.

MATERIALS

***BODY*—Brass, Monel ("S" and "M" series only) or type 316 stainless steel**

***STEM*—Hardened 17-4PH stainless steel in "S" series valves. "M" and "L" use type 316 stainless steel. Monel in Monel valves**

***O-RING**—Buna "N" in brass; Viton in stainless and Monel; Other materials furnished on request**

***GUIDE RING**—Glass filled TFE**

***BODY SEAL*—Buna "N" in brass; Viton in stainless and Monel ("SG" and "MG" straight pattern; "SGD" and "MGD" double pattern).**

***JAM NUT*—Same material as body except Monel valves use stainless steel**

***CAP*—Same material as body in "S" and "M" series except Monel valves use stainless steel; Green phenolic plastic with black anodized aluminum insert in "L" series**

***ALL OTHER PARTS*—Same material as the valve body**

***PLATING* — Brass bodies are cadmium plated. Brass bonnets, body extensions, jam nuts, and caps are silver mist chrome plated**

***For corrosive applications, NUPRO "S", "M", and "L" Series Metering Valves can be supplied with a three piece TFE packing system in place of the glass filled TFE guide ring. No O-Ring is used. This unique packing system has ceramic filled TFE outer glands which prevent extrusion or cold flow of the virgin TFE center seal ring, providing a reliable positive seal. *Add-TFE as a suffix to the part number when this packing is required.* Straight and double pattern "S" and "M" series valves use a virgin TFE body seal with this packing system.**

TECHNICAL DATA

NUPRO FINE METERING VALVES	"S" SERIES	"M" SERIES	"L" SERIES
Orifice Diameter	0.031 inches	0.055 inches	0.125 inches
Stem Taper (Included Angle)	1°	3°	5°
Number of Turns To Open	8 to 12	8 to 10	10 to 11
Dead Stop Handle	yes	not req'd	not req'd
Use for Shut-off	no	no	yes
Dead Space (Approximate)	0.006 cu. in.	0.028 cu. in.	0.035 cu.in.
Flow Coefficient	$C_v = 0.004$	$C_v = 0.03$	$C_v = 0.15$
Pressure Limits	2000 PSI @ 70°F	1000 PSI @ 70°F ■	1000 PSI @ 70°F ■
Temperature Limits▲	Brass with Buna "N" Seals—General: -40° to 300°F—With Alkalies: -40° to 158°F Stainless Steel with Viton Seals: -40° to 400°F		

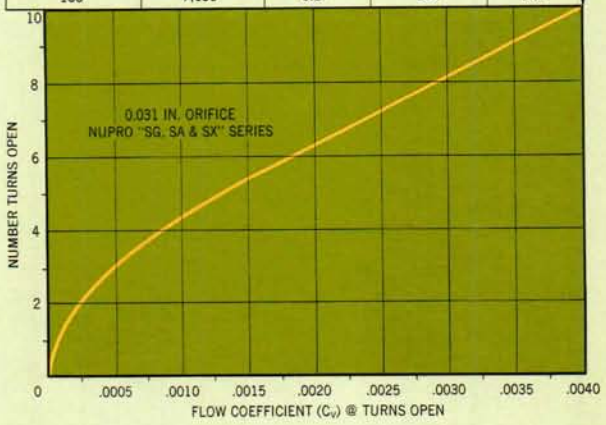
■ **Strength limitations of fine pitch threads and high operating torque restrict downstream pressure to 500 PSI on "M" and "L" Series when valves require adjustment at pressure.**

▲ **Ask about NUPRO Bellows Metering and Bellows Regulating Valves for higher temperature service.**

FLOW CAPACITY

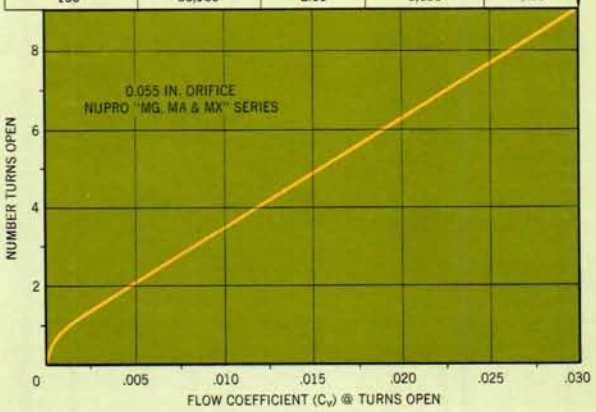
MAXIMUM FLOW FOR $C_V = 0.004$

PRESSURE DROP TO ATMOSPHERE (△P) PSI	AIR		WATER	
	SCC/min. @70°F	SCFM @70°F	CC/min. @70°F	GPM @70°F
10	1,700	0.06	38	0.01
50	4,250	0.15	114	0.03
100	7,650	0.27	151	0.04



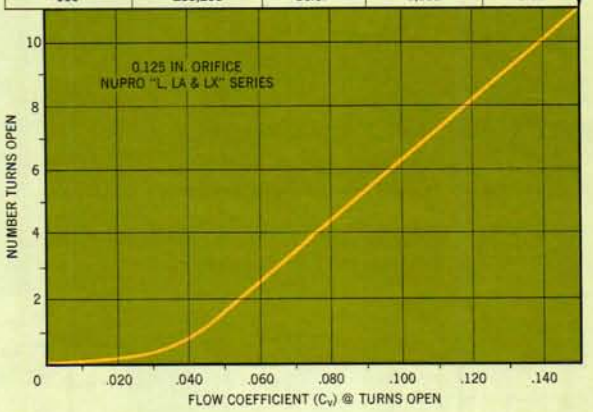
MAXIMUM FLOW FOR $C_V = 0.03$

PRESSURE DROP TO ATMOSPHERE (△P) PSI	AIR		WATER	
	SCC/min. @70°F	SCFM @70°F	CC/min. @70°F	GPM @70°F
10	11,900	0.42	341	0.09
50	32,300	1.14	795	0.21
100	56,900	2.01	1,135	0.30

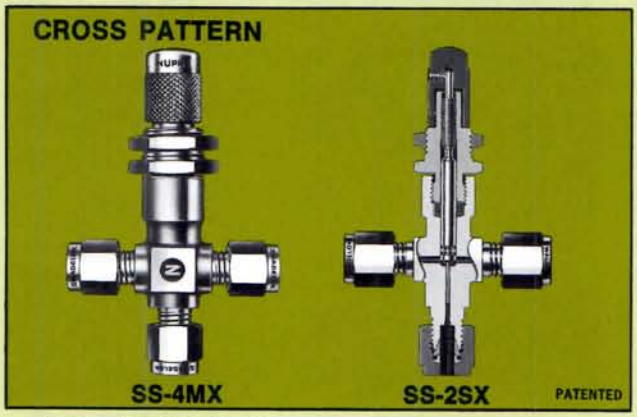


MAXIMUM FLOW FOR $C_V = 0.15$

PRESSURE DROP TO ATMOSPHERE (△P) PSI	AIR		WATER	
	SCC/min. @70°F	SCFM @70°F	CC/min. @70°F	GPM @70°F
10	58,900	2.08	1,780	0.47
50	160,900	5.68	4,010	1.06
100	285,200	10.07	5,680	1.50



CROSS PATTERN



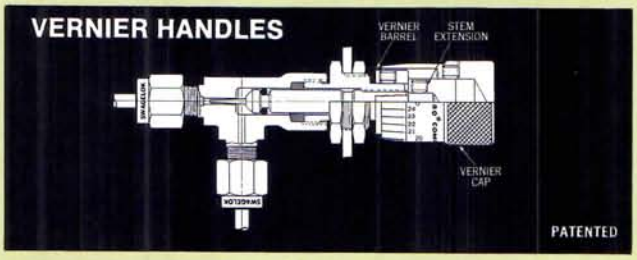
PURPOSE *("SX", "MX", AND "LX" SERIES)*

NUPRO Cross Pattern Fine Metering Valves save space, tubing and fittings. They can be used in place of manifolds when series or parallel installations of metering valves are required. Usage as a sampling valve on a mass spectrometer is another proven application. Installing the Cross Pattern Valve in place of the angle pattern often eliminates a tee, cuts installation costs and saves instrument space.

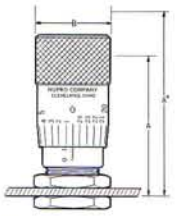
OPERATION

Visualize the Cross Pattern Valve as a tee with the branch port being a variable orifice. Flow through the branch port can be metered in either direction. Flow around the stem occurs between the side ports, even with the valve closed. Technical data, materials, special features, and flow capacities are shown on *Pages 2 and 3.*

VERNIER HANDLES

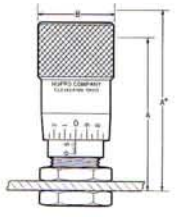


"M" SERIES AND "L" SERIES



Can be read to 1 thousandth of an inch

"S" SERIES



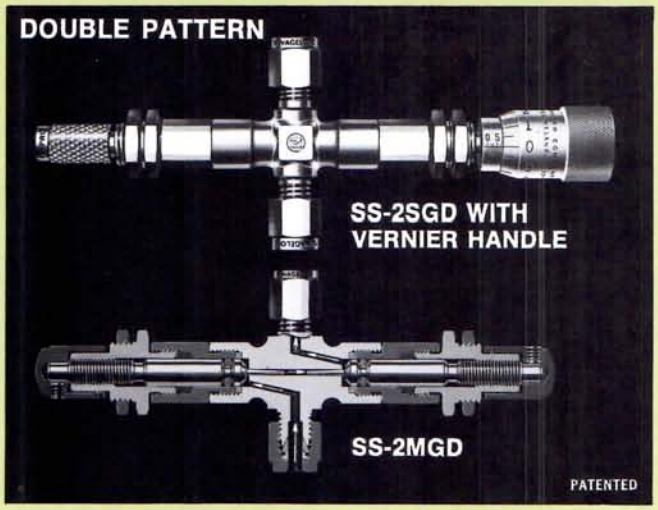
Can be read to 1/20 of a turn

Vernier handles are available for all patterns of NUPRO "S", "M", and "L" Series Metering Valves. The calibrated handle can be set at zero with the valve closed. As the valve is opened, the number of turns or the axial position of the stem can be determined. This provides an accurate method of resetting flow rates. The drawing illustrates a vernier handle kit set as a deadstop to prevent overtightening of the precision needle stem. Simply slide the vernier barrel on the bonnet. Attach the stem extension and lightly close the valve. (If possible, adjust the valve stem position on "S" or "M" Series Valves slightly below your minimum flow requirement and use a back-up valve for on-off service.) Next move the vernier barrel back against the stem extension and lock in place. Align the vernier cap to the zero reading, lock in place and the valve is ready for trouble-free operation.

All vernier handles are type 316F stainless steel with silver mist chrome plating. To panel mount a valve with a vernier handle, it is necessary to remove the vernier components and replace them as described above.

VERNIER HANDLE DIMENSIONS		
	"S" SERIES	"M" & "L" SERIES
A CLOSED	$1\frac{23}{64}$	$1\frac{15}{32}$
A* OPEN	$1\frac{39}{64}$	$1\frac{23}{32}$
B DIA.	$\frac{11}{16}$	$\frac{13}{16}$
HEX KEY SIZE	$\frac{1}{16}$	$\frac{5}{64}$

DOUBLE PATTERN



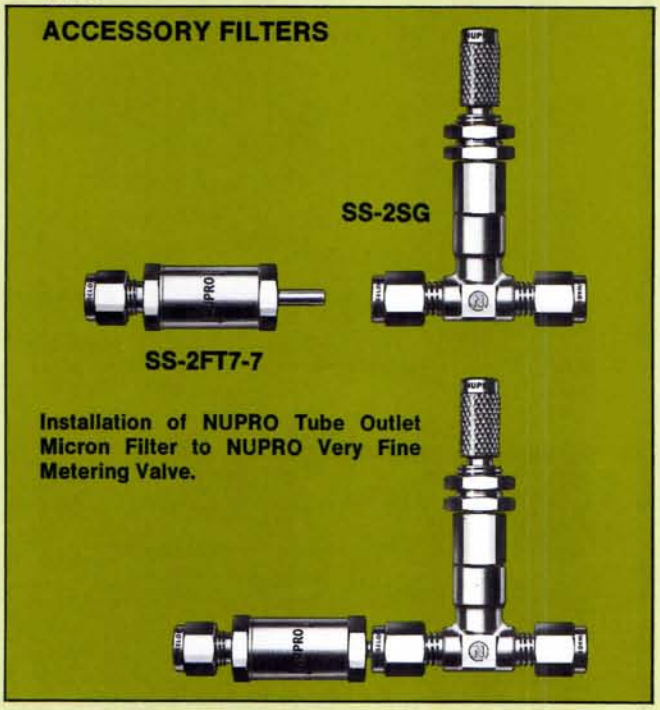
PURPOSE *("SGD" AND "MGD" SERIES ONLY)*

NUPRO Double Pattern Fine Metering Valves are used for extremely accurate flow control as low as 2 c.c. per day with liquids and fractions of 1 c.c. per hour with gases. They are helpful when high inlet pressures are used and low flow rates are required at the outlet port.

OPERATION

This unusual design permits the inlet valve handle to be set and locked at the maximum desired flow. The second valve handle is then used for fine flow control in any range up to the pre-set maximum. Technical data, materials, and special features are shown on *Pages 2 and 3.*

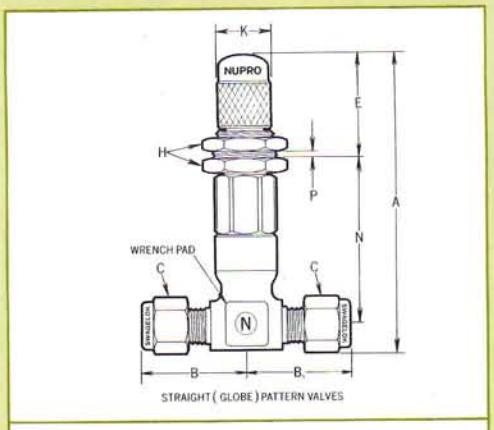
ACCESSORY FILTERS



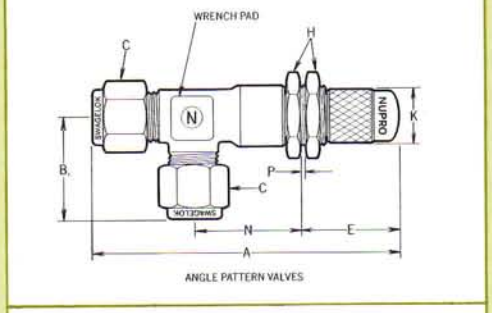
Installation of NUPRO Tube Outlet Micron Filter to NUPRO Very Fine Metering Valve.

Contamination can cause many problems in fluid systems, especially with the small orifices and finely tapered needles in NUPRO Fine Metering Valves. NUPRO Inline Filters provide excellent protection for these valves, helping to insure accurate control and long service life. Normally, nominal 7 or 15 micron elements are satisfactory, although 2 micron can be supplied on special orders for extremely sensitive applications.

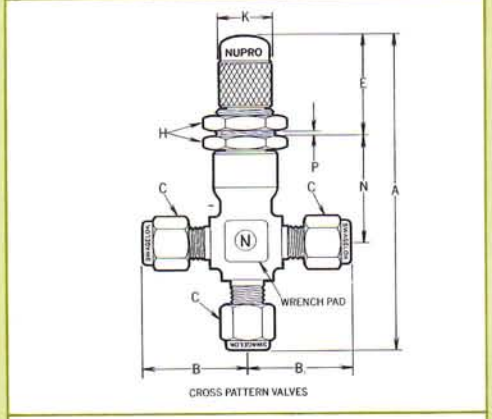
See Filter Subsection of Master Catalog Binder for additional information.



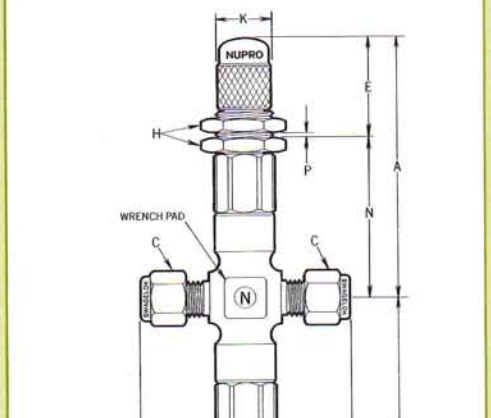
STRAIGHT (GLOBE) PATTERN VALVES



ANGLE PATTERN VALVES



CROSS PATTERN VALVES



DOUBLE PATTERN VALVES

TABLE OF DIMENSIONS

	FINE METERING VALVES CATALOG NUMBER ④	CONNECTION SIZE INLET & OUTLET	VALVE PATTERN	DIMENSIONS ② A CLOSED ①	B	B_1	C HEX	N
S	-1SA	1/16 SWAGELOK	ANGLE	2 13/16	—	13/16	5/16	29/32
	-1SG	1/16 SWAGELOK	STRAIGHT	2 9/16	25/32	25/32	5/16	1 3/8
	-1SGD	1/16 SWAGELOK	DOUBLE	2 3/8	25/32	25/32	5/16	1 3/8
	-1SX	1/16 SWAGELOK	CROSS	2 13/16	13/16	13/16	5/16	29/32
	-2SA	1/8 SWAGELOK	ANGLE	2 29/32	—	1	7/16	29/32
	-2SA1	1/8 MALE NPT 1/8 SWAGELOK	ANGLE	2 21/32	—	1	7/16	29/32
	-2SA4 (10-32)	#10-32 INT. STRAIGHT THR'D	ANGLE	2 21/32	—	3/4	—	29/32
	-2SA7	1/8 SWAGELOK 1/8 MALE NPT	ANGLE	2 29/32	—	3/4	7/16	29/32
	-2SG	1/8 SWAGELOK	STRAIGHT	2 9/16	31/32	31/32	7/16	1 3/8
	-2SGD	1/8 SWAGELOK	DOUBLE	2 3/8	31/32	31/32	7/16	1 3/8
	-2SX	1/8 SWAGELOK	CROSS	2 29/32	1	1	7/16	29/32
	-4SA	1/4 SWAGELOK	ANGLE	2 31/32	—	1 1/16	9/16	29/32
	-4SG	1/4 SWAGELOK	STRAIGHT	2 9/16	1 1/16	1 1/16	9/16	1 3/8
M	-2MA	1/8 SWAGELOK	ANGLE	3	—	1 1/32	7/16	1 1/32
	-2MA1	1/8 MALE NPT 1/8 SWAGELOK	ANGLE	2 23/32	—	1 1/32	7/16	1 1/32
	-2MA2	1/8 MALE NPT	ANGLE	2 23/32	—	3/4	—	1 1/32
	-2MA4	1/8 FEMALE NPT	ANGLE	2 15/16	—	31/32	—	1 1/32
	-2MA4 (10-32)	#10-32 INT. STRAIGHT THR'D	ANGLE	2 15/16	—	31/32	—	1 1/32
	-2MG	1/8 SWAGELOK	STRAIGHT	2 11/16	1 1/32	1 1/32	7/16	1 1/2
	-2MG1	1/8 MALE NPT 1/8 SWAGELOK	STRAIGHT	2 11/16	1 1/32	3/4	7/16	1 1/2
	-2MG2	1/8 MALE NPT	STRAIGHT	2 11/16	3/4	3/4	—	1 1/2
	-2MG4	1/8 FEMALE NPT	STRAIGHT	2 11/16	31/32	31/32	—	1 1/2
	-2MGD	1/8 SWAGELOK	DOUBLE	2 7/16	1 1/32	1 1/32	7/16	1 1/2
	-2MX	1/8 SWAGELOK	CROSS	3	1 1/32	1 1/32	7/16	1 1/32
	-4MA	1/4 SWAGELOK	ANGLE	3 3/32	—	1 1/8	9/16	1 1/32
	-4MA2	1/4 MALE NPT	ANGLE	2 31/32	—	1	—	1 1/32
	-4MA7	1/4 SWAGELOK 1/4 MALE NPT	ANGLE	3 3/32	—	1	9/16	1 1/32
	-4MG	1/4 SWAGELOK	STRAIGHT	2 11/16	1 1/8	1 1/8	9/16	1 1/2
	-4MG2	1/4 MALE NPT	STRAIGHT	2 11/16	1	1	—	1 1/2
	-4MGD	1/4 SWAGELOK	DOUBLE	2 7/16	1 1/8	1 1/8	9/16	1 1/2
	-4MX	1/4 SWAGELOK	CROSS	3 3/32	1 1/8	1 1/8	9/16	1 1/32
	-6MA	3/8 SWAGELOK	ANGLE	3 5/32	—	1 3/16	11/16	1 1/32
	-6MG	3/8 SWAGELOK	STRAIGHT	2 11/16	1 3/16	1 3/16	11/16	1 1/2
L	-2L2	1/8 MALE NPT	STRAIGHT	2 29/32	15/16	15/16	—	1 1/4
	-2L4	1/8 FEMALE NPT	STRAIGHT	2 29/32	31/32	31/32	—	1 1/4
	-2LA2	1/8 MALE NPT	ANGLE	3 1/4	—	15/16	—	1 1/32
	-2LA4	1/8 FEMALE NPT	ANGLE	3 9/32	—	31/32	—	1 1/32
	-4L	1/4 SWAGELOK	STRAIGHT	2 29/32	1 3/16	1 3/16	9/16	1 1/4
	-4L2	1/4 MALE NPT	STRAIGHT	2 29/32	1	1	—	1 1/4
	-4LA	1/4 SWAGELOK	ANGLE	3 1/2	—	1 3/16	9/16	1 1/32
	-4LA2	1/4 MALE NPT	ANGLE	3 5/16	—	1	—	1 1/32
	-4LX	1/4 SWAGELOK	CROSS	3 7/16	1 1/8	1 1/8	9/16	31/32
	-6L	3/8 SWAGELOK	STRAIGHT	2 29/32	1 1/4	1 1/4	11/16	1 1/4
	-6LA	3/8 SWAGELOK	ANGLE	3 9/16	—	1 1/4	11/16	1 1/32

TABLE OF COMMON DIMENSIONS

VALVE SERIES	ORIFICE INCHES	E ① CLOSED	H HEX	K CAP DIA.	P MAX	WRENCH PAD	PANEL OR BRACKET MOUNTING HOLE DIA.	HEX KEY SIZE CAP SET SCREW	HEX KEY SIZE CAP LOCKING SCREW
S	0.031	1	9/16	3/8	5/32	7/16	29/64	1/16	.035
M	0.055	15/16	11/16	1/2	5/32	1/2	37/64	5/64	.035
L	0.125	1 9/32	11/16	1	5/32	5/8 ③	37/64	5/64	—

① Add 1/4" to "A" and "E" dimensions for open position.
② Dimensions shown with SWAGELOK nuts finger-tight, when applicable
③ Wrench pad 1/2" on "4LX" valves
④ For a complete ordering number, add B for brass, SS for 316 stainless steel, or M for Monel as a prefix to catalog number — Example: B-2SA; SS-2MG; B-4MGD

SS-22RS4
0.020" ORIFICE

MICROMETER HANDLE/O-RING STEM SEAL

SS-21RS4
0.020" ORIFICE

PHENOLIC KNOB/TFE PACKING

PURPOSE

WHITEY Micro-Metering Valves provide precise control of extremely fine flow rates. These valves have a 0.020" orifice and a very slightly tapered needle to control flow rates from the maximum flow coefficient (C_v) of 0.007 to an effective C_v of 0.0005 or less with precision control throughout the entire flow range.

APPLICATIONS

WHITEY Micro-Metering Valves can also be used for shut-off service since the needle tip does not rotate at closure. The spring-loaded stem protects the needle from damage through over-tightening. These metering valves are especially useful in plant areas where valve abuse by careless or unskilled operators is difficult to control. Once the shut-off position has been reached, the needle simply retracts into the spring housing until the body of the stem dead stops against the orifice nut.

- Gas and vapor analysis
- Medical equipment
- Spectrographic work
- Laboratory sampling and research
- Speed or feed controls
- Variable restrictors
- Metering corrosive fluids

SPECIAL FEATURES

- Needle retracts against spring tension to prevent damage from over-tightening
- Needle does not rotate when seating
- Precision machined components
- Forty threads per inch on stem
- Metal-to-metal body to bonnet seal
- Straight and angle patterns
- Universal mounting nut standard
- 100% factory tested
- SWAGELOK end connections (⅛" and ¼")
- Female pipe connections (⅛")

TECHNICAL DATA

ORIFICE SIZE INCHES	FLOW COEFFICIENT Cv	PRESSURE RATING @70°F	MAXIMUM TEMPERATURE RATING
0.020	0.007	3000 PSI	450°F

MATERIALS

BODY—Brass and type 316 stainless steel

STEM—Type 316 stainless steel on all valves for the stem, spring, and retainer. The needle is type 303 stainless steel

PACKING—A Viton O-Ring with two TFE back-up rings is used with the micrometer handle. High density, pure, machined TFE cylinder packing is used with the phenolic knob

HANDLE—Type 316 stainless steel for the micrometer handle and barrel on all #22 valves. Molded phenolic knobs are available in black (standard), blue, green, red, yellow, orange, gray, maroon, and brown for all #21 valves

ORIFICE NUT—Type 316 stainless steel in all valves

ALL OTHER PARTS—Same material as body

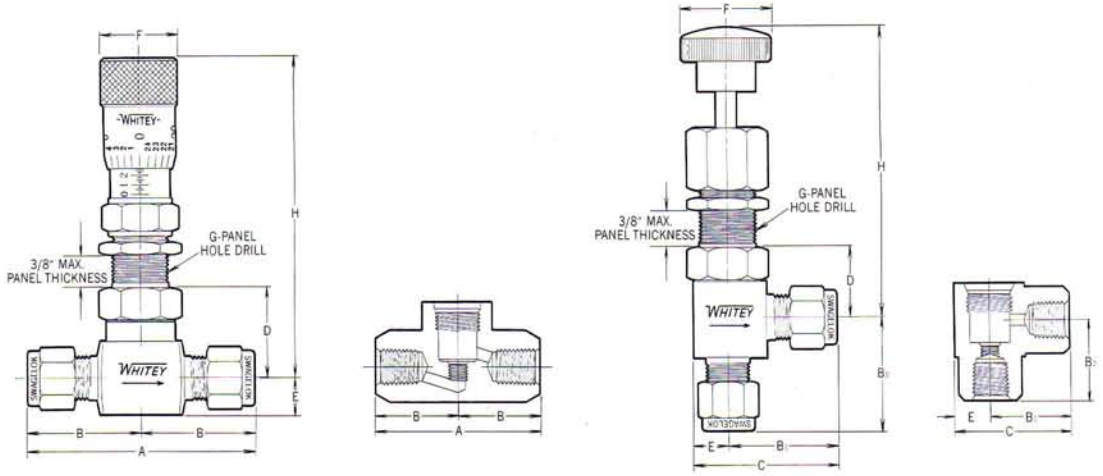


TABLE OF DIMENSIONS

MICRO-METERING VALVES			CONNECTION SIZE	DIMENSIONS②										
CATALOG NUMBER ①	STEM SEAL	ORIFICE INCHES	INLET & OUTLET	A	B	B_1	B_2	C	D	E	F	G	H OPEN	H CLOSED
-21RS2	TFE Packing	0.020	⅛ SWAGELOK	2⅜	1 3/16	1 7/32	1 7/32	1 21/32	1 5/32 ③	7/16	15/16 / 13/16	19/32	3 5/8 ③	3 1/4 ③
-22RS2	Viton O-Ring													
-21RS4	TFE Packing	0.020	¼ SWAGELOK	2 7/16	1 7/32	1¼	1¼	1 11/16	31/32 ④	7/16	15/16 / 13/16	19/32	3 7/16 ④	3 1/16 ④
-22RS4	Viton O-Ring													
-21RF2	TFE Packing	0.020	⅛ FEMALE NPT	1 13/16	29/32	15/16	15/16	1⅜	31/32 ④	7/16	15/16 / 13/16	19/32	3 7/16 ④	3 1/16 ④
-22RF2	Viton O-Ring													

① Add —A as a suffix when ordering angle pattern valves.
For a complete ordering number, add B for brass or SS for 316 stainless steel as a prefix to the catalog number — Example: B-21RS4; SS-22RS4-A

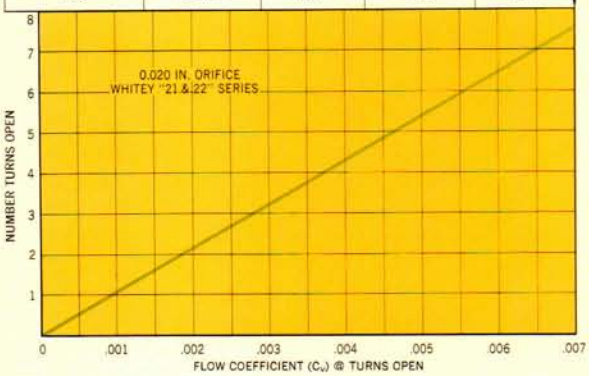
② Dimensions shown with SWAGELOK nuts finger-tight, when applicable

③ Subtract 3/8" for angle pattern valves

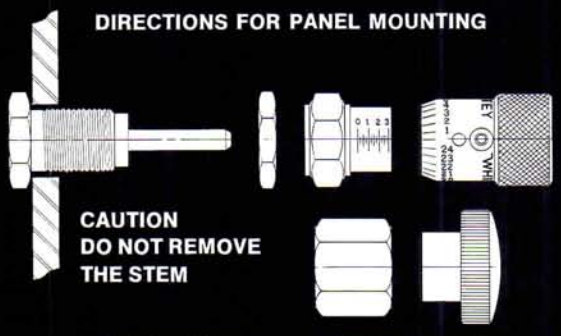
④ Subtract 3/16" for angle pattern valves

FLOW CAPACITY

MAXIMUM FLOW FOR C_V=0.007				
PRESSURE DROP TO ATMOSPHERE (△P) PSI	AIR		WATER	
	SCC/min. @70°F	SCFM @70°F	CC/min. @70°F	GPM @70°F
10	2,830	0.10	76	0.02
50	7,360	0.26	189	0.05
100	13,310	0.47	265	0.07



DIRECTIONS FOR PANEL MOUNTING



CAUTION
DO NOT REMOVE THE STEM

1. Turn the handle to the closed position.
2. Remove the handle from the stem.
3. Remove the packing nut and mounting nut.
4. Place the valve in the panel and reverse the above procedure.

VARIETY OF PATTERNS AND END CONNECTIONS

7

PURPOSE

The WHITEY Union Bonnet Metering Valve combines an exceptionally fine metering valve with the proven union bonnet construction. A long tapered needle stem provides micro-regulating control over the full range of ten turns of the stem.

Positive shut-off is assured by a Vee stem seat at the end of the tapered stem tip. The stem is made of hardened 440C stainless steel to prevent galling, both at the stem tip and in the stem threads.

WHITEY Union Bonnet Metering Valves provide safe, reliable operation with pressures up to 5000 PSI. The heavy duty, three-piece union bonnet construction is an important safety feature when working with high pressure systems. The union bonnet design prevents accidental disassembly of the valve while in service.

APPLICATIONS

WHITEY Union Bonnet Metering Valves are used in high pressure hydraulic and pneumatic systems, with natural gas lines, for feed lines in refineries and chemical plants, in sampling lines, in power plants, and in many laboratory and research applications.

SPECIAL FEATURES

Fine Metering Valves with positive shut-off • Hardened 440C stainless steel regulating stem for maximum service life • Union Bonnet construction for safety at higher pressures • Machined, pure TFE cylinder packing, fully contained by metal • Packing adjustable and can be replaced without removing valve from system • Precision machined barstock body • Metal-to-metal, non-rotating bonnet seal • Pressures to 5000 PSI • Straight and angle patterns • Universal mounting nut standard • SWAGELOK end connections • Female pipe connections • 100% factory tested.

TECHNICAL DATA

ORIFICE SIZE INCHES	FLOW COEFFICIENT Cv	PRESSURE RATING @ 70°F	MAXIMUM TEMPERATURE RATING▲
0.062	0.04	316 SS 5000 PSI Brass* 3000 PSI	450°F

*Available on special order. ▲Ask about NUPRO Bellows Metering Valves for higher temperature service.

MATERIALS

BODY—Type 316 stainless steel

STEM—Hardened 440C stainless steel

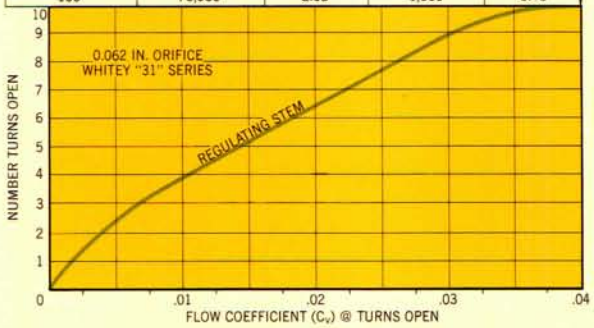
PACKING—Pure, high-density, TFE cylinder machined from extruded solid rod

HANDLES—Molded phenolic with cadmium plated hardened steel set screw. Available in black as standard and colors of red, orange, yellow, green, blue, maroon, brown and gray for color coded panels; Handle extensions can be supplied on special order

ALL OTHER PARTS—Type 316 stainless steel

FLOW CAPACITY

MAXIMUM FLOW FOR C_V = 0.04				
PRESSURE DROP TO ATMOSPHERE (ΔP) PSI	AIR		WATER	
	SCC/min. @70°F	SCFM @70°F	CC/min. @70°F	GPM @70°F
10	15,600	0.55	490	0.13
50	42,800	1.51	1,060	0.28
100	75,900	2.68	1,510	0.40



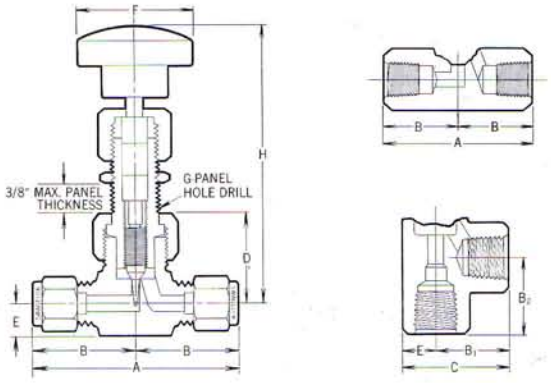


TABLE OF DIMENSIONS

UNION BONNET METERING VALVES			CONNECTION SIZE	DIMENSIONS ②										
CATALOG NUMBER ①	STEM TYPE	ORIFICE INCHES	INLET & OUTLET	A	B	B_1	B_2	C	D	E	F	G	H OPEN	H CLOSED
SS-31RS4	Regulating	0.062	¼ SWAGELOK	2 7/16	1 7/32	1 3/16	1 1/8	1 9/16	1 3/32	3/8	1 3/8	19/32	3 5/8	3 9/32
SS-31RF2			⅛ FEMALE NPT	2	1	7/8	13/16	1 1/4	1 3/32	3/8	1 3/8	19/32	3 5/8	3 9/32
SS-31RF4			¼ FEMALE NPT	2 1/16	1 1/32	15/16	15/16	1 3/8	1 3/32 ③	3/8 ③	1 3/8	19/32	3 5/8	3 9/32

① Add—A as a suffix when ordering angle pattern valves
② Dimensions shown with SWAGELOK nuts finger-tight, when applicable
③ Add 1/16" for angle pattern valves

Monel, T.M. International Nickel, • Viton, T.M. E.I. duPont de Nemours and Company (Inc.)

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2-74-100M-225M-BL

See Subsection on Bellows Seal Valves for packless metering valves. For metering in higher flow ranges, see Regulating & Shut-off Valves subsection.

NW-972

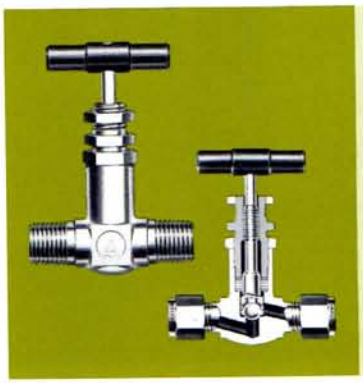
REGULATING AND SHUT-OFF VALVES

PRODUCT LOCATOR AND SUMMARY

"NB" SERIES SEVERE SERVICE UNION BONNET VALVES

Working threads out of contact with system fluid and a choice of hardened ball tip or soft seat regulating design for the most difficult fluid handling problems. Used with critical high pressures, corrosive fluids and on high purity applications in chemical processing, research and instrumentation. Excellent for repetitive shut-off service on gases, acids, solvents and other non-lubricating fluids from vacuum to high pressure.

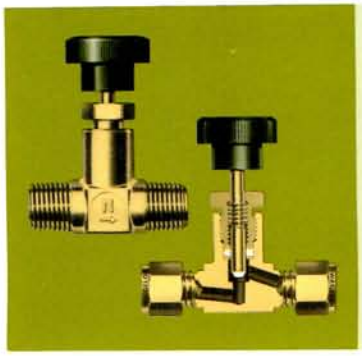
PAGE	STEM TYPE	ORIFICE (INCHES)	Cv	MAXIMUM PRESSURE (PSI)	MAXIMUM TEMP. (°F)	STANDARD MATERIALS
4,5	Ball Tip Regulating with TFE or KEL-F Insert for shut-off	0.156	0.35	6000	450 with TFE 200 with Kel-F	316 SS
		0.250	0.86			
		0.437	2.2			



"JB" SERIES SEVERE SERVICE FORGED BODY VALVES

Working threads out of contact with system fluid and a choice of non-rotating ball or regulating stem tip for severe service applications. Used in ultra-pure systems, moderate vacuum systems, sampling systems, instruments, laboratories and with chemicals, corrosives, high pressure gases, hydraulics and pneumatics. Long service life at a moderate price.

PAGE	STEM TYPE	ORIFICE (INCHES)	Cv	MAXIMUM PRESSURE (PSI)	MAXIMUM TEMP. (°F)	STANDARD MATERIALS
6,7	Ball Tip Regulating	0.172	0.24 Reg.	3000	450	316 SS
			0.30 Ball Tip (Straight)			
			0.39 Ball Tip (Angle)			



"J" SERIES MINIATURE FORGED BODY VALVES

A low cost brass valve for positive shut-off and regulating. Used on instrument and shop air, control panels, gauges, drains, vents, headers, water, vacuum, hydraulics, coolants and on many instrument and laboratory applications. Compact and inexpensive.

PAGE	STEM TYPE	ORIFICE (INCHES)	Cv	MAXIMUM PRESSURE (PSI)	MAXIMUM TEMP. (°F)	STANDARD MATERIALS
8,9	Vee Regulating	0.156	0.12 Reg.	600	300	Brass
			0.30 Vee (Straight)			
			0.43 Vee (Angle)			

FORGED BODY REGULATING AND SHUT-OFF VALVES

General purpose valves for regulation and shut-off of numerous gases and liquids from high pressure to non-critical vacuum. Used with air lines, natural gas, flow meters, sampling lines and control panels. Excellent valves for machine coolants, drains, vents and pressure gauges. Used extensively by laboratory and research facilities. Complete range of materials, flow capacities, stem types, patterns and end connections.

PAGE	STEM TYPE	ORIFICE (INCHES)	Cv	MAXIMUM PRESSURE (PSI)	MAXIMUM TEMP. (°F)	STANDARD MATERIALS
10,11 12,13	Regulating Kel-F Tip Vee	0.080	0.09	3000	250 with Kel-F 450 with Reg. or Vee (400 with brass or aluminum bodies)	Brass 316 SS Carbon Steel Aluminum Monel
		0.172	0.37			
		0.250	0.73			
		0.375	1.8			

TOGGLE OPERATED FORGED BODY SHUT-OFF VALVES

Valves for quick on-off operation with numerous fluids. Used on test benches, instruments, control panels, air lines, gauges, manometers, coolants, sampling lines, vents, etc.

PAGE	STEM TYPE	ORIFICE (INCHES)	Cv	MAXIMUM PRESSURE (PSI)	MAXIMUM TEMP. (°F)	STANDARD MATERIALS
14,15	TFE Tip	0.080 (port)	0.11	300	200	Brass 316 SS
		0.125	0.20	300		
		0.250	0.70	200		

CREDITS: Viton-Delrin, TM DuPont / Penton, TM Hercules Incorporated / Monel-Inconel, TM International Nickel / 17-4PH, TM Armco Steel / Kel-F, TM Minnesota Mining & Mfg. / Stellite, TM Haynes Stellite Div. of Cabot Corp.

UNION BONNET REGULATING & SHUT-OFF VALVES

Bar stock valves with a rugged union bonnet construction for safety and high pressures. Offered in a versatile range of orifice sizes and stem types for numerous pneumatic and hydraulic systems. Used in natural gas lines, feed lines in refineries and chemical plants and in sampling lines in power plants. Used as shut-off valves for pumps and compressors, gauges and meters, and in many laboratory and research applications.

PAGE	STEM TYPE	ORIFICE (INCHES)	Cv	MAXIMUM PRESSURE (PSI)	MAXIMUM TEMP. (°F)	STANDARD MATERIALS
16,17	Regulating	0.156	0.37	5000	450	316 SS
	TFE Tip	0.250	0.85			
	Vee	0.312	1.4			

SCREWED BONNET REGULATING & SHUT-OFF VALVES

Heavy duty bar stock valves in the screwed bonnet design for many regulating and shut-off applications in hydraulic and pneumatic systems. Used on test benches, control panels, sampling lines, natural gas and as shut-off valves for gauges, manifolds and meters.

PAGE	STEM TYPE	ORIFICE (INCHES)	Cv	MAXIMUM PRESSURE (PSI)	MAXIMUM TEMP. (°F)	STANDARD MATERIALS
18,19	Regulating	0.093	0.15	3000	250 with Kel-F 450 with Reg. or Vee (400 with brass bodies)	Brass 316 SS
		0.200	0.48			
		0.312	1.15			
	Kel-F Tip	0.312	1.20			
	Vee	0.093	0.14			
		0.200	0.51			
		0.312	1.20			

"PD" SERIES STRAIGHT-THROUGH PLUG VALVES

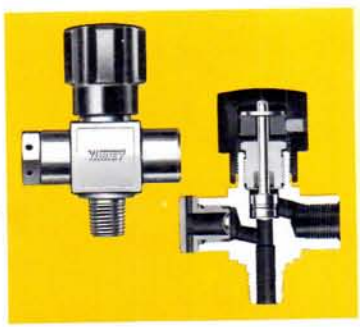
Full flow design with working threads out of contact with the system fluid. Easily replaceable plastic seats that absorb contamination such as scale, sand, dust, dirt, chips, rust, etc. Used on offshore installations, refineries, natural gas installations, oil and gas wells, resins and in petrochemical and liquified petroleum gas processing plants. Also useful on sampling systems and cylinders.

PAGE	STEM TYPE	ORIFICE (INCHES)	Cv	MAXIMUM PRESSURE (PSI)	MAXIMUM TEMP. (°F)	STANDARD MATERIALS
20,21	Rising Plug	0.187	0.63	6000	250	316 SS
		0.250	1.8			

"DK" SERIES FORGED BODY SHUT-OFF VALVES

Rugged, high integrity shut-off valves, packed below the threads for sample bombs, cylinders, tanks, corrosive fluids, high purity systems, non-critical vacuum, instrumentation and research. Extruded aluminum cover handle prevents damage from punishing environments.

PAGE	STEM TYPE	ORIFICE (INCHES)	Cv	MAXIMUM PRESSURE (PSI)	MAXIMUM TEMP. (°F)	STANDARD MATERIALS
22,23	Kel-F Tip	0.093 (port)	0.12	3000	250	Brass 316 SS
	Vee	0.156	0.27			
		0.218	0.53			



CYLINDER VALVES WITH RUPTURE DISCS

Rugged WHITEY cylinder valves with rupture discs provide a positive, reliable method of over-pressure protection for any system or cylinder. These valves are approved for use on D.O.T., B.T.C. and C.T.C. specification high pressure cylinders charged with both flammable and non-flammable liquids and compressed gases.

PAGE	STEM TYPE	ORIFICE (INCHES)	Cv	MAXIMUM PRESSURE (PSI)	MAXIMUM TEMP. (°F)	STANDARD MATERIALS
24	Kel-F Tip	0.218	0.53	3000	250	Brass 316 SS

THREE ORIFICE SIZES

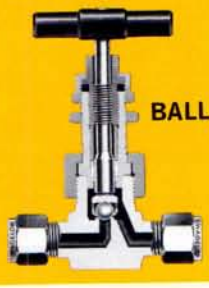
0.156" ORIFICE

0.250" ORIFICE

0.437" ORIFICE

TWO STEM TYPES

PATENTED



BALL TIP

SOFT SEAT REGULATING

PURPOSE

WHITEY Severe Service Union Bonnet Valves are designed for shut-off and regulating service under the most difficult system conditions. The valves have a union bonnet construction with the stem threads removed from contact with the system fluid by a unique three-piece packing design. The "NB" Series has a hardened ball tip to provide metal-to-metal leak tight shut-off. The "NTR" and "NKR" Series feature precise flow control with positive soft seat shut-off.

OPERATION

The WHITEY Severe Service Valve is operated simply by turning the bar handle. Approximately 2-1/2 to 4-1/2 turns open the valves to full flow. If packing adjustment should become necessary, loosen the packing lock nut and tighten the packing screw as required. Retighten the packing lock nut to secure the packing screw against loosening when the valve is operated. *For Air Operated Models, see WHITEY Technical Bulletin No. 27.*

APPLICATIONS

All areas where it would be difficult to maintain thread lubrication, system purity or where galling of the valve seat could be encountered • Solvents • Acid Feeds • Critical High Pressure • Gases • Corrosive Fluids • High Purity Systems • Chemical Processing • Electronics Plants • Research Facilities • General Instrumentation • Vacuum Systems.

SPECIAL FEATURES

Packing Below the Threads—Pure TFE packing provides a seal between the system fluid and the stem threads. This permits the threads to be well lubricated for maximum service life. The lubrication cannot be washed out by the system fluid and will not contaminate the system. The system media cannot corrode or deposit sludge on the stem threads to make the valve difficult to operate.

Three-Piece Packing System—Ceramic filled TFE outer glands prevent extrusion, assuring long life without adjustment or replacement. A virgin TFE ring is in the center to provide a positive stem seal.

Adjustable Packing—Although adjustment is seldom required, the packing is readily adjustable while the valve is on stream. With the valve in the open position loosen the large packing lock nut and tighten the packing adjustment screw as necessary. Retighten the packing lock nut.

Low Dead Space—The packing is located as deep in the bonnet as possible to minimize dead space. The valve is easy to flush out since the system media does not get trapped in or above the stem threads.

Hardened Ball Stem Tip—The hardened ball tip in the "NB" Series forms a bearing joint with the stem, which eliminates rotation between the ball and seat at closure. Thus, galling and scoring of the valve seat is prevented. The ball brinells a perfect seat in the valve to provide repetitive leak-tight shut-off throughout its pressure range with low shut-off torque.

Soft Seat Regulating Stem—The TFE or Kel-F seating ring is positively held in place around the regulating tip on the "NTR" or "NKR" series to provide flow control with easy shut-off.

Safety Backseat—The valve stem back stops against the bonnet to prevent the stem from being screwed out of the valve. It also serves as a backseat to prevent gross leakage in the event of a packing failure.

Additional Features—Threads never uncovered • Hardened packing screw assures maximum service life by preventing thread galling and freeze-up • Union bonnet construction for high pressures and safety • Barstock body and bonnet • Straight and angle patterns • Metal-to-metal bonnet seal • Universal mounting nut standard • Color coded handles can be provided • SWAGELOK connections • Female pipe connections • Socket or butt weld connections • 100% factory tested • Soft tipped shut-off models ("NT") and all metal regulating tipped models ("NR") available. *See WHITEY Technical Bulletin No. 28.*

TECHNICAL DATA

SERIES	STEM TYPE	ORIFICE SIZE (INCHES)	FLOW COEFFICIENT, Cv	PRESSURE RATING @ 70°F	MAXIMUM TEMPERATURE RATING*
3 NB 3NTR	Ball Tip Reg-TFE Insert	0.156	0.35	6000 psi	450°F with TFE packing
6NB 6NTR	Ball Tip Reg-TFE Insert	0.250	0.86		
12NB	Ball Tip	0.437	2.2		200°F with Kel-F stem tip
12NKR	Reg-Kel-F Insert		1.9		

*High temperature packing rating is 600°F for normal service. Consult factory for ratings for higher temperature applications. High temperature packings are recommended for steam and liquids, but do not always seal gas tight at high pressure for very many cycles.

MATERIALS

Body, Bonnet, Stem, Packing Gland, Packing Lock Nut, Panel Nut, Union Nut—316 stainless steel.

Packing Screw—Hardened 416 stainless steel.

Packings—STANDARD: Ceramic filled TFE outer glands; pure, machined virgin TFE inner packing. HIGH TEMPERATURE: John Crane 187IX asbestos ("6N" & "12N" Series); Grafoil ("3N", "6N" & "12N" Series). See TECHNICAL DATA for rating.

Stem Tips—"NB": Stellite ball.
"NTR": machined, high density TFE insert.
"NKR": machined, unplasticized Kel-F insert.
NOTE: For higher temperature applications requiring regulation, an all metal regulating stem can be supplied ("NR" Series).

Handle—Black anodized aluminum bar handle is standard. Handle extensions can be supplied on special order.

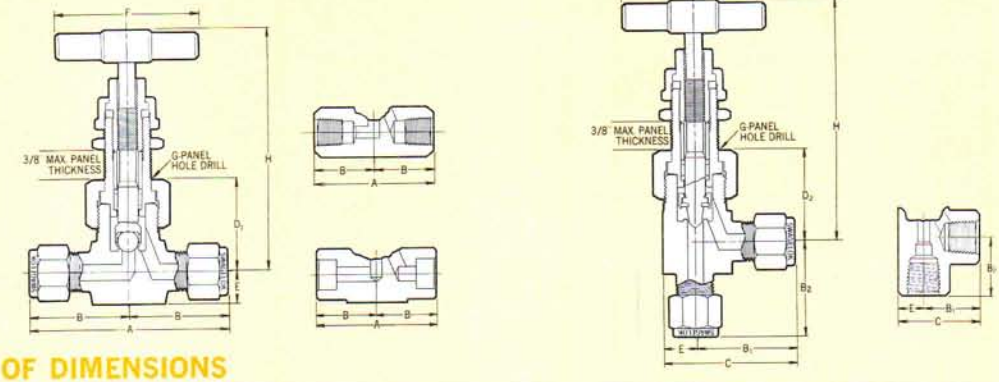


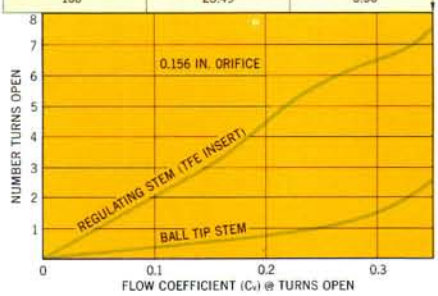
TABLE OF DIMENSIONS

SEVERE SERVICE VALVES		CONNECTION SIZE	DIMENSIONS ②										STRAIGHT		ANGLE	
PART NUMBER ①	ORIFICE (INCHES)	INLET & OUTLET	A	B	B_1	B_2	C	D_1	D_2	E	F	G	H OPEN	H CLOSED	H OPEN	H CLOSED
SS-3NBF2 SS-3NTRF2	0.156	⅛ Female NPT	2	1	29/32	1	19/32	13/32	19/32	3/8	1¾	19/32	3 11/64	2 29/32	3 23/64	3 3/32
SS-3NBF4 SS-3NTRF4		¼ Female NPT	2 1/16	1 1/32	29/32	1	19/32	13/32	19/32	3/8	1¾	19/32	3 11/64	2 29/32	3 23/64	3 3/32
SS-3NBS4 SS-3NTRS4		¼ SWAGELOK	2 7/16	1 7/32	1 3/16	1½	1 9/16	13/32	13/32	3/8	1¾	19/32	3 11/64	2 29/32	3 11/64	2 29/32
SS-3NBSW4T		¼ TSW	1 13/16	29/32	⅞	1 3/16	1¼	13/32	13/32	3/8	1¾	19/32	3 11/64	2 29/32	3 11/64	2 29/32
SS-6NBF4 SS-6NTRF4	0.250	¼ Female NPT	2¼	1⅛	1	1⅛	1½	1 11/32	1 15/32	½	2½	25/32	3 13/16	3 15/32	3 15/16	3 19/32
SS-6NBSW4P		¼ PSW														
SS-6NBF6 SS-6NTRF6		⅜ Female NPT														
SS-6NBS6 SS-6NTRS6		⅜ SWAGELOK	2⅞	1 7/16	1 5/16	1 11/16	1 13/16	1 11/32	1 7/32	½	2½	25/32	3 13/16	3 15/32	3 11/16	3 11/32
SS-6NBSW6T		⅜ TSW	2¼	1⅛	1	1⅛	1½	1 11/32	1 15/32	½	2½	25/32	3 13/16	3 15/32	3 15/16	3 19/32
SS-6NBS8 SS-6NTRS8		½ SWAGELOK	2⅞	1 7/16	1 17/32	1 13/32	2 1/32	1 11/32	1 11/32	½	2½	25/32	3 13/16	3 15/32	3 13/16	3 15/32
SS-6NBSW8T		½ TSW	2¼	1⅛	1	1⅛	1½	1 11/32	1 15/32	½	2½	25/32	3 13/16	3 15/32	3 15/16	3 19/32
SS-12NBF8 SS-12NKRF8	0.437	½ Female NPT	3	1½	1½	1 11/16	2⅛	1 13/16	1⅞	⅝	3½	1 1/16	5	4 9/16	5 1/16	4⅝
SS-12NBS8 SS-12NKRS8		½ SWAGELOK	3 15/16	1 31/32	1 29/32	1 21/32	1 17/32	1 13/16	1 13/16	⅝	3½	1 1/16	5	4 9/16	5	4 9/16
SS-12NBSW8P		½ PSW	3	1½	—	—	—	1⅞	—	⅝	3½	1 1/16	5 1/16	4⅝	—	—
SS-12NBSW8T		½ TSW	3	1½	1½	1 11/16	2⅛	1 13/16	1⅞	⅝	3½	1 1/16	5	4 9/16	5 1/16	4⅝
SS-12NBS12 SS-12NKRS12		¾ SWAGELOK	3 15/16	1 31/32	1 29/32	1 21/32	2 17/32	1 13/16	1 13/16	⅝	3½	1 1/16	5	4 9/16	5	4 9/16
SS-12NBSW12T		¾ TSW	3	1½	1½	1 11/16	2⅛	1 13/16	1⅞	⅝	3½	1 1/16	5	4 9/16	5 1/16	4⅝

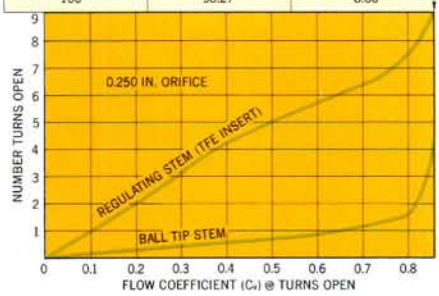
① Add -A as a suffix when ordering angle pattern valves. Example: SS-3NBS4-A. ② Dimensions shown with SWAGELOK nuts finger-tight, when applicable.

FLOW CAPACITY CURVES

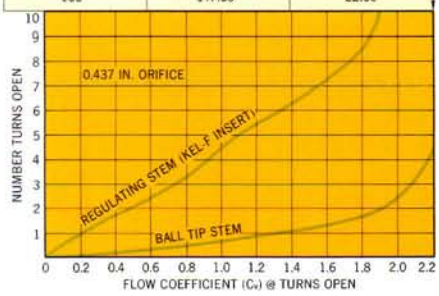
MAXIMUM FLOW FOR C_v = 0.35		
PRESSURE DROP TO ATMOSPHERE (△P) PSI	AIR SCFM @ 70°F	WATER GPM@ 70°F
10	4.82	1.11
50	13.25	2.48
100	23.49	3.50



MAXIMUM FLOW FOR C_v = 0.86		
PRESSURE DROP TO ATMOSPHERE (△P) PSI	AIR SCFM @ 70°F	WATER GPM@ 70°F
10	11.89	2.72
50	32.87	6.08
100	58.27	8.60

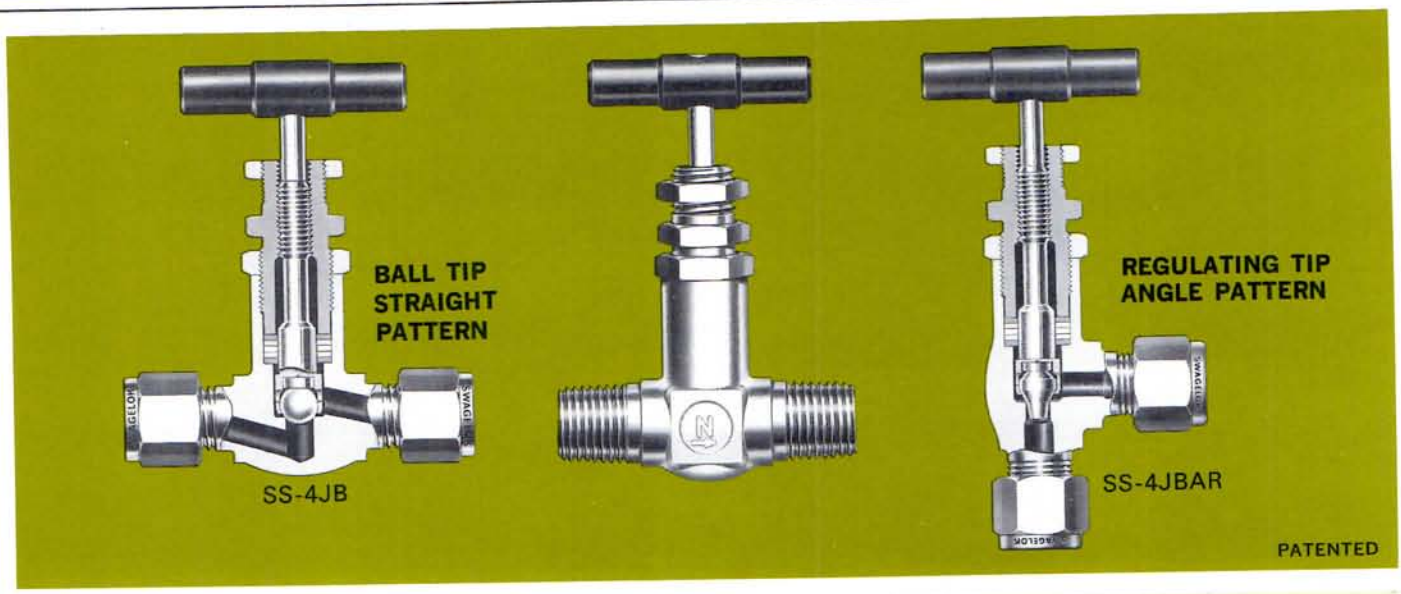


MAXIMUM FLOW FOR C_v = 2.2		
PRESSURE DROP TO ATMOSPHERE (△P) PSI	AIR SCFM @ 70°F	WATER GPM@ 70°F
10	30.66	6.96
50	83.30	15.56
100	147.68	22.00



5

"JB" SERIES SEVERE SERVICE FORGED BODY VALVES



PURPOSE

The NUPRO "JB" Series Miniature Stainless Steel Forged Body Valve fulfills the need for a compact, reliable, corrosion resistant shut-off valve which can be easily connected to any instrument or system. Valves are available with ball tip stems for on-off service and regulating stems for good flow control plus non-rotating shut-off. Choose between angle and straight patterns with a variety of SWAGELOK and pipe connections.

OPERATION

NUPRO "JB" Series Valves with ball tip stems open approximately 2 turns to full flow. The "JBR" Series with regulating stems require approximately 2½ turns to full flow.

Mounting—All "JB" Series Valves may be panel or bracket mounted by simply removing the handle and jam nut and inserting the valve through a hole in the panel. Next, tighten the jam nut and replace the handle.

APPLICATIONS

Chemicals • Ultra-Pure Systems • Moderate Vacuum Systems • Hydraulics • Corrosives • High pressure gases • Pneumatics • Sampling • Instruments • Laboratory applications.

SPECIAL FEATURES

New ball tip shut-off stops leaks—The ball tip forms a bearing joint with the stem, eliminating rotation between the ball and seat at closure. This prevents galling and scoring of the valve seat and insures long life in repetitive shut-off service. A cleanout hole in the stem prevents clogging.

Differential hardness in seating—The spherically ground 316 stainless steel ball tip is considerably harder than the 316 stainless steel forged body.

As the valve is used, a brinelling action occurs in the seat causing the seat to be deformed to the exact contour of the ball. Repeated shut-offs result in continued reliable sealing.

Bearing disc behind ball—The ball tip rides on a hardened bearing disc which maintains free operation of the ball in the stem and prevents backlash.

Threads removed from fluid system for long life—The TFE stem seals are located between the stem threads and the wetted portion of the valve. Thus, the operating threads cannot be attacked by system fluids and thread lubricant will not contaminate clean systems. Threads are always covered by the bonnet to retain lubricant and prevent contamination from external sources.

New packing system reduces maintenance—Ceramic-filled TFE glands prevent extrusion of the virgin TFE seal, assuring long life without adjustment or replacement. The virgin TFE ring is in the center of the packing system to provide a positive stem seal. When necessary the TFE packings can be easily adjusted while the valve is in service.

With the valve in the open position, loosen the bonnet lock nut and tighten the bonnet as necessary. Then re-tighten the bonnet lock nut against the body.

Safety bonnet lock—The bonnet is secured with a lock nut against the valve body. This prevents the packing and bonnet from loosening as the valve is turned to the full open position.

Additional features—316 stainless steel • Universal mounting nut standard • Low operating torque • Miniature forged body design (approximately 4 oz.) • Variety of SWAGELOK and pipe connections • Straight and angle patterns • Pressures to 3000 psi • 100% factory tested.

NUPRO®
"JB" SERIES SEVERE SERVICE FORGED BODY VALVES

TECHNICAL DATA

Pressure Rating—Moderate vacuum to 3000 psi
Temperature Rating— 450°F max.*
Orifice Size—0.172" (Some connections require smaller port orifices. See Table of Dimensions)
Flow Coefficient—C_V=0.24 (regulating tip, straight and angle patterns) C_V=0.30 (ball tip, straight pattern) C_V=0.39 (ball tip, angle pattern)

*Asbestos packing can be supplied for service to 600°F. However, asbestos packing does not always seal gas tight at high pressure for very many cycles. It is useful in some high temperature liquid and steam applications, or where slight stem leakage of gas is not detrimental. Ask about NUPRO Bellows Valves for critical high temperature applications.

MATERIALS

Body—316 stainless steel.

Bearing Disc—17-4PH stainless steel.

Packings—Ceramic-filled TFE outer glands; pure, machined, virgin TFE inner gland (See asbestos packing information for special service under Technical Data).

Handle—Aluminum, hunter green, with cadmium plated steel set screw (3/32" Hex Key).

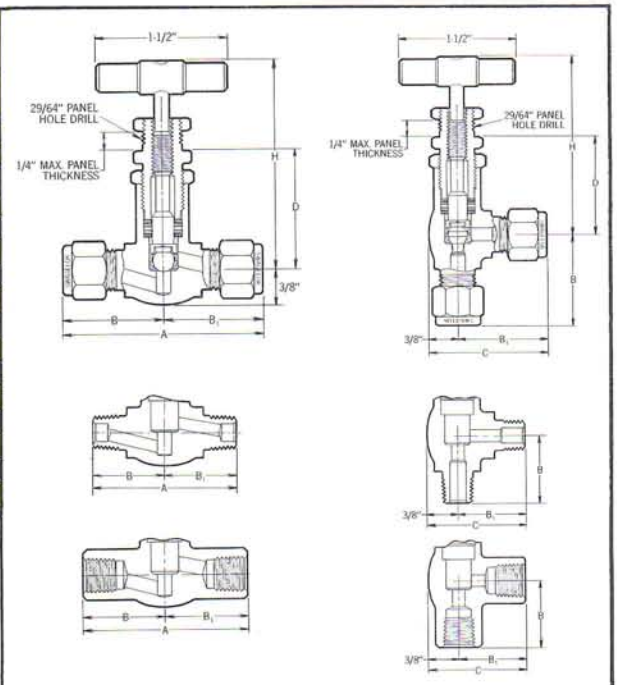
All Other Parts—Same material as body.

NOTE: An optional hardened 440-C stainless steel ball is available for applications requiring better abrasion and wear resistance than 316 stainless steel.

TABLE OF DIMENSIONS

MINIATURE FORGED BODY VALVES	CONNECTION SIZE		DIMENSION ②					
PART NUMBER ①	INLET	OUTLET	A	B	B_1	C	D	H ③ Closed
SS-2JB ④	⅛ SWAGELOK	⅛ SWAGELOK	25/16	15/32	15/32	—	1⅜	213/32
SS-2JB2	⅛ MALE NPT	⅛ MALE NPT	1¼	⅜	⅜	—	1⅜	213/32
SS-2JB4	⅛ FEMALE NPT	⅛ FEMALE NPT	2	1	1	—	1⅜	213/32
SS-2JBA ⑤	⅛ SWAGELOK	⅛ SWAGELOK	—	13/32	13/32	115/32	1¼	29/32
SS-2JBA2	⅛ MALE NPT	⅛ MALE NPT	—	⅜	⅜	1¼	1¼	29/32
SS-2JBA4	⅛ FEMALE NPT	⅛ FEMALE NPT	—	⅜	⅜	1¼	1¼	29/32
SS-4JB	¼ SWAGELOK	¼ SWAGELOK	23/8	13/16	13/16	—	1⅜	213/32
SS-4JB1	¼ MALE NPT	¼ SWAGELOK	25/16	1	13/16	—	1⅜	213/32
SS-4JB2	¼ MALE NPT	¼ MALE NPT	2	1	1	—	1⅜	213/32
SS-4JB-TSW ⑥	¼TSW / ⅜MTW	¼TSW / ⅜MTW	19/16	25/32	25/32	—	1⅜	213/32
SS-4JBA	¼ SWAGELOK	¼ SWAGELOK	—	13/16	13/16	19/16	1¼	29/32
SS-4JBA1	¼ MALE NPT	¼ SWAGELOK	—	1	13/16	19/16	1¼	29/32
SS-4JBA2	¼ MALE NPT	¼ MALE NPT	—	1	1	13/8	1¼	29/32
SS-6JB ⑦	⅜ SWAGELOK	⅜ SWAGELOK	21/2	1¼	1¼	—	1⅜	213/32
SS-(6MM) JB	6MM SWAGELOK	6MM SWAGELOK	23/8	13/16	13/16	—	1⅜	213/32
SS-(6MM) JBA	6MM SWAGELOK	6MM SWAGELOK	—	13/16	13/16	19/16	1¼	29/32

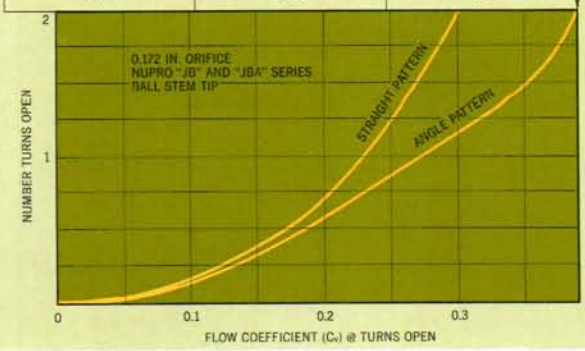
NOTES:
① For regulating stem design, add R after JB or JBA in part number.
Example: SS-4JBR2; SS-4JBAR2
② Dimensions shown with SWAGELOK nuts finger-tight, when applicable.
③ For "H Open" dimension, add 1/32 inch to "H Closed" dimension.
④ Port orifice 0.082"
⑤ Port orifice 0.094"
⑥ Remove valve upper works prior to socket or butt welding tubes to valve body.
⑦ Body orifice 0.156"



FLOW CAPACITY CURVES

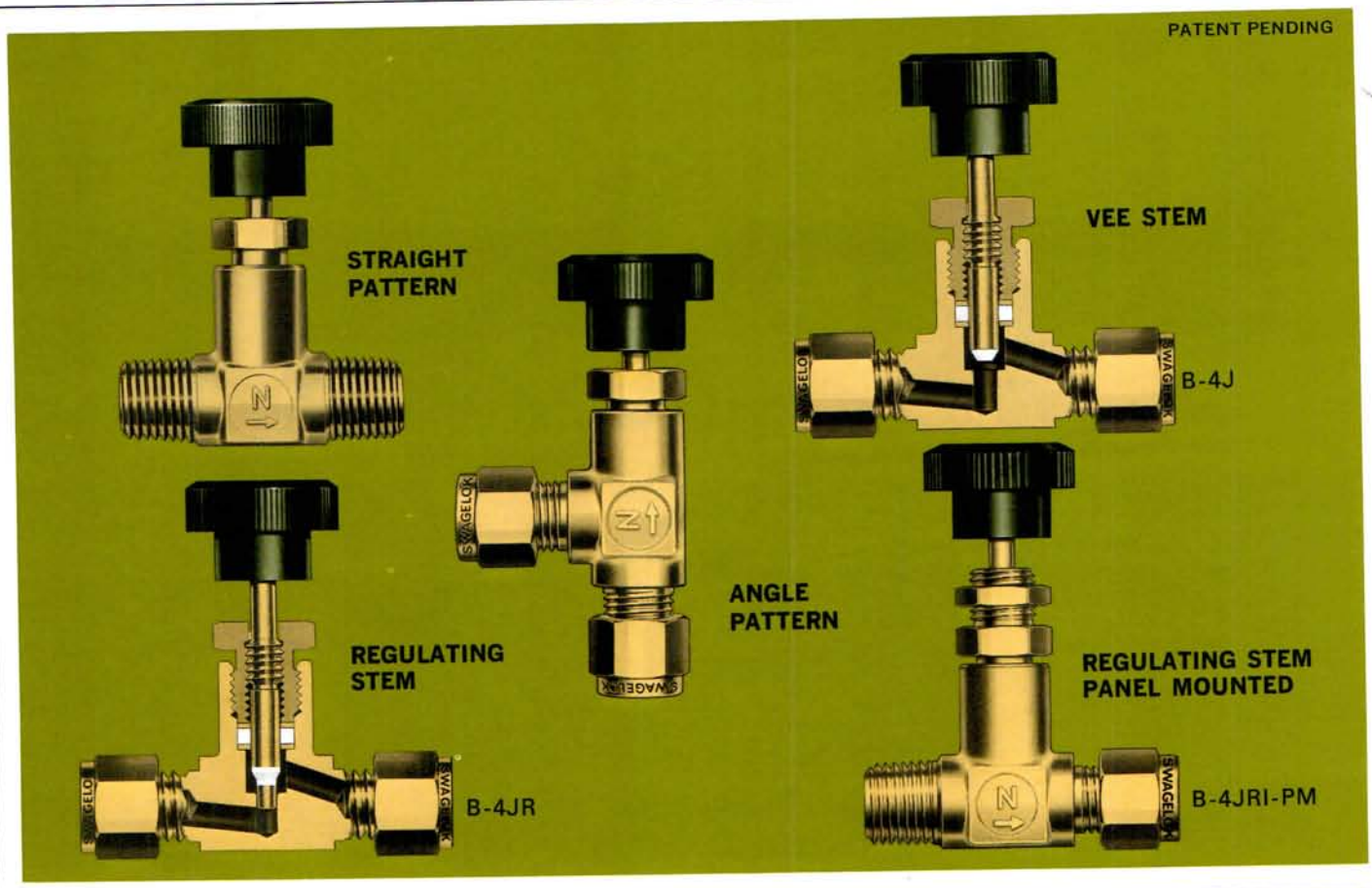
MAXIMUM FLOW FOR C_V=0.24		
PRESSURE DROP TO ATMOSPHERE (△P) PSI	AIR SCFM @ 70°F	WATER GPM @ 70°F
10	3.36	0.76
50	9.09	1.70
100	16.11	2.40

MAXIMUM FLOW FOR C_V=0.39		
PRESSURE DROP TO ATMOSPHERE (△P) PSI	AIR SCFM @ 70°F	WATER GPM @ 70°F
10	5.46	1.23
50	14.77	2.76
100	26.18	3.90



NUPRO COMPANY • 4800 East 345th Street • Willoughby, Ohio 44094

"J" SERIES MINIATURE FORGED BODY VALVES



PURPOSE

The NUPRO "J" Series Miniature Forged Body Valve is a compact, reliable, and inexpensive shut-off valve that can be connected easily to any instrument or system. Valves are available with vee stems for on-off and throttling service and regulating stems for flow control plus shut-off. Choose between angle and straight patterns, with or without the panel mounting feature.

OPERATION

NUPRO "J" Series Valves with vee stems open 2½ to 3½ turns to full flow. The "JR" Series with regulating stems require 3 to 4 turns to full flow.

Mounting — NUPRO "J" and "JR" Series Miniature Forged Body Valves are available with an optional panel or bracket mounting feature. Add -PM as a suffix to the part number when this feature is required. See Table of Dimensions for specifics.

APPLICATIONS

Low cost positive shut-off and regulating • Instrument and shop air • Control panels • Gauge shut-off • Water • Vacuum • Hydraulics • Coolants • Drain Valves • Vents • Headers • Instruments • Laboratory applications.

SPECIAL FEATURES

Economical all-brass design • Straight and angle patterns • TFE coated stem tip for repetitive shut-off at low torque • TFE adjustable packing • No threads in fluid system • SWAGELOK or pipe connections • Regulating or vee stems • Optional panel or bracket mounting • Color coded handles available • Pressures to 600 psi • Temperatures to 300°F.

TECHNICAL DATA

Pressure Rating—Non-critical vacuum to 600 psi max.

Temperature Rating— −40°F to 300°F max.

Orifice Size— 0.156″ (Some connections require smaller port orifices. See Table of Dimensions.)

Flow Coefficient—C_v=0.12 (regulating stem, straight & angle patterns)

C_v=0.30 (vee stem, straight pattern)

C_v=0.43 (vee stem, angle pattern)

"J" SERIES MINIATURE FORGED BODY VALVES

MATERIALS

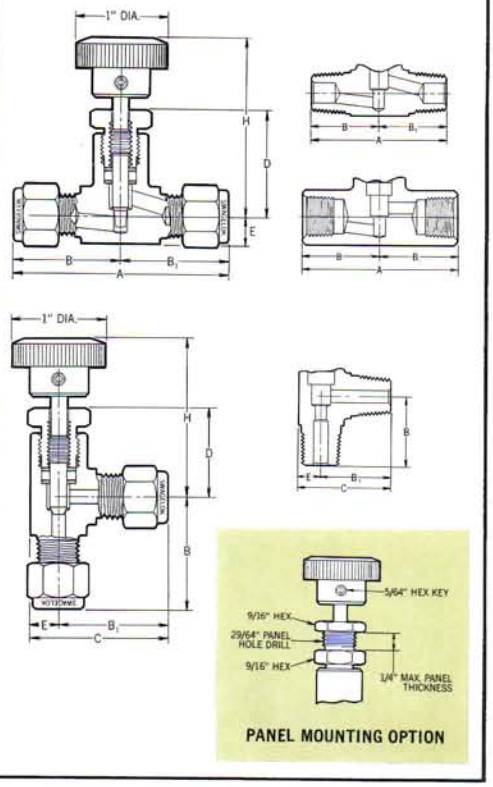
Body—Brass.
Stem—Silicon Bronze with TFE coated tip.
Packing—Pure TFE.
Glands—Phosphor Bronze.
Handle—Green phenolic plastic with brass insert*.
Set Screw—Cadmium plated steel, cone point (5/64" Hex Key).
All Other Parts—Brass.

*Optional colors of red, blue, yellow and black are available.

TABLE OF DIMENSIONS

MINIATURE FORGED BODY VALVES	CONNECTION SIZE		DIMENSIONS ③						
PART NUMBER ①	INLET	OUTLET	A	B	B_1	C	D	E	H ③ Closed
B-2J ④	1/8 SWAGELOK	1/8 SWAGELOK	2 5/16	1 5/32	1 5/32	—	1 1/8	5/16	1 7/8
B-2J2	1/8 MALE NPT	1/8 MALE NPT	1 1/4	7/8	7/8	—	1 1/8	5/16	1 7/8
B-2JA ⑤	1/8 SWAGELOK	1/8 SWAGELOK	—	1 5/32	1 5/32	1 15/32	15/16	5/16	1 11/16
B-2JA2	1/8 MALE NPT	1/8 MALE NPT	—	7/8	7/8	1 3/16	15/16	5/16	1 11/16
B-4J	1/4 SWAGELOK	1/4 SWAGELOK	2 3/8	1 3/16	1 3/16	—	1 1/8	5/16	1 7/8
B-4J1	1/4 MALE NPT	1/4 SWAGELOK	2 1/8	15/16	1 3/16	—	1 1/8	5/16	1 7/8
B-4J2	1/4 MALE NPT	1/4 MALE NPT	1 27/32	15/16	15/16	—	1 1/8	5/16	1 7/8
B-4J4	1/4 FEMALE NPT	1/4 FEMALE NPT	2 1/8	1 1/16	1 1/16	—	1 1/16	11/32	1 13/16
B-4J5	1/4 MALE NPT	1/4 FEMALE NPT	2 1/8	1 1/16	1 1/16	—	1 1/16	11/32	1 13/16
B-4JA	1/4 SWAGELOK	1/4 SWAGELOK	—	1 3/16	1 3/16	1 1/2	15/16	5/16	1 11/16
B-4JA1	1/4 MALE NPT	1/4 SWAGELOK	—	15/16	1 3/16	1 1/2	15/16	5/16	1 11/16
B-4JA2	1/4 MALE NPT	1/4 MALE NPT	—	15/16	15/16	1 1/4	15/16	5/16	1 11/16
B-6J ⑥	3/8 SWAGELOK	3/8 SWAGELOK	2 15/32	1 1/4	1 1/4	—	1 1/8	5/16	1 7/8
B-(6MM)J	6MM SWAGELOK	6MM SWAGELOK	2 3/8	1 3/16	1 3/16	—	1 1/8	5/16	1 7/8
B-6JA ⑥	3/8 SWAGELOK	3/8 SWAGELOK	—	1 1/4	1 1/4	1 9/16	15/16	5/16	1 11/16
B-24J1	1/8 MALE NPT	1/4 SWAGELOK	2 1/16	7/8	1 3/16	—	1 1/8	5/16	1 7/8
B-24JA1	1/8 MALE NPT	1/4 SWAGELOK	—	7/8	1 3/16	1 1/2	15/16	5/16	1 11/16

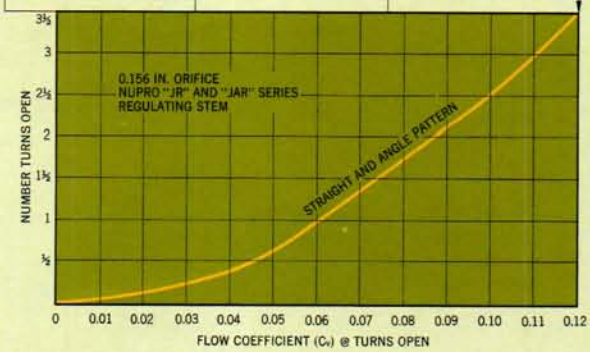
NOTES:
① For regulating or panel mounting options:
a) Add R after J or JA in part number for regulating stem.
b) Add -PM after part number for panel mounting.
Examples: 1) B-4JR2; B-4JAR2
2) B-4J-PM; B-4JA-PM; B-4JR-PM
② Dimensions shown with SWAGELOK nuts finger-tight, when applicable.
③ For "H Open" dimension, add 5/32 inch to "H Closed" dimension.
④ Port orifice 0.082"
⑤ Port orifice 0.094"
⑥ Body orifice 0.156"



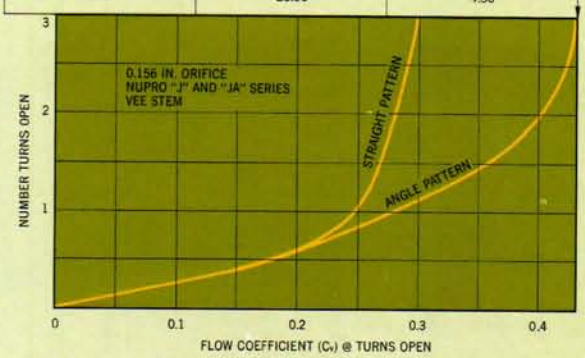
PANEL MOUNTING OPTION

FLOW CAPACITY CURVES

MAXIMUM FLOW FOR C_v ~ 0.12		
PRESSURE DROP TO ATMOSPHERE (ΔP) PSI	AIR SCFM @ 70°F	WATER GPM @ 70°F
10	1.66	0.38
50	4.54	0.85
100	8.06	1.20



MAXIMUM FLOW FOR C_v ~ 0.43		
PRESSURE DROP TO ATMOSPHERE (ΔP) PSI	AIR SCFM @ 70°F	WATER GPM @ 70°F
10	5.94	1.36
50	16.28	3.04
100	28.86	4.30



FOUR ORIFICE SIZES

0.080″ ORIFICE

0.172″ ORIFICE

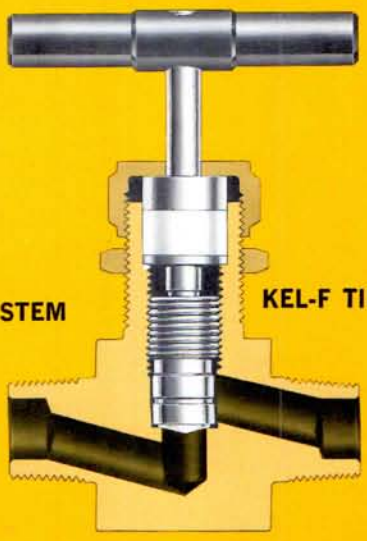
0.250″ ORIFICE

0.375″ ORIFICE

THREE STEM TYPES

REGULATING STEM

SS-0RS2



KEL-F TIP STEM

B-18KM8

VEE STEM

SS-1VS4

PURPOSE

With a wide range of patterns, sizes, end connections and stem types available, WHITEY Forged Body Valves provide complete flexibility in any layout from miniaturized tubing to piping systems up to 1/2". All can be supplied with SWAGELOK Tube Fitting connections as well as male and female pipe connections.

Interchangeable stems offer fine flow control combined with shut-off, and metal-to-metal or soft seat shut-off. Kel-F tip stems are recommended for positive, repetitive shut-off with thin gases and non-lubricating fluids, where operating conditions will permit.

Rugged, compact WHITEY Forged Body Valves afford exceptional versatility for ease of installation and exacting service.

OPERATION

All 0.375" orifice valves open to full flow with 4 turns of the bar handle. All others use a phenolic knob and open to maximum flow with approximately 3 turns for Kel-F and vee stems and 8 to 9 turns for regulating stems.

APPLICATIONS

General purpose valves for regulating and shut-off of many gases and liquids • Non-critical vacuum to high pressure • Air lines • Test benches • Manifolds • Flow meters • Natural gas lines • Sampling lines • Control panels • Machine coolants • Drains • Vents • Pressure gauges • Chemical processing • Laboratory and research applications.

SPECIAL FEATURES

Integral bonnet construction • Machined, pure TFE cylinder packing, fully contained by metal • Adjustable packing that can be replaced without removing valve from system • Stainless steel stems in all valves except Monel • Rugged compact forged body • Straight, angle and cross patterns • Low operating torque • Color coded handles • Universal mounting nut standard • 100% factory tested.

TECHNICAL DATA

ORIFICE SIZE (INCHES)	FLOW COEFFICIENT, Cv	PRESSURE RATING @ 70°F	MAXIMUM TEMPERATURE RATING
0.080	0.09	3000 PSI	250°F with Kel-F tip stem 450°F with Reg. & Vee stems, TFE packing (400°F with brass or aluminum bodies)
0.172	0.37		
0.250	0.73		
0.375	1.80		

MATERIALS

Body—Brass and carbon steel in 0.375" orifice valves; brass, 316 stainless steel, aluminum, carbon steel and Monel in all others.

Stems—Type 303 stainless steel in 0.375" orifice valves; type 316 stainless steel in all others except Monel valves use Monel stems.

NOTE: A Kel-F tip stem is recommended for positive, repetitive shut-off where operating conditions will permit.

Handles—Black anodized aluminum bar handle on 0.375" orifice valves; black molded phenolic knobs with cadmium plated hardened steel set screws on all others.*

NOTE: Bar handles and handle extensions can be supplied for all valves on special request.

Packing—Pure high density TFE cylinder machined from extruded solid rod.

Bottom Gland—302 stainless steel on 0.375" orifice valves; type 316 stainless steel on all others except Monel valves use Monel.

All Other Parts—Same material as body.

*For color coded panels or systems, phenolic knobs are available in optional colors of red, orange, yellow, green, blue, maroon, brown and gray.

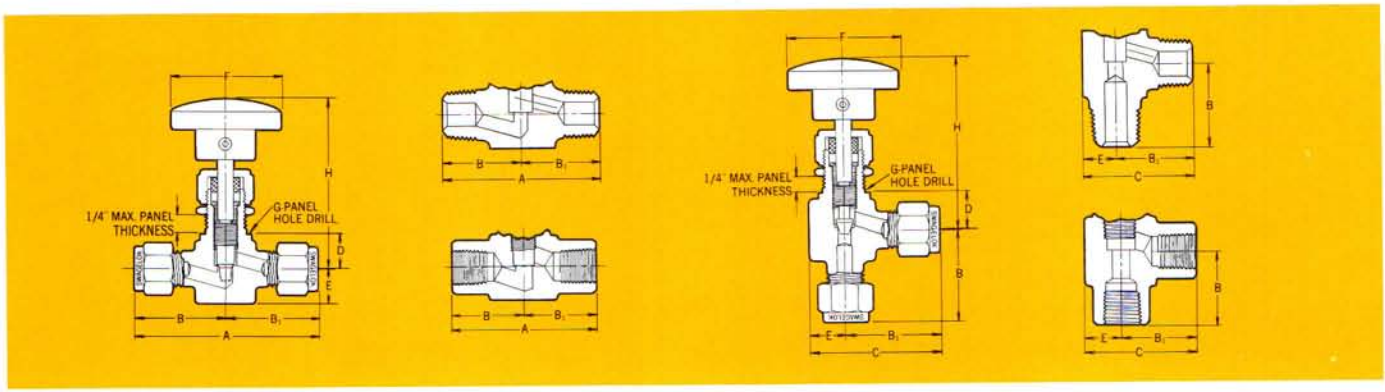


TABLE OF DIMENSIONS

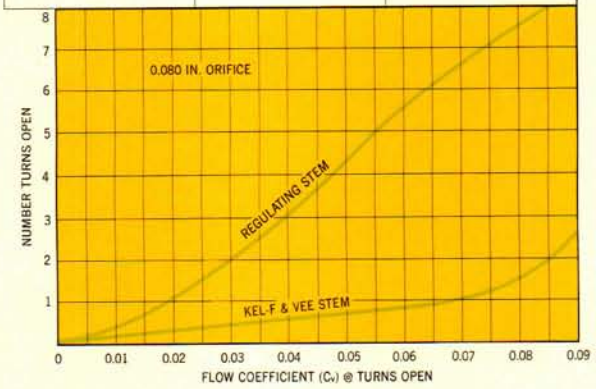
FORGED BODY VALVES			CONNECTION SIZE		DIMENSIONS ▲									
CATALOG NUMBER*	STEM TYPE	ORIFICE (INCHES)	INLET	OUTLET	A	B	B_1	C	D	E	F	G	H OPEN	H CLOSED
-0KF2 -0RF2 -0VF2	Kel-F Reg. Vee	0.080	⅛ Female NPT	⅛ Female NPT	1⅞	15/16	15/16	1 17/32	7/16	9/32	15/16	29/64	2¼	2
-0KM2 -0RM2 -0VM2	Kel-F Reg. Vee	0.080	⅛ Male NPT	⅛ Male NPT	1½	¾	¾	1	7/16	¼	15/16	29/64	2¼	2
-0KM2-S2 -0RM2-S2 -0VM2-S2	Kel-F Reg. Vee	0.080	⅛ Male NPT	⅛ SWAGELOK	1¾	¾	1	1¼	7/16	¼	15/16	29/64	2¼	2
-0KS2 -0RS2 -0VS2	Kel-F Reg. Vee	0.080	⅛ SWAGELOK	⅛ SWAGELOK	2	1	1	1¼	7/16	¼	15/16	29/64	2¼	2
-1KF2 -1RF2 -1VF2	Kel-F Reg. Vee	0.172	⅛ Female NPT	⅛ Female NPT	1⅝	13/16	13/16	1¼	7/16	7/16	1⅜	33/64	2½	2¼
-1KM4 -1RM4 -1VM4	Kel-F Reg. Vee	0.172	¼ Male NPT	¼ Male NPT	1 31/32	1	1	1 13/32	7/16	7/16	1⅜	33/64	2½	2¼
-1KM4-S4 -1RM4-S4 -1VM4-S4	Kel-F Reg. Vee	0.172	¼ Male NPT	¼ SWAGELOK	2 5/32	1	1 5/32	1 19/32	7/16	7/16	1⅜	33/64	2½	2¼
-1KS4 -1RS4 -1VS4	Kel-F Reg. Vee	0.172	¼ SWAGELOK	¼ SWAGELOK	2 5/16	1 5/32	1 5/32	1 19/32	7/16	7/16	1⅜	33/64	2½	2¼
-1KF4 -1RF4 -1VF4	Kel-F Reg. Vee	0.250	¼ Female NPT	¼ Female NPT	2⅛	1 1/16	1 1/16	1 9/16	½	½	1⅞	25/32	3	2¾
-1KM4-S6 -1RM4-S6 -1VM4-S6	Kel-F Reg. Vee	0.250	¼ Male NPT	⅜ SWAGELOK	2 7/16	1⅛	1 5/16	1 13/16	½	½	1⅞	25/32	3	2¾
-1KM6 -1RM6 -1VM6	Kel-F Reg. Vee	0.250	⅜ Male NPT	⅜ Male NPT	2¼	1⅛	1⅛	1⅝	½	½	1⅞	25/32	3	2¾
-1KS6 -1RS6 -1VS6	Kel-F Reg. Vee	0.250	⅜ SWAGELOK	⅜ SWAGELOK	2⅝	1 5/16	1 5/16	1 13/16	½	½	1⅞	25/32	3	2¾
-1KS8 -1RS8 -1VS8	Kel-F Reg. Vee	0.250	½ SWAGELOK	½ SWAGELOK	2 13/16	1 13/32	1 13/32	1 29/32	9/16	½	1⅞	25/32	3	2¾
-18KF8 -18VF8	Kel-F Vee	0.375	½ Female NPT	½ Female NPT	3	1½	1½	2 5/16	¾	13/16	3	1 1/32	3 25/32	3½
-18KM8 -18VM8	Kel-F Vee	0.375	½ Male NPT	½ Male NPT	3	1½	1½	2 5/16	¾	13/16	3	1 1/32	3 25/32	3½
-18KS8 -18VS8	Kel-F Vee	0.375	½ SWAGELOK	½ SWAGELOK	4⅛	2 1/16	2 1/16	2⅞	¾	13/16	3	1 1/32	3 25/32	3½
-18KS12 -18VS12	Kel-F Vee	0.375	¾ SWAGELOK	¾ SWAGELOK	3 11/16	1 27/32	1 27/32	2 21/32	¾	13/16	3	1 1/32	3 25/32	3½

* For a complete ordering number, add B for brass, SS for 316 stainless steel, A for aluminum, S for carbon steel or M for Monel as a prefix to the catalog number. Add -A as a suffix for angle pattern valves. Example: SS-ORF2, B-1RS8, M-1VS4, B-1VS4-A.

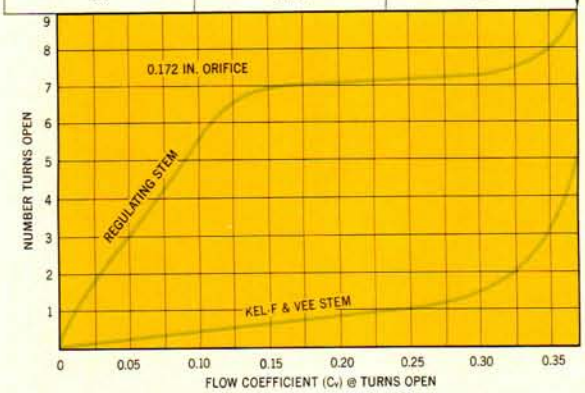
▲ Dimensions shown with SWAGELOK nuts finger-tight, when applicable.

FLOW CAPACITY CURVES

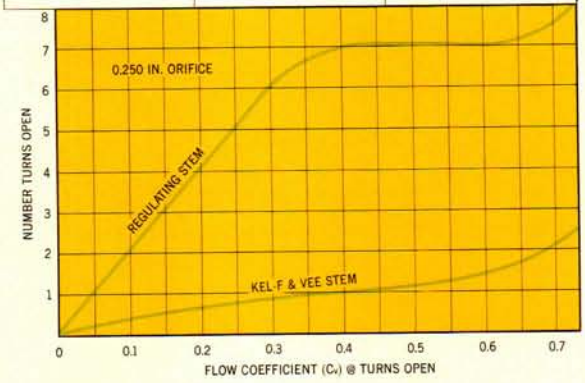
MAXIMUM FLOW FOR C_v = 0.09		
PRESSURE DROP TO ATMOSPHERE (△P) PSI	AIR SCFM @ 70°F	WATER GPM @ 70°F
10	1.28	0.29
50	3.41	0.64
100	6.04	0.90



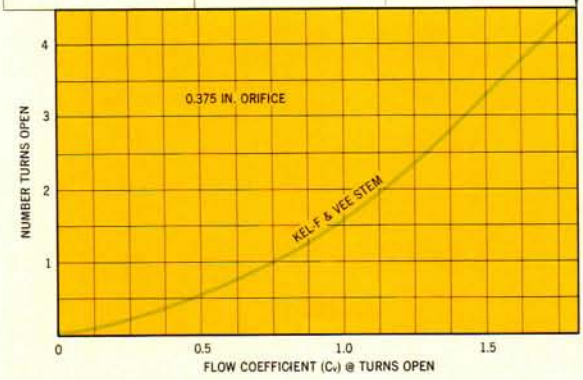
MAXIMUM FLOW FOR C_v = 0.37		
PRESSURE DROP TO ATMOSPHERE (△P) PSI	AIR SCFM @ 70°F	WATER GPM @ 70°F
10	5.14	1.17
50	14.01	2.62
100	24.84	3.70



MAXIMUM FLOW FOR C_v = 0.73		
PRESSURE DROP TO ATMOSPHERE (△P) PSI	AIR SCFM @ 70°F	WATER GPM @ 70°F
10	10.11	2.31
50	27.64	5.16
100	49.00	7.30



MAXIMUM FLOW FOR C_v = 1.8		
PRESSURE DROP TO ATMOSPHERE (△P) PSI	AIR SCFM @ 70°F	WATER GPM @ 70°F
10	25.04	5.69
50	68.16	12.73
100	120.83	18.00



VARIETY OF PATTERNS, END CONNECTIONS AND MATERIALS

ANGLE PATTERN

A-1VM6-S6-A

CROSS PATTERN*

SS-1VS4-X

STRAIGHT PATTERN

M-0VM2

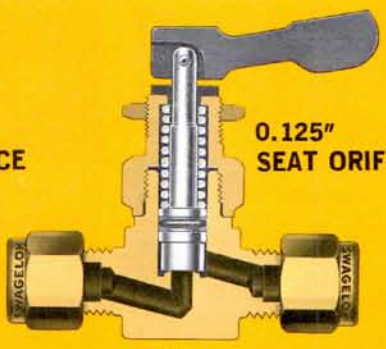
STRAIGHT PATTERN

S-18VM8-F8

*NOTE: Uninterrupted flow between side ports at all times. On-off or metered flow thru bottom port.

PATENTED

SS-0GS2



B-1GS4

SS-1GS6

PURPOSE

WHITEY Toggle Operated Forged Body Valves are positive, soft seat shut-off valves designed for quick opening or closing. They are offered in a variety of sizes, patterns and end connections, making them suitable for many low pressure instrument and control systems. An O-Ring stem seal close to the valve orifice provides the reliability of a single seal point and offers the additional advantage of minimum dead space.

Heavy duty TFE coated stainless steel springs are used in all valves. Since it is the spring load that closes the valve, shut-off force is constant and the stem cannot be over-tightened or galled. The O-Ring stem seal protects the spring from system fluids and contaminants.

OPERATION

A 90° movement of the handle opens the valve to full flow. The valve handle locks firmly in the open position and will not close by an accidental touch or through vibration. When the handle is lowered to the closed position, a TFE stem tip seats against a raised, tapered orifice for a positive leak-tight shut-off under all rated pressure conditions.

If momentary opening is desired for jogging, timed control or reading an instrument, the handle may be pressed down to open and simply released to close.

An extra hole in the handle allows easy conversion to a "snap-shut" handle. A 1/16" pin inserted into this hole prevents the valve from being left in the open position.

APPLICATIONS

Quick on-off operation • Pneumatics • Test benches • Instrumentation • Control panels • Air lines • Gauges • Manometers • Coolant lines • Sampling lines • Vents

SPECIAL FEATURES

Quick opening or closing • Cannot be over-tightened • Positive, repetitive shut-off • Burnished bore for Viton O-Ring seal • Minimum dead space • Rugged compact forged body • TFE coated spring protected from contaminants • Straight, angle and cross patterns • Stainless steel stems in all standard valves • Color coded handles • Universal mounting nut standard • 100% factory tested • Integral SWAGELOK end connections • Male and female pipe connections

TECHNICAL DATA

ORIFICE SIZE (INCHES)	FLOW COEFFICIENT, Cv	PRESSURE RATING @ 70°F	TEMPERATURE RATING
0.080*	0.11	300 PSI	-40 to 200°F
0.125	0.20		
0.250	0.70	200 PSI	

*Orifice at the seat is 0.125"; 0.080" port orifice sets the maximum flow.

0.080" PORT ORIFICE MAXIMUM FLOW FOR Cv=0.11		
PRESSURE DROP TO ATMOSPHERE (△P) PSI	AIR SCFM @ 70°F	WATER GPM @ 70°F
10	1.61	0.35
50	4.17	0.78
100	7.38	1.10

0.125" SEAT ORIFICE MAXIMUM FLOW FOR Cv=0.20		
PRESSURE DROP TO ATMOSPHERE (△P) PSI	AIR SCFM @ 70°F	WATER GPM @ 70°F
10	2.73	0.63
50	7.57	1.41
100	13.43	2.00

0.250" SEAT ORIFICE MAXIMUM FLOW FOR Cv=0.70		
PRESSURE DROP TO ATMOSPHERE (△P) PSI	AIR SCFM @ 70°F	WATER GPM @ 70°F
10	9.79	2.21
50	26.51	4.95
100	46.99	7.00

MATERIALS

Stem—Type 316 stainless steel with TFE tip in all valves.

Top Gland; Spring Washers—Nylon.

Handle—Standard nylon handles are black; optional handles are available in red, orange, yellow, green, blue, purple and white. Aluminum handles can be provided.

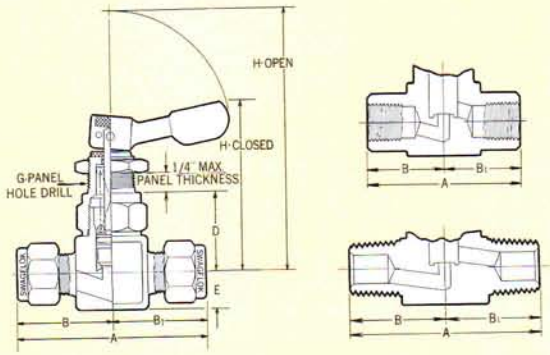
Pin—Type 302 stainless steel.

Spring—Stainless steel, TFE coated.

O-Ring—Viton is standard on all valves. Other elastomers can be furnished.

All other parts—Type 316 stainless steel or brass.

NOTE: Brass and 316 stainless steel are standard valve materials; aluminum, steel and Monel valves are available on special order.



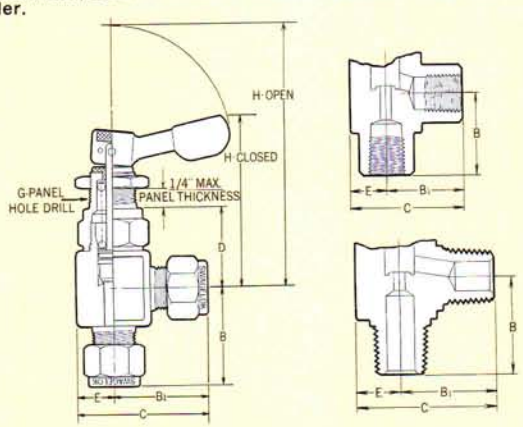


TABLE OF DIMENSIONS

TOGGLE OPERATED VALVES		CONNECTION SIZE		DIMENSIONS②								
CATALOG NUMBER①	ORIFICE (INCHES)	INLET	OUTLET	A	B	B_1	C	D	E	G	H OPEN	H CLOSED
-0GM2	0.080③	⅛ Male NPT	⅛ Male NPT	1½	¾	¾	1	29/32	¼	17/32	2⅞	1 13/16
-0GM2-S2	0.080③	⅛ Male NPT	⅛ SWAGELOK	1¾	¾	1	1¼	29/32	¼	17/32	2⅞	1 13/16
-0GS2	0.080③	⅛ SWAGELOK	⅛ SWAGELOK	2	1	1	1¼	29/32	¼	17/32	2⅞	1 13/16
-1GF2	0.125	⅛ Female NPT	⅛ Female NPT	1⅝	13/16	13/16	1¼	27/32	7/16	17/32	2¾	1⅞
-1GM4	0.125	¼ Male NPT	¼ Male NPT	1 31/32	63/64	63/64	1 27/64	27/32	7/16	17/32	2¾	1⅞
-1GM4-S4	0.125	¼ Male NPT	¼ SWAGELOK	2 9/64	63/64	1 5/32	1 19/32	27/32	7/16	17/32	2¾	1⅞
-1GS4	0.125	¼ SWAGELOK	¼ SWAGELOK	2 5/16	1 5/32	1 5/32	1 19/32	27/32	7/16	17/32	2¾	1⅞
-1GF4	0.250	¼ Female NPT	¼ Female NPT	2⅛	1 1/16	1 1/16	1 9/16	1 1/16	½	21/32	3½	2⅜
-1GM6	0.250	⅜ Male NPT	⅜ Male NPT	2¼	1⅛	1⅛	1⅝	1 1/16	½	21/32	3½	2⅜
-1GS6	0.250	⅜ SWAGELOK	⅜ SWAGELOK	2⅝	1 5/16	1 5/16	1 13/16	1 1/16	½	21/32	3½	2⅜
-1GS8	0.250	½ SWAGELOK	½ SWAGELOK	2 13/16	1 13/32	1 13/32	1 29/32	1 1/16	½	21/32	3½	2⅜

① For a complete ordering number, add B for brass, SS for 316 stainless steel, A for aluminum, S for carbon steel or M for Monel as a prefix to the catalog number. Add -A as a suffix for angle pattern valves. Example: SS-1GS4, B-0GS2, SS-1GM4-A.

② Dimensions shown with SWAGELOK nuts finger-tight, when applicable.

③ Orifice at the seat is 0.125"; 0.080" port orifice sets the maximum flow.

SS-1GS4-X
CROSS PATTERN

Bottom port can be used for on-off service. Uninterrupted flow is allowed between the side ports, regardless of stem position.

302-14G
HANDLE POSITIONER

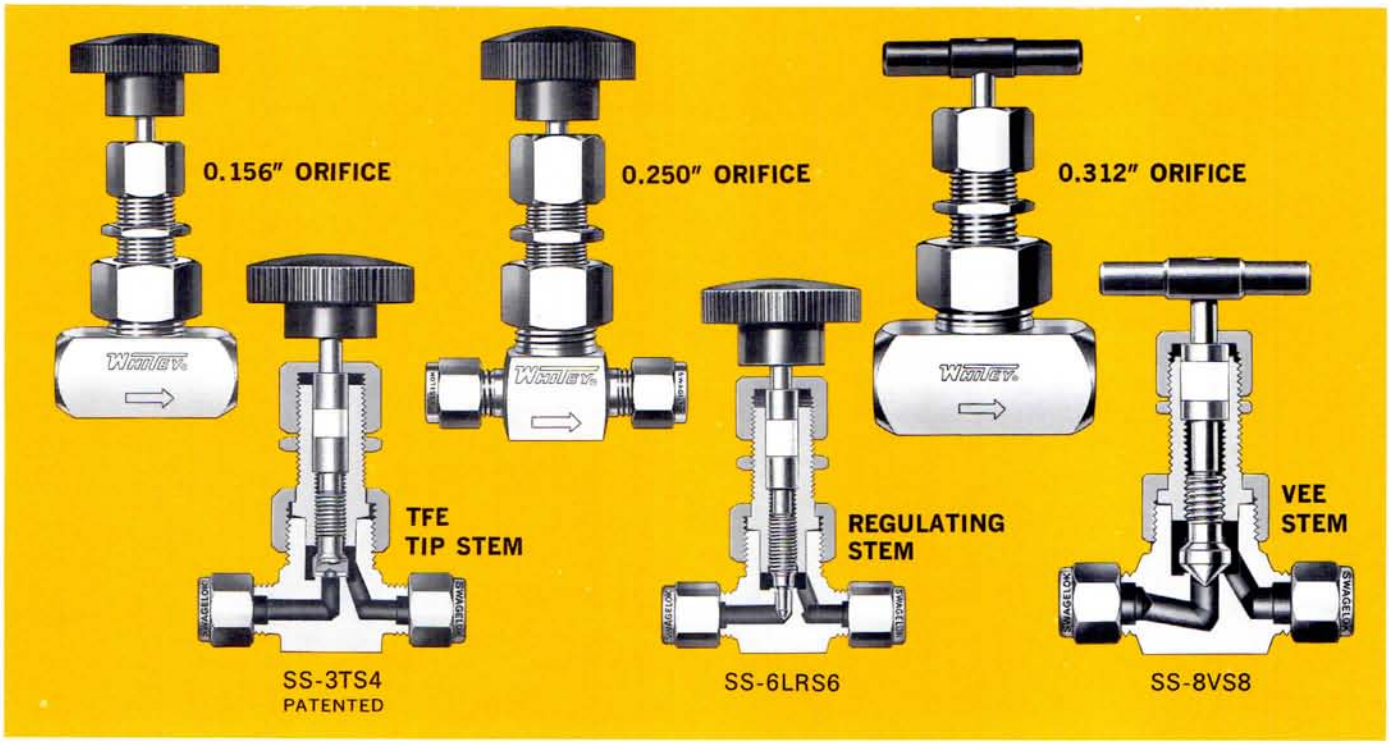
Fixes the handle in any desired location and prevents it from rotating. Improves panel appearance. Colored handles are available on all models for coded panels.

PATENTED

PATENTED

MS-1-6
UNIVERSAL MOUNTING BRACKET

The universal mounting bracket can be used to hold the valve firmly, when not panel mounted, to prevent placing any strain on the tubing. The hinged bracket can be snapped open for assembly without removing the jam nut. These brackets can be used with a variety of WHITEY Valves.



PURPOSE

WHITEY Union Bonnet Valves provide safe, reliable operation with pressures up to 5000 psi. The heavy duty, three-piece union bonnet construction is an important safety feature when working with high pressure systems. The union bonnet design prevents accidental disassembly of the valve while in service.

Vee stems are used for shut-off service with self-lubricating fluids. A TFE tip stem for positive, repetitive shut-off, is especially useful with thin gases, solvents, etc. A TFE ring is press-fitted and mechanically rolled into the stem on the inside and outside diameters of the ring. The result is a permanent assembly which will not come apart in service. Regulating stems are used for fine control and shut-off throughout a broad flow range.

OPERATION

WHITEY Union Bonnet Valves with TFE and Vee stems are opened to full flow with 2 to 3 turns of the handle. Regulating stem valves open 7 to 12 turns, depending on the orifice size.

APPLICATIONS

High pressure hydraulic and pneumatic systems • Shut-off valves for pumps, compressors and gauges • Natural gas lines • Feed lines in refineries and chemical plants • Sampling lines • Power plants • Laboratory and research applications.

SPECIAL FEATURES

Machined, pure TFE cylinder packing, fully contained by metal • Packing adjustable • Precision machined barstock body • Metal-to-Metal, non-rotating bonnet seal • Pressures to 5000 psi • Straight and angle patterns • Universal mounting nut standard • SWAGELOK end connections • Female pipe connections • 100% factory tested.

TECHNICAL DATA

ORIFICE SIZE (INCHES)	FLOW COEFFICIENT, Cv	PRESSURE RATING @ 70°F	MAXIMUM TEMPERATURE RATING
0.156	0.37	316 SS 5000 psi	450°F with TFE packing
0.250	0.85		
0.312	1.4		

MATERIALS

Body—Type 316 stainless steel.

Stem—Type 316 stainless steel on all valves. TFE tip stems can be furnished in all valves.

Packing—Pure high-density, TFE cylinder machined from extruded solid rod.

Handle—Black anodized aluminum bar handle on 0.312" orifice valve. On other orifice sizes, molded phenolic knobs are available in black (standard), blue, green, red, yellow, orange, gray, maroon and brown. Handle extensions can be supplied on special order.

All Other Parts—Type 316 stainless steel.

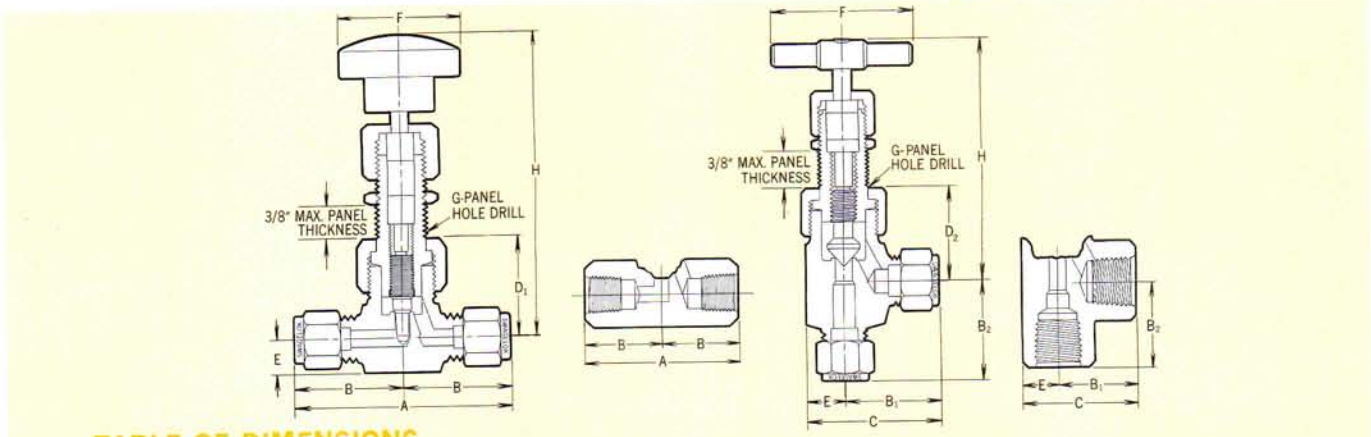


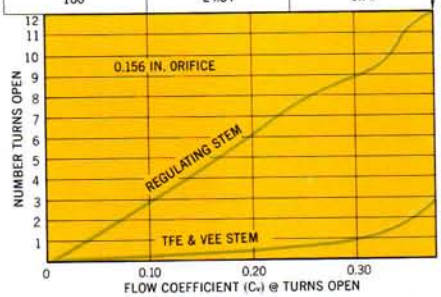
TABLE OF DIMENSIONS

UNION BONNET VALVES			CONNECTION SIZE	DIMENSIONS ②										STRAIGHT		ANGLE	
PART NUMBER ①	STEM TYPE	ORIFICE (INCHES)	INLET AND OUTLET	A	B	B_1	B_2	C	D_1	D_2	E	F	G	H OPEN	H CLOSED	H OPEN	H CLOSED
SS-3LRF2 SS-3TF2 SS-3VF2	Reg. TFE Tip Vee	0.156	⅛ Female NPT	2	1	29/32	1	1 9/32	1 3/32	1 9/32	3/8	1 3/8	19/32	3 7/8	3 1/4	4 1/16	3 7/16
SS-3LRF4 SS-3TF4 SS-3VF4	Reg. TFE Tip Vee	0.156	¼ Female NPT	2 1/16	1 1/32	29/32	1	1 9/32	1 3/32	1 9/32	3/8	1 3/8	19/32	3 7/8	3 1/4	4 1/16	3 7/16
SS-3LRS4 SS-3TS4 SS-3VS4	Reg. TFE Tip Vee	0.156	¼ SWAGELOK	2 7/16	1 7/32	1 3/16	1 1/2	1 9/16	1 3/32	1 3/32	3/8	1 3/8	19/32	3 7/8	3 1/4	3 7/8	3 1/4
SS-6LRF4 SS-6TF4 SS-6VF4	Reg. TFE Tip Vee	0.250	¼ Female NPT	2 1/4	1 1/8	1	1 1/8	1 1/2	1 11/32	1 15/32	1/2	1 7/8	25/32	4 11/16	4 7/32	4 13/16	4 11/32
SS-6LRS6 SS-6TS6 SS-6VS6	Reg. TFE Tip Vee	0.250	⅜ SWAGELOK	2 7/8	1 7/16	1 5/16	1 11/16	1 13/16	1 11/32	1 7/32	1/2	1 7/8	25/32	4 11/16	4 7/32	4 9/16	4 3/32
SS-8RF6 SS-8TF6 SS-8VF6	Reg. TFE Tip Vee	0.312	⅜ Female NPT	2 3/4	1 3/8	1 1/4	1 3/8	1 7/8	1 11/16	1 13/16	5/8	2 1/2	29/32	4 23/32	4 1/32	4 27/32	4 5/32
SS-8RF8 SS-8TF8 SS-8VF8	Reg. TFE Tip Vee	0.312	½ Female NPT	2 3/4	1 3/8	1 1/4	1 3/8	1 7/8	1 11/16	1 13/16	5/8	2 1/2	29/32	4 23/32	4 1/32	4 27/32	4 5/32
SS-8RS8 SS-8TS8 SS-8VS8	Reg. TFE Tip Vee	0.312	½ SWAGELOK	3 9/16	1 25/32	1 21/32	1 31/32	2 19/32	1 11/16	1 5/8	5/8	2 1/2	29/32	4 23/32	4 1/32	4 21/32	3 31/32

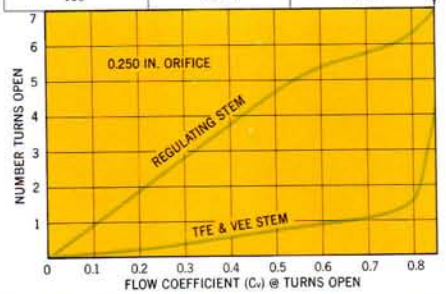
① Add -A as a suffix when ordering angle pattern valves. ② Dimensions shown with SWAGELOK nuts finger-tight, when applicable.

FLOW CAPACITY CURVES

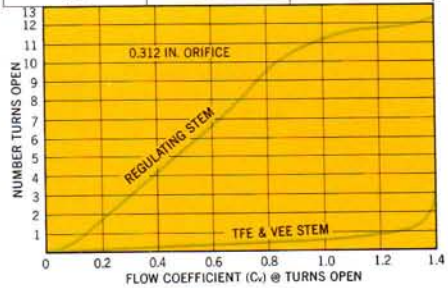
MAXIMUM FLOW FOR C_v = 0.37		
PRESSURE DROP TO ATMOSPHERE (△P) PSI	AIR SCFM @ 70°F	WATER GPM @ 70°F
10	5.14	1.17
50	14.01	2.62
100	24.84	3.70

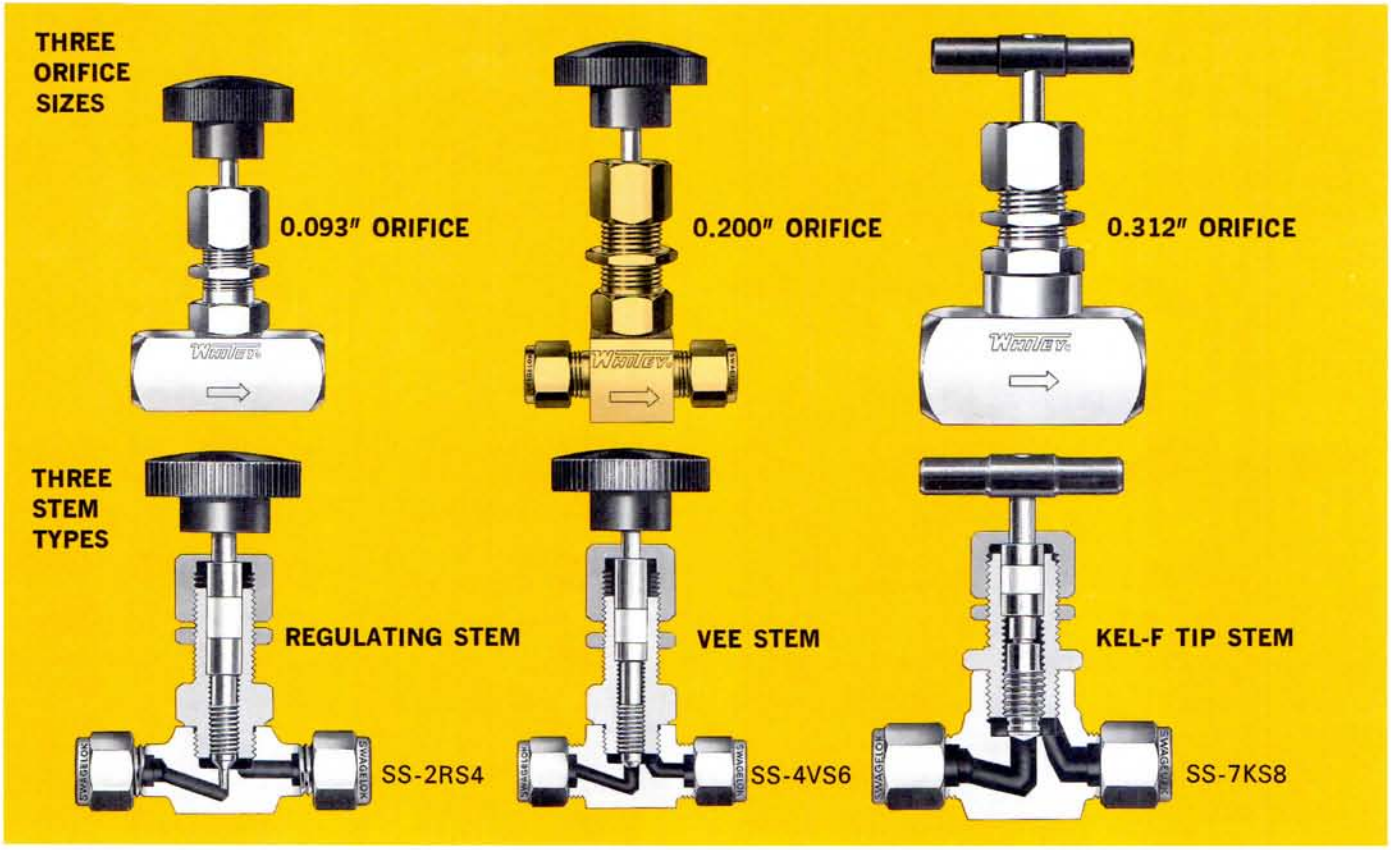


MAXIMUM FLOW FOR C_v = 0.85		
PRESSURE DROP TO ATMOSPHERE (△P) PSI	AIR SCFM @ 70°F	WATER GPM @ 70°F
10	11.88	2.69
50	32.19	6.01
100	57.06	8.50



MAXIMUM FLOW FOR C_v = 1.4		
PRESSURE DROP TO ATMOSPHERE (△P) PSI	AIR SCFM @ 70°F	WATER GPM @ 70°F
10	19.58	4.43
50	53.01	9.90
100	93.98	14.00





PURPOSE

The versatile WHITEY Screwed Bonnet Valve line incorporates Vee stems for shut-off service and regulating stems for shut-off and fine control over a wide range of flows. Kel-F tip stems are available in the 0.312" orifice valves for positive, repetitive shut-off. Screwed Bonnet Valves can have the bonnet removed for close center-to-center installation on meters and orifice plates.

OPERATION

Screwed Bonnet Valves are fully opened with 2 to 3 turns of the handle using Vee or Kel-F tip stems. Regulating stems open 7 to 12 turns depending on the orifice size.

APPLICATIONS

Sampling lines • Hydraulic and pneumatic systems • Gauges • Meters • Test Benches • Panels • Manifolds • Natural gas lines.

SPECIAL FEATURES

Machined, pure TFE cylinder packing, fully contained by metal • Packing adjustable and can be replaced without removing valve from system • Precision machined barstock body • Type 316 stainless stems in all valves • Metal-to-metal, body-to-bonnet seal • Straight and angle patterns • Universal mounting nut standard • SWAGELOK end connections • Female pipe connections • 100% factory tested.

TECHNICAL DATA

ORIFICE SIZE (INCHES)	FLOW COEFFICIENT, Cv	PRESSURE RATING @ 70°F	MAXIMUM TEMPERATURE RATING
0.093	Reg. 0.15 Vee 0.14	3000 psi	250°F with Kel-F tip stem
0.200	Reg. 0.48 Vee 0.51		450°F with Reg. & Vee stems, TFE packing (400°F with brass)
0.312	Reg. 1.15 Vee, Kel-F 1.20		

MATERIALS

Body—Brass and type 316 stainless steel.

Stem—Type 316 stainless steel on all valves. A Kel-F stem tip can be used in 0.312" orifice valves when specified.

Packing—Pure high-density, TFE cylinder machined from extruded solid rod.

Handle—Black anodized aluminum bar handle on 0.312" orifice valves. On other orifice sizes, molded phenolic knobs are available in black (standard), blue, green, red, yellow, orange, gray, maroon and brown. Handle extensions can be supplied on special order.

All Other Parts—Same material as the body.

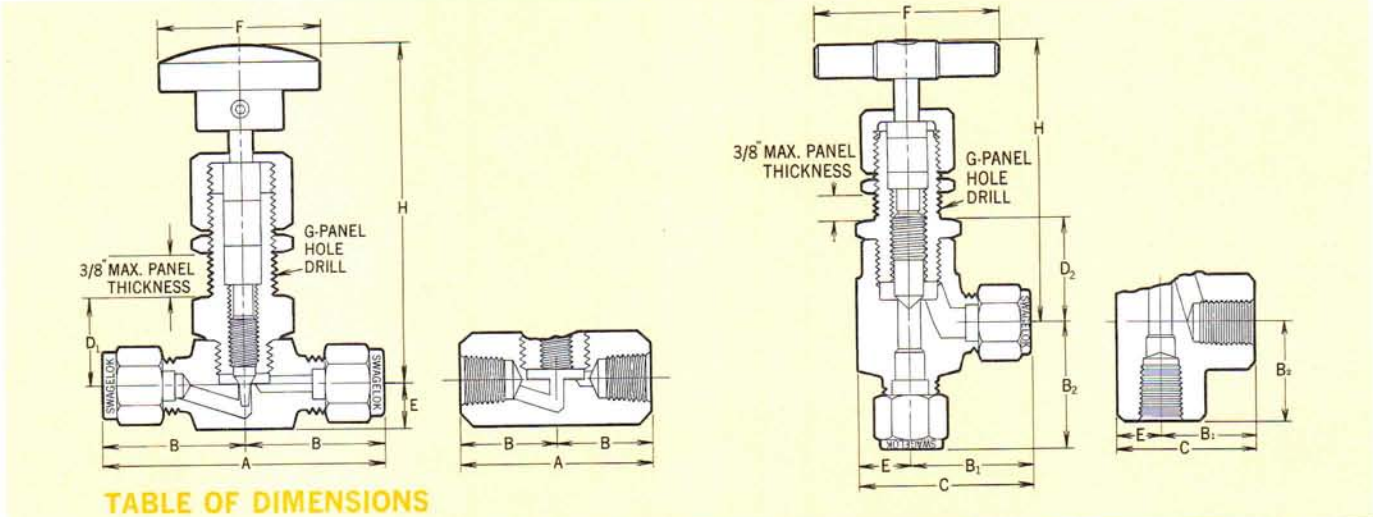


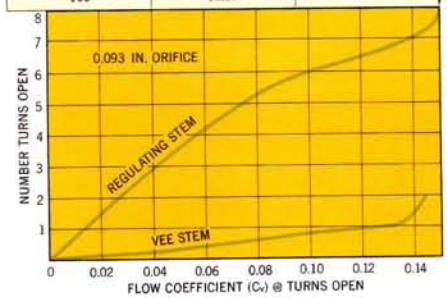
TABLE OF DIMENSIONS

SCREWED BONNET VALVES			CONNECTION SIZE	DIMENSIONS ②										STRAIGHT		ANGLE	
CATALOG NUMBER ①	STEM TYPE	ORIFICE (INCHES)	INLET AND OUTLET	A	B	B_1	B_2	C	D_1	D_2	E	F	G	H OPEN	H CLOSED	H OPEN	H CLOSED
-2RF2	Reg.	0.093	1/8 Female NPT	1 13/16	29/32	7/8	15/16	1 3/8	3/4	3/4	3/8	1 3/8	19/32	3 1/8	2 7/8	3 1/8	2 7/8
-2RF4	Reg.	0.093	1/4 Female NPT	2	1	15/16	15/16	1 3/8	3/4	13/16	3/8	1 3/8	19/32	3 1/8	2 7/8	3 3/16	2 15/16
-2RS4	Reg.	0.093	1/4 SWAGELOK	2 7/16	1 7/32	1 3/16	1 3/16	1 9/16	3/4	3/4	3/8	1 3/8	19/32	3 1/8	2 7/8	3 1/8	2 7/8
-4RF4 -4VF4	Reg. Vee	0.200	1/4 Female NPT	2 1/8	1 1/16	1 1/32	1	1 1/2	1 1/16	1	7/16	1 7/8	25/32	4 11/32	3 15/16	4 9/32	3 7/8
-4RS4 -4VS4	Reg. Vee	0.200 ③	1/4 SWAGELOK	2 1/2	1 1/4	1 11/32	1 5/16	1 13/16	1 1/16	1	7/16	1 7/8	25/32	4 11/32	3 15/16	4 9/32	3 7/8
-4RS6 -4VS6	Reg. Vee	0.200	3/8 SWAGELOK	2 3/4	1 3/8	1 11/32	1 5/16	1 13/16	1 1/16	1	7/16	1 7/8	25/32	4 11/32	3 15/16	4 9/32	3 7/8
-7KF6 -7RF6 -7VF6	Kel-F Reg. Vee	0.312	3/8 Female NPT	2 3/4	1 3/8	1 1/4	1 3/8	1 7/8	1 9/16	1 11/16	5/8	2 1/2	29/32	4 23/32	4 1/32	4 27/32	4 5/32
-7KF8 -7RF8 -7VF8	Kel-F Reg. Vee	0.312	1/2 Female NPT	2 3/4	1 3/8	1 1/4	1 3/8	1 7/8	1 9/16	1 11/16	5/8	2 1/2	29/32	4 23/32	4 1/32	4 27/32	4 5/32
-7KS8 -7RS8 -7VS8	Kel-F Reg. Vee	0.312	1/2 SWAGELOK	3 9/16	1 25/32	1 21/32	1 31/32	2 19/32	1 9/16	1 1/2	5/8	2 1/2	29/32	4 23/32	4 1/32	4 21/32	3 31/32

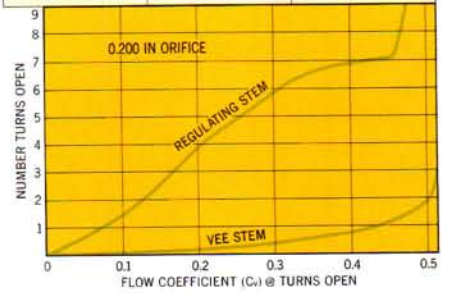
① For a complete ordering number, add B for brass or SS for 316 stainless steel as a prefix to the catalog number. Add -A as a suffix for angle pattern valves. Example: B-2RF2, SS-7RS8-A. ② Dimensions shown with SWAGELOK nuts finger-tight, when applicable. ③ Cv = .42 due to port orifice drilling.

FLOW CAPACITY CURVES

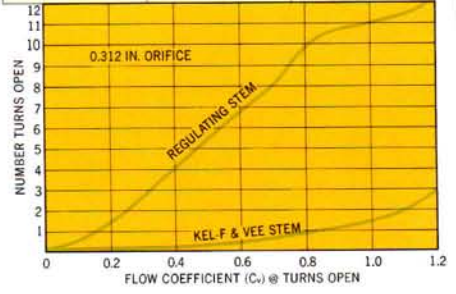
MAXIMUM FLOW FOR C_v = 0.15		
PRESSURE DROP TO ATMOSPHERE (△P) PSI	AIR SCFM @ 70°F	WATER GPM@ 70°F
10	2.09	0.47
50	5.68	1.06
100	10.07	1.50



MAXIMUM FLOW FOR C_v = 0.51		
PRESSURE DROP TO ATMOSPHERE (△P) PSI	AIR SCFM @ 70°F	WATER GPM@ 70°F
10	7.06	1.61
50	19.31	3.61
100	34.23	5.10



MAXIMUM FLOW FOR C_v = 1.2		
PRESSURE DROP TO ATMOSPHERE (△P) PSI	AIR SCFM @ 70°F	WATER GPM @ 70°F
10	16.69	3.79
50	45.44	8.49
100	80.55	12.00



WHITEY® "PD" SERIES STRAIGHT-THROUGH PLUG VALVES

PATENT PENDING

0.187" ORIFICE

SS-4PDF4

0.187" ORIFICE WITH GAUGE PORTS

SS-4PDGF4

0.250" ORIFICE

SS-5PDM8-F8

PURPOSE

The WHITEY "PD" Series Valve is an extremely rugged, straight-through design, rising plug valve. The valve provides good regulation as well as large flow capacity in the wide open position.

The plastic seat inserts can absorb large quantities of solid contaminants and still provide a very positive, leak-tight shut-off. All valves are roddable for easy cleaning.

This stainless steel WHITEY Valve with replaceable seats and seals is ideal for use where it is desirable to have a permanent installation with easy and inexpensive maintenance.

WHITEY "PDG" Series Valves have two extra side ports in the same compact body, providing versatility for use in manifolds or for gauge installation where a purge valve, sampling line or test pressure source is required.

WHITEY "PDG" Series Manifolds are fully described in Technical Bulletin No. 26.

OPERATION

The WHITEY "PD" and "PDG" Series Valves are opened to full flow with approximately 4-1/2 turns of the handle. In the closed position, the type 316 stainless steel stem tip is shut off against the molded Delrin seat insert, forcing contaminants into the throw-away seat and allowing repetitive, leak-tight shut-off.

APPLICATIONS

Liquified petroleum gas processing plants • Offshore installations • Refineries • Petrochemical plants • Natural gas installations • System difficult to shut off due to solid contaminants, scale, sand, dust, dirt, chips, rust, etc. • Sampling systems and cylinders • Oil and gas wells • Resins.

SPECIAL FEATURES

Stainless steel "PD" and "PDG" Series Valves have throw-away seats and seals that are easily replaced, eliminating the high maintenance costs of valve removal and replacement • Excellent flow regulation and leak-tight, soft seat shut-off • Slow opening to prevent damage to instruments or gauges through a sudden pressure surge • Roddable for easy cleaning • Straight-through orifice for maximum flow • Actuating threads out of contact with system fluid prevent lubricant washout, keep operating torque low and provide long service life • Roller-burnished bore for maximum O-Ring life • TFE back-up ring above the O-Ring prevents extrusion at higher pressures • TFE wiper below the O-Ring protects against damage from contaminants • Permanent, internal stem wiper protects threads from external contamination and keeps lubrication on the threads where it belongs • No threads exposed in the full open position • Safety lock nut secures the bonnet and body against accidental disassembly • Non-rotating stem tip for maximum seat life and positive sealing every time • Rugged construction for tough environments • Hardened actuator provides maximum service life by preventing thread galling and freeze up • All wetted metal parts are 316 stainless steel for maximum valve life • Safety metal-to-metal backstop prevents accidental disassembly • 100% factory tested. • Low operating torque—Rolled stem threads are heavily lubricated • Rugged, stainless steel bar handle and cap screw • Metal-to-metal bonnet seal. • ¼" and ½" male and female pipe ends in two body sizes with interchangeable bonnets.

TECHNICAL DATA

SERIES	ORIFICE SIZE (INCHES)	FLOW COEFFICIENT, Cv	MAXIMUM PRESSURE RATING** @ 70°F	MAXIMUM TEMPERATURE RATING*
"4PD" "4PDG"	0.187	0.63	6000 psi	250°F
"5PD"	0.250	1.8		

NOTES:

*250°F is an allowable temperature rating for fluids compatible with Delrin, except that water or steam is not recommended for temperatures over 200°F.

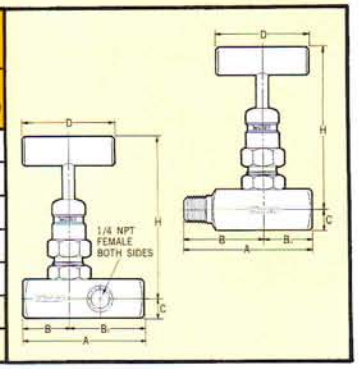
**As pressure containing devices, these valves are rated at 6000 psi with a safety factor of 4:1. They are easily operable at 6000 psi. However, maximum cycle life will be obtained at pressures of 3000 psi and below. This is due to the high force loads on stem threads at higher pressures present on *all* valves of this type. This valve greatly exceeds the cycle life of competitive valves of this general style because of rolled stem threads on a hardened actuator, plus the unique method of retaining thread lubrication.

MATERIALS

Body, Stem Tip, Bonnet, Bonnet Lock Nut—Type 316 stainless steel.
Stem Actuator—17-4PH hardened stainless steel.
Handle Retaining Bolt—Type 18-8 stainless steel.
Handle—Type 303 stainless steel.
Replaceable Seat Insert—Molded Delrin is standard; Molded Penton available for improved chemical resistance to 150°F maximum. Machined glass-filled TFE or Kel-F are also available.
O-Ring—Viton.
Back-up Rings—Virgin TFE.
Wiper Ring—Glass-filled TFE.

TABLE OF DIMENSIONS

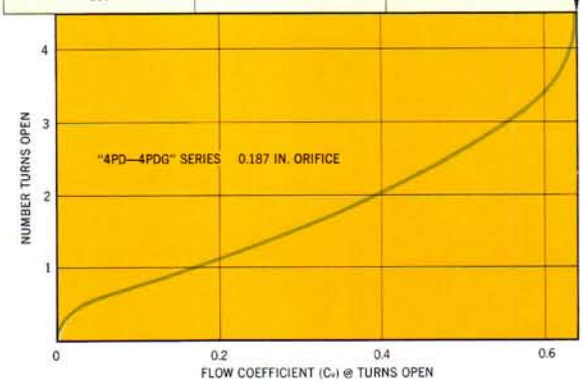
STRAIGHT-THROUGH PLUG VALVES		CONNECTION SIZE		DIMENSIONS						
PART NUMBER	ORIFICE (INCHES)	INLET	OUTLET	A	B	B_1	C	D	H OPEN	H CLOSED
SS-4PDF4	0.187	¼ Female NPT	¼ Female NPT	2¼	1⅛	1⅛	7/16	27/32	323/32	313/32
SS-4PDGF4	0.187	¼ Female NPT	¼ Female NPT	2⅛	1⅛	1¾	7/16	27/32	323/32	313/32
SS-4PDGM8-F4*	0.187	½ Male NPT	¼ Female NPT	4⅛	3⅛*	1¾	7/16	27/32	323/32	313/32
SS-4PDM4-F4	0.187	¼ Male NPT	¼ Female NPT	229/32	125/32	1⅛	7/16	27/32	323/32	313/32
SS-4PDM8-F4	0.187	½ Male NPT	¼ Female NPT	31/32	129/32	1⅛	7/16	27/32	323/32	313/32
SS-5PDF8	0.250	½ Female NPT	½ Female NPT	221/32	111/32	111/32	9/16	27/32	323/32	313/32
SS-5PDM8-F8	0.250	½ Male NPT	½ Female NPT	3½	25/32	111/32	9/16	27/32	323/32	313/32



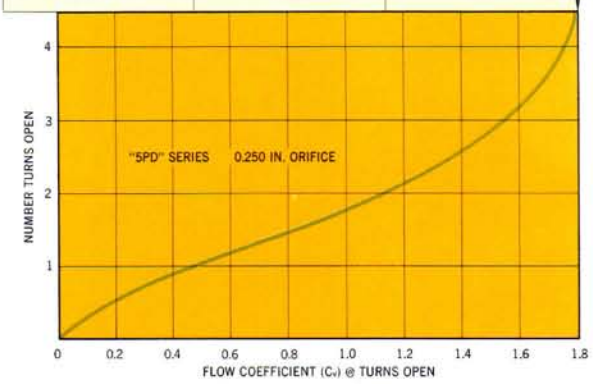
*Includes 2" lagging extension for insertion through pipe insulation.
NOTE: Female NPT side ports on "PDG" valves match the outlet size.

FLOW CAPACITY CURVES

MAXIMUM FLOW FOR C_v = 0.63		
PRESSURE DROP TO ATMOSPHERE (△P) PSI	AIR SCFM @ 70°F	WATER GPM @ 70°F
10	8.83	1.99
50	23.86	4.46
100	42.29	6.30



MAXIMUM FLOW FOR C_v = 1.8		
PRESSURE DROP TO ATMOSPHERE (△P) PSI	AIR SCFM @ 70°F	WATER GPM @ 70°F
10	25.04	5.69
50	68.16	12.73
100	120.83	18.00

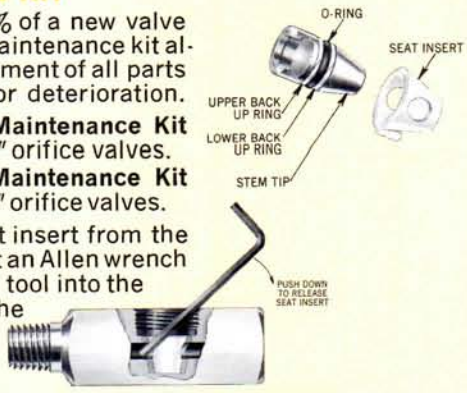


MAINTENANCE KIT

For less than 15% of a new valve cost, the above maintenance kit allows easy replacement of all parts subject to wear or deterioration.

Order: **SS-4PD Maintenance Kit** for 0.187" orifice valves.
SS-5PD Maintenance Kit for 0.250" orifice valves.

To release seat insert from the valve body, insert an Allen wrench or other suitable tool into the orifice through the bonnet bore and push down.



INSTRUCTIONS

Without removing the valve from the system, just loosen the lock nut and remove the bonnet assembly. Pry out the old seat and replace with a new one.

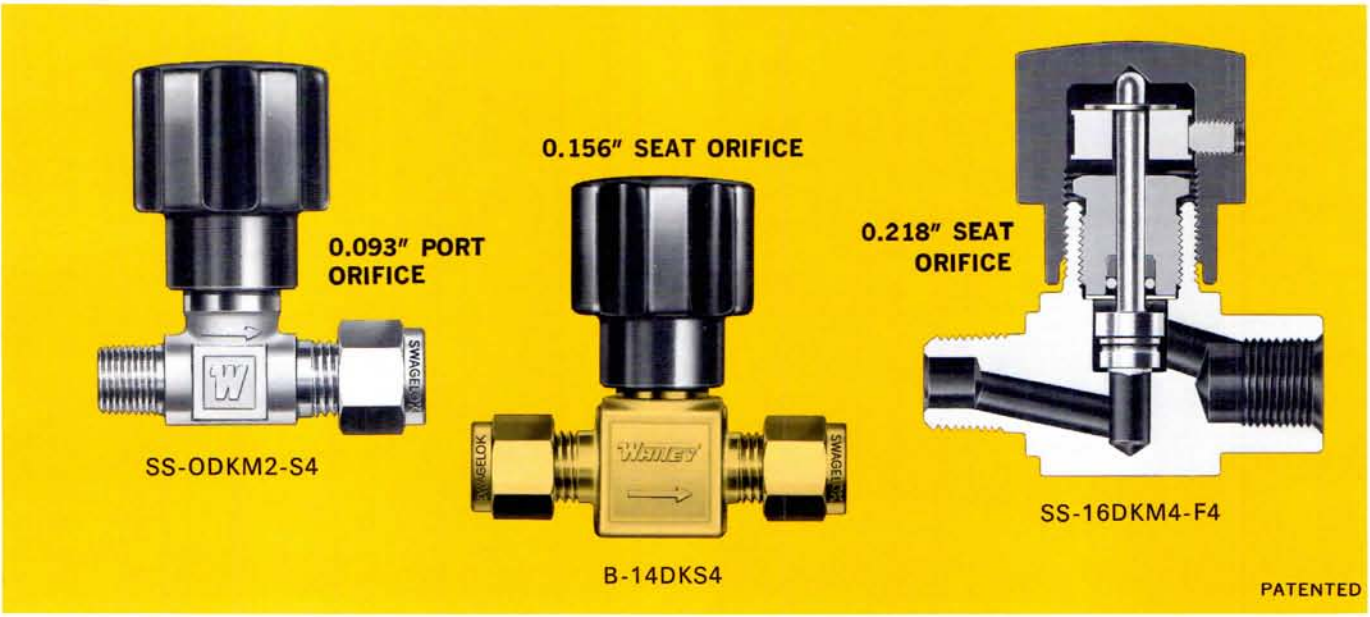
Align the side projection on the new seat insert with the groove in the body.

Turn the stem all the way down, slip off the stem tip assembly with the seal system attached.

Replace with the new preassembled unit. Retract the stem and reassemble the bonnet to the body.

Lock with the lock nut by tightening from 1/4 to 1/2 turn from finger-tight.

With a little practice, this can be done in one to two minutes.



PURPOSE

WHITEY "DK" Shut off Valves fulfill the need for durable, compact, reliable valves that resist rough handling. The rugged forged body and extruded aluminum handle make this valve an ideal choice wherever a punishing environment is encountered.

OPERATION

WHITEY "DK" Valves are opened to full flow with 1-1/2 to 2-1/2 turns of the handle. A relatively low flow is obtained by cracking the handle slightly, thus allowing a small sample volume to flow from a system or cylinder.

APPLICATIONS

High pressure • Corrosive fluids • High purity systems • Pressure gauges • Sample bombs, cylinders, tanks • Non-critical vacuum • Instrumentation • Research.

SPECIAL FEATURES

Positive Stem Retraction—A unique spool-handle design provides positive mechanical retraction of the stem under all conditions. The spool engages the retaining ring as the handle is opened, thus lifting the stem from the valve seat.

Soft Seating—A fully contained Kel-F stem insert allows repetitive on-off service. It is extremely difficult to cause damage to this model by over-tightening. All metal Vee stems are available for metal-to-metal shut-off on special order. Substitute the letter "V" in place of "K" in the valve part number when ordering the Vee stem.

Non-Rotating Stem—There is no stem rotation at shut-off. This promotes long service life by reducing wear of the stem tip.

Threads Removed from System—A Viton O-Ring and Kel-F back-up ring provide a leak-tight stem seal between the threads and the system fluid. The external operating threads cannot be attacked by system fluids and the thread lubricant will not contaminate clean systems or samples.

Additional Features—Safety back seating • Resistance to rough handling • Low pressure drop • All seals can be replaced without disconnecting valve from system • SWAGELOK end connection • Male or female pipe connections • Straight or angle pattern • Ease of operation • 100% factory tested.

TECHNICAL DATA

ORIFICE SIZE (INCHES)	FLOW COEFFICIENT, Cv	PRESSURE RATING @ 70°F	TEMPERATURE RATING
0.093*	0.12	Non-critical vacuum to 3000 psi	-40°F to 250°F
0.156	0.27		
0.218	0.53		

*Orifice at the seat is 0.156"; 0.093 port orifices set the maximum flow.

MATERIALS

Body—Type 316 stainless steel or brass.

Stem—Type 316 stainless steel.

Spool & Handle—Aluminum.

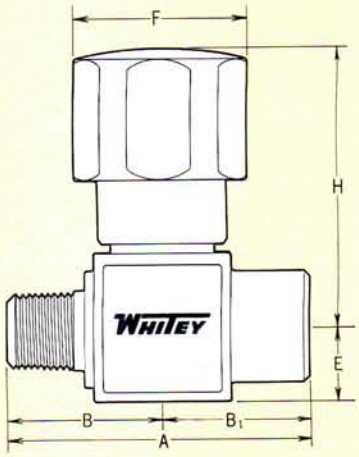
Retaining Ring & Set Screws—Cadmium plated steel.

Stem Insert & Back-up Ring—Kel-F.

Gasket—Annealed type 316 stainless steel, TFE coated with stainless valves; Aluminum on brass valves.

O-Ring—Viton.

All Other Parts—Same material as the body.



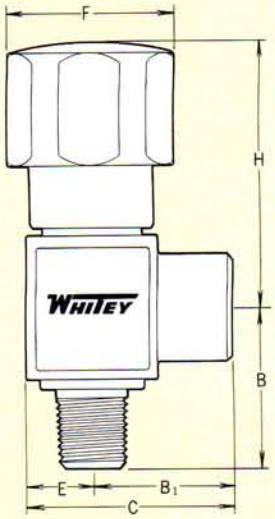


TABLE OF DIMENSIONS

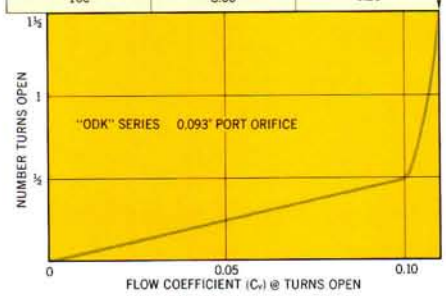
FORGED BODY SHUT-OFF VALVES		CONNECTION SIZE		DIMENSIONS②							
CATALOG NUMBER①	ORIFICE (INCHES)	INLET	OUTLET	A	B	B_1	C	E	F	H OPEN	H CLOSED
-0DKM2-F2	0.093③	⅛ Male NPT	⅛ Female NPT	1 11/16	¾	15/16	1 11/64	15/64	1⅛	1 55/64	1 51/64
-0DKM2-S4	0.093③	⅛ Male NPT	¼ SWAGELOK	1 29/32	¾	1 5/32	1 25/64	15/64	1⅛	1 55/64	1 51/64
-14DKM4	0.156	¼ Male NPT	¼ Male NPT	1 31/32	63/64	63/64	1 23/64	⅜	1⅛	1 55/64	1 51/64
-14DKM4-S4	0.156	¼ Male NPT	¼ SWAGELOK	2 9/64	63/64	1 5/32	1 17/32	⅜	1⅛	1 55/64	1 51/64
-14DKS4	0.156	¼ SWAGELOK	¼ SWAGELOK	2 5/16	1 5/32	1 5/32	1 17/32	⅜	1⅛	1 55/64	1 51/64
-16DKM4-F4	0.218	¼ Male NPT	¼ Female NPT	2 3/16	1⅛	1 1/16	1 9/16	½	1¼	1 61/64	1⅞
-16DKS6	0.218	⅜ SWAGELOK	⅜ SWAGELOK	2⅜	1 5/16	1 5/16	1 13/16	½	1¼	1 61/64	1⅞

① For a complete ordering number, add B for brass or SS for 316 stainless steel as a prefix to the catalog number. Add -A as a suffix for angle pattern valves. Example: SS-0DKM2-F2, B-14DKS4-A. ② Dimensions shown with SWAGELOK nuts finger-tight, when applicable. ③ Orifice at the seat is 0.156"; 0.093" port orifice sets the maximum flow.

FLOW CAPACITY CURVES

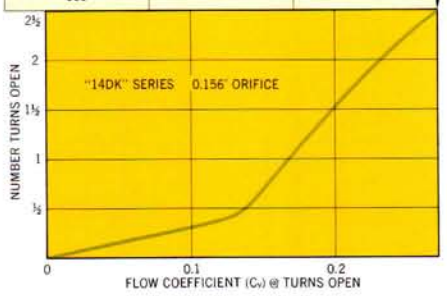
MAXIMUM FLOW FOR C_v = 0.12

PRESSURE DROP TO ATMOSPHERE (△P) PSI	AIR SCFM @ 70°F	WATER GPM@ 70°F
10	1.61	0.38
50	4.54	0.85
100	8.06	1.20



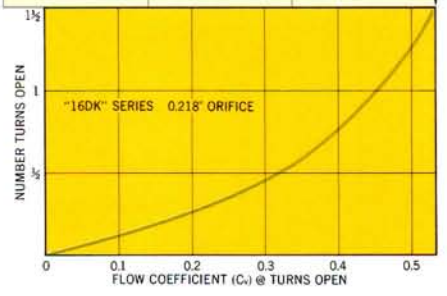
MAXIMUM FLOW FOR C_v = 0.27

PRESSURE DROP TO ATMOSPHERE (△P) PSI	AIR SCFM @ 70°F	WATER GPM@ 70°F
10	3.69	0.85
50	10.22	1.91
100	18.12	2.70



MAXIMUM FLOW FOR C_v = 0.53

PRESSURE DROP TO ATMOSPHERE (△P) PSI	AIR SCFM @ 70°F	WATER GPM@ 70°F
10	7.38	1.68
50	20.07	3.75
100	35.58	5.30

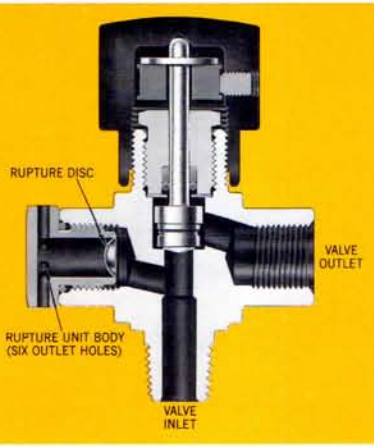


WHITEY "ODK" Series Valve installed on WHITEY Sample Cylinder

WHITEY "16DK" Series Valve with rupture disc installed on WHITEY Sample Cylinder.

NOTE: WHITEY Valves with rupture discs are shown on page 24. Ask for WHITEY Sample Cylinder Data Sheet for complete cylinder information.

SS-16DKM4-F4-A-RD (1900)



PATENTED

PURPOSE

WHITEY "16DK" Series Valves with Rupture Discs provide a positive, reliable method of over-pressure protection for any system or cylinder.

OPERATION

The rupture unit in a WHITEY "16DK" Series Valve consists of a rupture disc silver soldered to the rupture unit body. This unit is then sealed to a specially constructed port on the valve body by means of a Viton O-Ring. The rupture disc is so constructed as to provide instantaneous and unrestricted opening to atmosphere at a predetermined pressure.

APPLICATIONS

WHITEY "16DK" Series Valves with Rupture Discs are approved for use on D.O.T., B.T.C. and C.T.C. specification high pressure cylinders charged with both flammable and non-flammable liquids and compressed gases.

TECHNICAL DATA

"16DK" SERIES SHUT-OFF VALVES			
ORIFICE SIZE (INCHES)	FLOW COEFFICIENT, Cv▲	MAXIMUM PRESSURE RATING @ 70°F	TEMPERATURE RATING
0.218	0.53	3000 psi	–40°F to 250°F

RUPTURE UNITS	
NOMINAL BURST PRESSURE @ 72°F	MINIMUM & MAXIMUM BURST PRESSURE @ 72°F
1900 psi	1800 psi to 2000 psi
2850 psi	2700 psi to 3000 psi

▲See "16DK" Series FLOW CAPACITY CHART on the previous page.

NOTE: The rated bursting pressure of the discs must not exceed the required test pressure of the cylinders on which they are installed. It is our recommendation that a disc should not be used at working pressures over 70% of nominal burst pressure.

MATERIALS

VALVE MATERIALS—See MATERIALS on the previous page.

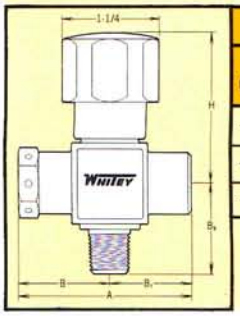
RUPTURE UNIT MATERIALS

Body—Type 316 stainless steel.
Disc—Inconel, silver soldered to body.
Seal—Viton O-Ring.

MARKING ON RUPTURE UNIT

The end face of the hex shaped rupture unit is marked similar to the above. D.O.T. regulations require manufacturer's name and the lot or production batch number. The nominal burst pressure of the rupture unit @ 72°F is shown in the middle. Rupture units can be replaced or interchanged within the valve body as the situation may require.

TABLE OF DIMENSIONS



RUPTURE DISC VALVES			CONNECTION SIZE		DIMENSIONS					
CATALOG NUMBER*	PATTERN	ORIFICE (INCHES)	INLET	OUTLET	A	B	B_1	B_2	H OPEN	H CLOSED
-16DKM4-F4-RD (**)	Straight	0.218	¼ Male NPT	¼ Female NPT	2 3/16	1 1/8	1 1/16	1 3/16	1 61/64	1 7/8
-16DKM4-F4-A-RD (**)	Angle	0.218	¼ Male NPT	¼ Female NPT	2 1/4	1 3/16	1 1/16	1 1/8	1 61/64	1 7/8
-16DKM8-F4-A-RD (**)	Angle	0.218	½ Male NPT	¼ Female NPT	2 5/8	1 9/32	1 11/32	1 11/32	2 1/16	1 31/32

*For a complete ordering number, add B for brass or SS for 316 stainless steel as a prefix to the catalog number. Add -A as a suffix for angle pattern valves. Example: SS-16DKM4-F4-A-RD(**)

**Specify nominal burst pressure in psi—(1900) or (2850).

YOUR LOCAL SALES & SERVICE REPRESENTATIVE:

9-74-100M-225M-CL
PRINTED IN U.S.A.

This subsection is limited to packed valves. See subsection on Bellows Seal Valves for applications requiring packless valves. For finer regulation, see Metering Valves subsection. For higher flow capacities, see Ball Valves subsection.

MATERIAL DESIGNATOR GUIDE

The following list shows materials and material designators for various standard and special NUPRO, WHITEY and SNO-TRIK Valves in this section of the binder. However, not all valves are available in all materials. Consult your local disributor for current information on material availability.

All materials are designated as a PREFIX to the part number followed by a dash (—). For example: B - 2MA; SS - 1VS4; M - 4M, etc.

MATERIALS - (Metal)	MATERIAL DESIGNATOR
Aluminum Alloys	A—
Brass	B—
Hastelloy/Alloy B*	HB—
Hastelloy/Alloy C-276*	HC—
Inconel 600†	INC—
Monel†	M—
Nickel	NI—
Carpenter 20 Cb3 Stainless Steel‡	C20—
Carpenter 455 Stainless Steel‡	455—
304 Stainless Steel	304—
304L Stainless Steel	304L—
316 Stainless Steel	SS—
316L Stainless Steel	316L—
321 Stainless Steel	321—
347 Stainless Steel	347—
410 Stainless Steel	410—
416 Stainless Steel	416—
Steel (Carbon)	S—
Tantalum	TA—
Titanium	TI—

MATERIALS - (Plastic)	MATERIAL DESIGNATOR
Acetal	DEL—
Chlorinated Polyether	PENTON—
Nylon	NY—
PCTFE Fluorocarbon	KF—
Polyethylene	P—
Polyvinyl Chloride	PVC—
TFE Fluorocarbon	T—

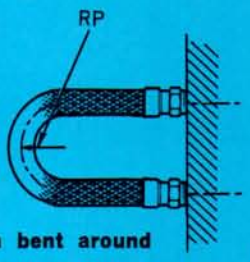
*—Cabot Corporation—Stellite Div.
†—International Nickel Co.
‡—Carpenter Technology Corp.

DATA SHEET 9D

Swagelok®
FLEXIBLE METAL HOSE CONNECTOR

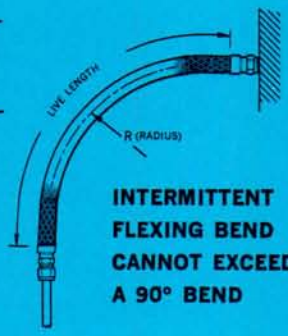
Industrial corrugated flexible type 316 stainless steel hose is welded to SWAGELOK fittings. The assembly is used for installing flexible loops to allow for thermal expansion, misalignment, intermittent flexing and continuous flexure (vibration). It can also be used for static bends.

SHORT LENGTH (S) INSTALLATION



PERMANENT BEND MINIMUM CENTERLINE RADIUS

Once hose has been bent around minimum bend radius, it should not be straightened and re-bent again. This could cause hairline cracks on corrugations.



INTERMITTENT FLEXING BEND CANNOT EXCEED A 90° BEND

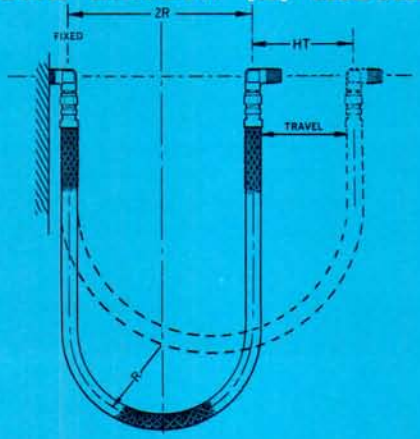
OFFSET MOTION

MOTION IN SAME PLANE ONLY

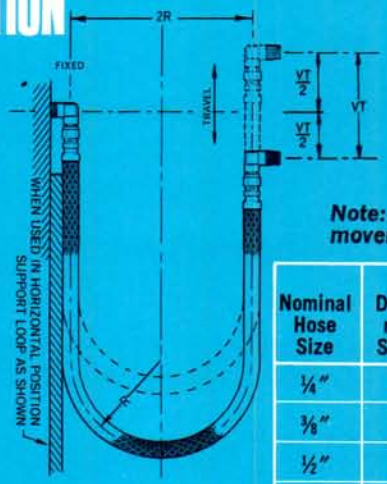
OFFSET INSTALLATION OF SHORT LENGTH.

Nominal Hose Size	Designator Suffix	Y Offset (inches)	R Flexing Bend (inches)	RP Permanent Bend (No Motion) (inches)	"SHORT" Live Hose Length (inches)
¼"	S4	1¼	5½	⅞	10
⅜"	S6	2	6	1⅛	11
½"	S8	2	7	1½	12
¾"	S12	2½	8½	2⅛	14
1"	S16	3	10	2¾	17

LONG LENGTH (L) INSTALLATION



HORIZONTAL TRAVELING LOOP



VERTICAL TRAVELING LOOP

MOVEMENT CAN ALSO BE APPLIED WHEN LOOP IS IN A HORIZONTAL POSITION, PROVIDED THAT THE FIXED END OF HOSE IS SUPPORTED AS SHOWN.

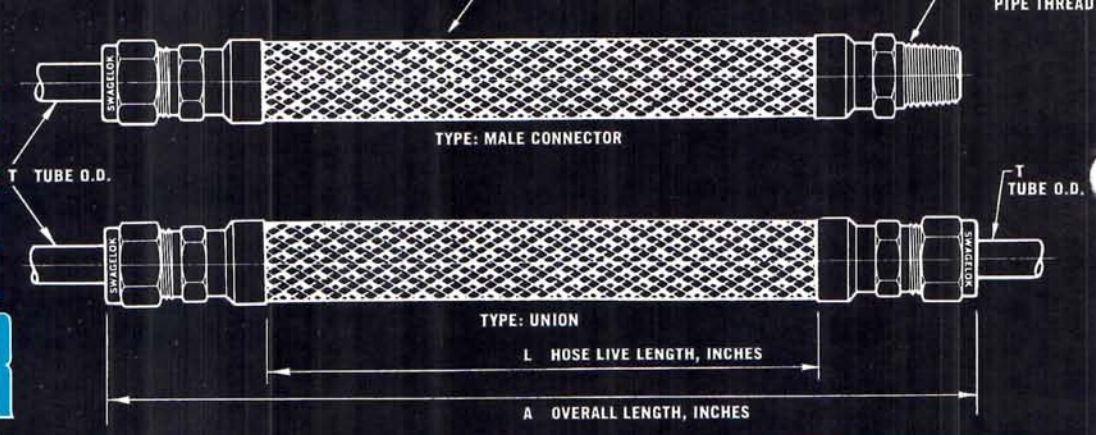
Note: In hanging loops, both connections and movement should be in same plane.

Nominal Hose Size	Designator Suffix	R (inches)	HT (inches)	VT (inches)	"LONG" Live Hose Length (inches)
¼"	L4	5½	6	20	32
⅜"	L6	6	6	20	34
½"	L8	7	6	20	38
¾"	L12	8½	6	20	44
1"	L16	10	6	20	50

Dimensions for reference only, subject to change

Swagelok

FLEXIBLE METAL HOSE CONNECTOR



TYPE	PART NUMBER	T	P	A	Nominal Hose Size H	L	Max. Pressure (PSIG) Ratings at 70°F. (21°C) S.S. Hose, Single Braid	
							Working	Nom. Burst
Male Connector	SS – 4 HO – 1 – 4 – S 4	¼	¼	1231/32	¼	10	2,660	10,640
Male Connector	SS – 4 HO – 1 – 4 – L 4	¼	¼	3431/32	¼	32	2,660	10,640
Union	SS – 4 HO – 6 – S 4	¼	–	13⅛	¼	10	2,660	10,640
Union	SS – 4 HO – 6 – L 4	¼	–	35⅛	¼	32	2,660	10,640
Male Connector	SS – 6 HO – 1 – 6 – S 6	⅜	⅜	149/32	⅜	11	1,610	6,440
Male Connector	SS – 6 HO – 1 – 6 – L 6	⅜	⅜	379/32	⅜	34	1,610	6,440
Union	SS – 6 HO – 6 – S 6	⅜	–	14½	⅜	11	1,610	6,440
Union	SS – 6 HO – 6 – L 6	⅜	–	37½	⅜	34	1,610	6,440
Male Connector	SS – 8 HO – 1 – 8 – S 8	½	½	1515/16	½	12	1,310	5,240
Male Connector	SS – 8 HO – 1 – 8 – L 8	½	½	4115/16	½	38	1,310	5,240
Union	SS – 8 HO – 6 – S 8	½	–	16 1/16	½	12	1,310	5,240
Male Connector	SS –10 HO – 1 – 8 – S 8	⅝	½	1531/32	½	12	1,310	5,240
Union	SS –10 HO – 6 – L 8	⅝	–	42⅛	½	38	1,310	5,240
Male Connector	SS –12 HO – 1 –12 – S 12	¾	¾	18⅜	¾	14	915	3,660
Union	SS –12 HO – 6 – S 12	¾	–	18½	¾	14	915	3,660
Union	SS –12 HO – 6 – L 12	¾	–	48½	¾	44	915	3,660
Male Connector	SS –16 HO – 1 –16 – S 16	1 in.	1 in.	2125/32	1 in.	17	645	2,580
Union	SS –16 HO – 6 – S 16	1 in.	–	21⅞	1 in.	17	645	2,580
Union	SS –16 HO – 6 – L 16	1 in.	–	54⅞	1 in.	50	645	2,580

DESIGNATORS

- Material
- Mandatory Dash
- First End Size
- Flexible Metal Hose
- Mandatory Dash
- Nominal Hose Size (Inches)
- Length: S=Short L=Long
- Reduced size or type of end connection (if different from first end)
- Mandatory Dash
- Type of Fitting (1=Male Connector, 6=Union)

Dimensions for reference only, subject to change All dimensions in inches

The annular corrugations of the hose are protected by a single braided stainless steel wire sheath.

MATERIAL:

Fittings & Hose—Type 316 stainless steel.
Braid—Type 321 stainless steel.

SWAGELOK Metal Hose Assemblies will allow flexibility and change of direction in a line up to 180° and can also be used at temperatures as high as 1500°F (815°C).

For use in ultra-high vacuum systems, mass spectrometer, helium leak testing should be specified at an additional charge.

TEMPERATURE RATINGS:

Multiply pressure by factors shown below to obtain pressure ratings at higher temperatures. These ratings apply only to Flexible Metal Hose Connectors.

°C	°F	FACTOR
93	200	.94
204	400	.83
316	600	.74
427	800	.66
538	1,000	.60
649	1,200	.55
760	1,400	.44
815	1,500 Max.	.40

NOTE:

PULSATING OR SHOCK PRESSURES:

When pulsating, surge or shock pressures exist, such as occur due to fast closing valves, the peak pressure shall not exceed 50% of the Maximum Working Pressure. Installation shall be such that there is no initial slack in the braid when the pressure pulse, surge or shock occurs.

YOUR LOCAL SALES & SERVICE REPRESENTATIVE:

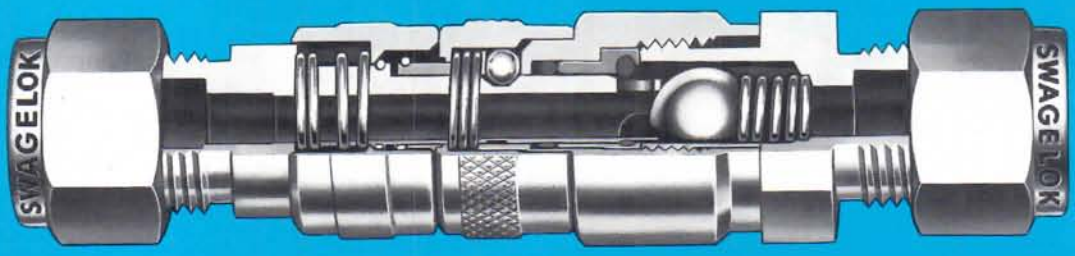
9-74-125M-360M-CL
PRINTED IN U.S.A.

Flexible Metal Hose

For additional information on Flexible Stainless Steel Tubing, see Vacuum Products subsection.

Swagelok® QUICK-CONNECTS

STANDARD QUICK-CONNECTS -QC SERIES



Single End Shut-Off

Double End Shut-Off

Pages 2, 3, 4

Patented

FULL FLOW QUICK-CONNECTS -QF SERIES

Pages 5, 6

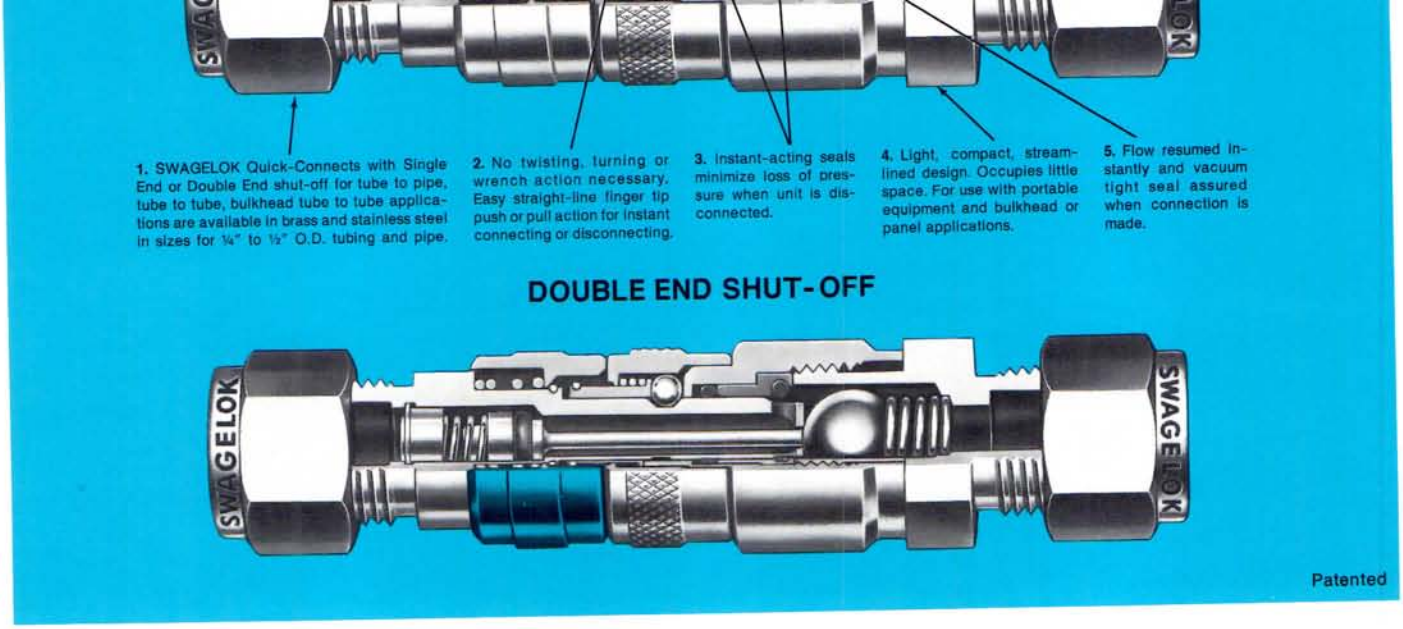
Patented

MINIATURE QUICK-CONNECTS -QM SERIES

Page 7

Patented

CRAWFORD FITTING COMPANY
29500 Solon Road • Cleveland, Ohio 44139



PURPOSE

SWAGELOK "QC" Series Standard Quick-Connects with Single End or Double End shut-off fill the need for compact, easy, **push** or **pull** operation to connect and disconnect units for dependable service in hydraulic, pneumatic, fluid transfer, and vacuum systems.

SPECIAL FEATURES

- Reduce time in connection changes with push-to-connect operation.
- Reliable connections in vacuum and pressure systems.
- Use with portable equipment and bulkhead panel systems allows rapid changeover of different pieces of equipment with a single source.
- Automatic shut-off minimizes pressure loss or fluid spillage when disconnecting.
- Compact, in-line valve with no protruding handles.
- In-line shut-off valve requiring no clearance for valve handles.

TECHNICAL DATA

Materials

Body, Stem—Brass or 316 stainless steel

Snap Ring & Springs—302 stainless steel

Balls—316 stainless steel

O-Ring—Buna (Viton and other O-Ring materials available on request.)

Insert—Delrin (Brass and stainless steel available on request.)

Pressure Ratings

SWAGELOK Standard Quick-Connects may be safely connected and disconnected at pressures from vacuum to 250 psi. When in the connected position, Standard Quick-Connects may be used at the following recommended maximum safe working pressures:

STANDARD QUICK-CONNECT SIZE	BRASS (PSI)	316 SS (PSI)
"QC4"	2000	3000
"QC6"	1000	1500
"QC8"	500	750

These ratings may vary according to other system variables.

Temperature Ratings

250°F (121°C) with Buna O-Rings and Delrin insert

450°F (232°C) with Viton O-Rings and metal insert

Other O-Ring materials available on request

NOTE: When O-Rings other than Buna are ordered, insert is same material as body.

FLOW CAPACITY

"QC4" SERIES				
MAXIMUM FLOW	(SINGLE END Cv=.22)		(DESO Cv=.17)	
PRESSURE DROP TO ATMOSPHERE (△P) PSI	AIR SCFM @ 70°F (21°C)		WATER GPM @ 70°F (21°C)	
	SINGLE END	DESO	SINGLE END	DESO
10	3.04	2.35	.70	.54
25	5.16	3.99	1.10	.85
100	14.92	11.53	2.20	1.70

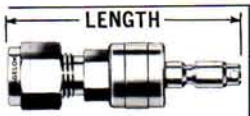
"QC6" SERIES				
MAXIMUM FLOW	(SINGLE END Cv=.79)		(DESO Cv=.56)	
PRESSURE DROP TO ATMOSPHERE (△P) PSI	AIR SCFM @ 70°F (21°C)		WATER GPM @ 70°F (21°C)	
	SINGLE END	DESO	SINGLE END	DESO
10	10.93	7.75	2.50	1.78
25	18.54	13.14	3.95	2.80
100	53.56	37.97	7.90	5.60

"QC8" SERIES				
MAXIMUM FLOW	(SINGLE END Cv=1.92)		(DESO Cv=1.27)	
PRESSURE DROP TO ATMOSPHERE (△P) PSI	AIR SCFM @ 70°F (21°C)		WATER GPM @ 70°F (21°C)	
	SINGLE END	DESO	SINGLE END	DESO
10	26.56	17.57	6.08	4.03
25	45.05	29.80	9.60	6.35
100	130.17	86.10	19.20	12.70

In order to help you avoid stocking unnecessary quantities of stems or bodies, all SWAGELOK Quick-Connects are sold as individual stem or body assemblies. Shown below is a variety of stem and body assemblies with dimensions. (Previously-used catalog numbers for complete stem and body combinations are shown on page 4.)

Stem Assembly

SWAGELOK TUBE CONNECTIONS



TUBE	SINGLE END SHUT-OFF	LENGTH
1/4"	-QC4-S-400	2 3/16
3/8"	-QC6-S-600	2 3/8
1/2"	-QC8-S-810	2 15/16

TUBE	DOUBLE END SHUT-OFF	LENGTH
1/4"	-QC4-D-400	2 1/4
3/8"	-QC6-D-600	2 7/16
1/2"	-QC8-D-810	2 15/16

TUBE	BULKHEAD SINGLE END SHUT-OFF	LENGTH
1/4"	-QC4-S1-400	2 23/32
3/8"	-QC6-S1-600	2 15/16
1/2"	-QC8-S1-810	3 13/32

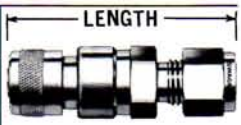
TUBE	BULKHEAD DOUBLE END SHUT-OFF	LENGTH
1/4"	-QC4-D1-400	2 25/32
3/8"	-QC6-D1-600	3
1/2"	-QC8-D1-810	3 15/32

PIPE	MALE PIPE SINGLE END SHUT-OFF	LENGTH
1/8"	-QC4-S-2PM	1 27/32
1/4"	-QC4-S-4PM	2 5/32
1/4"	-QC6-S-4PM	2 5/32
3/8"	-QC6-S-6PM	2 17/32
1/2"	-QC8-S-8PM	2 13/16

PIPE	FEMALE PIPE SINGLE END SHUT-OFF	LENGTH
1/8"	-QC4-S-2PF	1 29/32
1/4"	-QC4-S-4PF	2 3/32
1/4"	-QC6-S-4PF	2 7/32
3/8"	-QC6-S-6PF	2 9/32
1/2"	-QC8-S-8PF	2 3/4

TUBE (AN)	37° AN FLARE SINGLE END SHUT-OFF	LENGTH
1/8"	-QC4-S-2AN	1 59/64
1/4"	-QC4-S-4AN	2 1/64
1/4"	-QC6-S-4AN	2 9/64
3/8"	-QC6-S-6AN	2 5/32
1/2"	-QC8-S-8AN	2 23/32

Body Assembly



TUBE	SWAGELOK TUBE CONNECTIONS	LENGTH
1/4"	-QC4-B-400	2 1/8
3/8"	-QC6-B-600	2 13/32
1/2"	-QC8-B-810	2 29/32

TUBE	BULKHEAD SWAGELOK TUBE CONNECTIONS	LENGTH
1/4"	-QC4-B1-400	2 1/2
3/8"	-QC6-B1-600	2 13/16
1/2"	-QC8-B1-810	2 31/32

PIPE	MALE PIPE	LENGTH
1/8"	-QC4-B-2PM	1 25/32
1/4"	-QC4-B-4PM	1 31/32
1/4"	-QC6-B-4PM	2 3/16
3/8"	-QC6-B-6PM	2 3/16
1/2"	-QC8-B-8PM	2 25/32

PIPE	BULKHEAD MALE PIPE	LENGTH
1/8"	-QC4-B1-2PM	2 13/32
1/4"	-QC6-B1-4PM	2 13/16
3/8"	-QC8-B1-6PM	3 15/32

PIPE	FEMALE PIPE	LENGTH
1/8"	-QC4-B-2PF	1 27/32
1/4"	-QC4-B-4PF	2 3/32
1/4"	-QC6-B-4PF	2 7/32
3/8"	-QC6-B-6PF	2 1/4
1/2"	-QC8-B-8PF	2 7/8

TUBE (AN)	37° AN FLARE	LENGTH
1/8"	-QC4-B-2AN	1 55/64
1/4"	-QC4-B-4AN	1 61/64
1/4"	-QC6-B-4AN	2 11/64
3/8"	-QC6-B-6AN	2 3/16
1/2"	-QC8-B-8AN	2 11/16

Any "QC4" stem assembly will fit with any "QC4" body assembly, etc.

NOTE: To calculate overall length in connected position, subtract the following from any overall stem and body combination length to allow for insertion depth:

SERIES	DEDUCT
"QC4"	.856" (approx.)
"QC6"	.981" (approx.)
"QC8"	1.263" (approx.)

TABLE OF DIMENSIONS

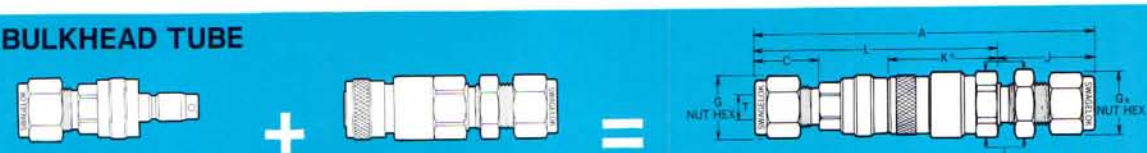
TUBE TO PIPE

STEM CATALOG NUMBER	BODY CATALOG NUMBER	PREVIOUS CATALOG NUMBER	T TUBE	PIPE SIZE	A	C	F	G	K	L
-QC4-S-400	-QC4-B-2PM	-400-QC-1-2	1/4	1/8	3 1/16	23/32	5/8	1/2	1 13/32	2 11/16
-QC4-S-400	-QC4-B-4PM	-400-QC-1-4	1/4	1/4	3 1/4	23/32	5/8	1/2	1 13/32	2 11/16
-QC6-S-600	-QC6-B-4PM	-600-QC-1-4	3/8	1/4	3 9/16	25/32	3/4	11/16	1 5/8	3
-QC8-S-810	-QC8-B-8PM	-810-QC-1-8	1/2	1/2	4 15/32	7/8	15/16	7/8	2 1/32	3 23/32

TUBE TO TUBE

STEM CATALOG NUMBER	BODY CATALOG NUMBER	PREVIOUS CATALOG NUMBER	T TUBE	A	C	F	G	Gx	K	L
-QC4-S-400	-QC4-B-400	-400-QC-6	1/4	3 13/32	23/32	5/8	1/2	9/16	1 13/32	2 11/16
-QC6-S-600	-QC6-B-600	-600-QC-6	3/8	3 25/32	25/32	3/4	11/16	11/16	1 5/8	3
-QC8-S-810	-QC8-B-810	-810-QC-6	1/2	4 19/32	7/8	15/16	7/8	7/8	2 1/32	3 23/32

TUBE TO BULKHEAD TUBE

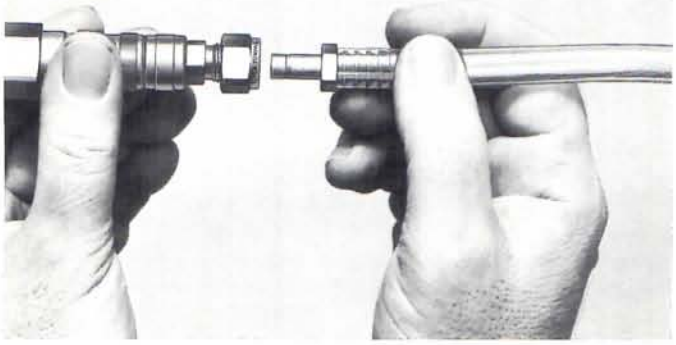


STEM CATALOG NUMBER	BODY CATALOG NUMBER	PREVIOUS CATALOG NUMBER	T TUBE	A	C	F	G	Gx	J	K	L	PANEL HOLE DRILL SIZE	MAX. PANEL THICKNESS
-QC4-S-400	-QC4-B1-400	-400-QC-61	1/4	3 25/32	23/32	5/8	1/2	9/16	1 3/32	1 13/32	2 11/16	29/64	9/32
-QC6-S-600	-QC6-B1-600	-600-QC-61	3/8	4 3/16	25/32	3/4	11/16	11/16	1 3/16	1 5/8	3	37/64	9/32
-QC8-S-810	-QC8-B1-810	-810-QC-61	1/2	5 1/16	7/8	15/16	7/8	7/8	1 11/32	2 1/32	3 23/32	49/64	9/32

FOR A COMPLETE ORDERING NUMBER, ADD B- FOR BRASS OR SS- FOR 316 STAINLESS STEEL AS A PREFIX TO THE CATALOG NUMBER
*NOTE: "K" DIMENSION IS IN DISCONNECTED POSITION

Special Accessories for Standard Quick-Connects, "QC" Series

To protect "QC" Body Assemblies or Stem Assemblies from damage, dust, or contaminants, protective units are available.



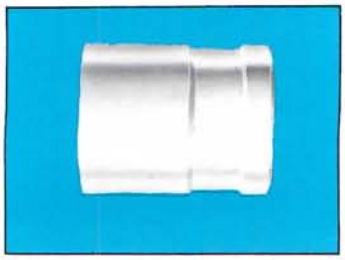
For use with flexible hose, see Hose Connector Subsection of Master Catalog Binder.

Stem Protector Cap

Stem Protector Caps are used with standard "QC" Series stems. Caps are available for "QC4", "QC6" and "QC8" sizes in brass or 316 stainless steel, and include a 6" long bead chain.

Body Protector Plug

Body Protector Plugs are used with standard "QC" Series Body Assemblies. They are available for "QC4", "QC6" and "QC8" sizes in brass or 316 stainless steel and include a 6" long bead chain.

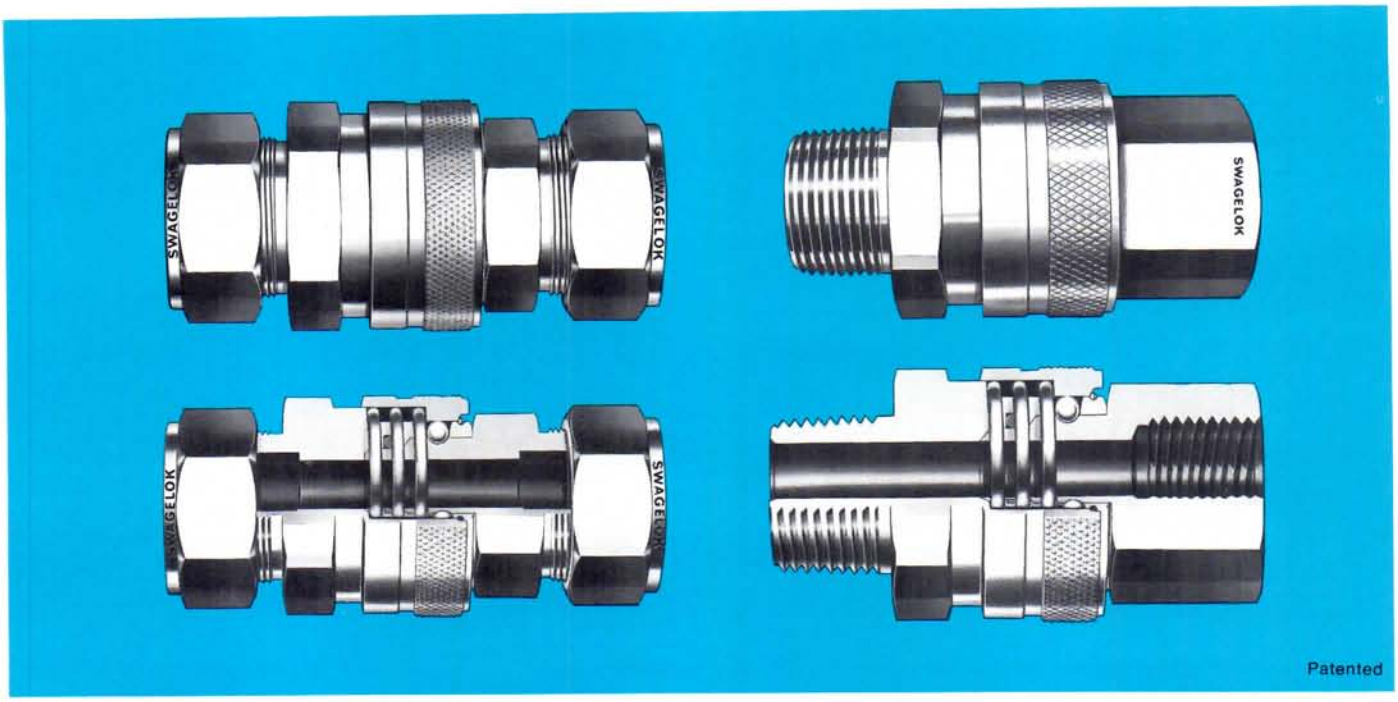


Dust Cap

Plastic Dust Caps are available for sizes "QC4," "QC6" and "QC8" Body Assemblies.

Swagelok®

FULL FLOW QUICK-CONNECTS, "QF" SERIES



OPERATION

Connect or disconnect in seconds

To Connect:

1. Slide spring-loaded knurled sleeve back.
2. Insert stem into body until it bottoms.
3. Release sleeve and connection is made when sleeve is in forward position.

To Disconnect:

1. Pull spring-loaded knurled sleeve back.
2. Remove stem from body.

5

PURPOSE

SWAGELOK "QF" Series Full Flow Quick-Connects are designed for maximum flow, and fast, leak-tight connections on rigid or flexible tubing, hose, and piping lines.

APPLICATIONS

SWAGELOK Full Flow Quick-Connects are used in hydraulic and pneumatic systems, gravity flow systems and transfer line connections. They operate in vacuum or pressurized systems at high or low temperatures, and in gas or liquid service.

Other applications include: Food processing, Chemical research, High pressure systems.

SPECIAL FEATURES

- Full flow without orifice restrictions.
- Permits 360° swivel action.
- SWAGELOK Connections or pipe ends integral with body and/or stem.
- No twisting required for connecting and disconnecting.
- Compact
- O-Ring can be changed without disassembling body.
- Standard O-Rings used.
- Various end connections available in ¾" and 1" series.

TECHNICAL DATA

Materials

Body, Stem & Sleeve—Brass or 316 stainless steel
Snap Ring & Springs—302 stainless steel
Balls—316 stainless steel
O-Ring—Buna (Viton and other O-Ring materials available on request)

Pressure Rating ¾" and 1" Series

Brass—Vacuum to 3000 psi max.
316 SS—Vacuum to 6000 psi max.

Temperature Ratings

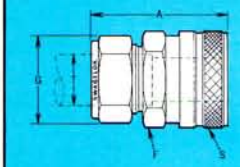
250°F (121°C) with Buna
450°F (232°C) with Viton

25	469.32	100
100	1355.94	200

25	915.17	195
100	2644.08	390

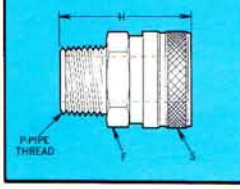
TABLE OF DIMENSIONS, "QF" SERIES

BODIES



CATALOG NUMBER	T TUBE	A	F BODY HEX	G NUT HEX	S SLEEVE DIAMETER
-QF12-B-1210	¾"	2 29/64	1½	1⅛	1 21/32
-QF16-B-1610	1"	2 47/64	1¾	1½	1⅞

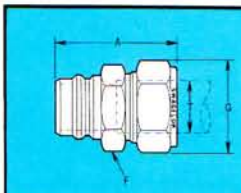
CATALOG NUMBER	P PIPE	H	F BODY HEX	—	S SLEEVE DIAMETER
-QF12-B-12PF	¾"FPT	1¾	1½	—	1 21/32
-QF16-B-16PF	1"FPT	1 31/32	1¾	—	1⅞



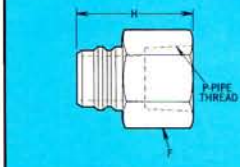
CATALOG NUMBER	P PIPE	H	F BODY HEX	—	S SLEEVE DIAMETER
-QF12-B-12PM	¾"MPT	2 21/64	1½	—	1 21/32
-QF16-B-16PM	1"MPT	2 41/64	1¾	—	1⅞

6

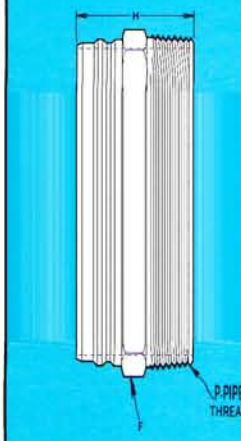
STEMS



CATALOG NUMBER	T TUBE	A	F STEM HEX	G NUT HEX	—
-QF12-S-1210	¾"	2 5/32	1 1/16	1⅛	—
-QF16-S-1610	1"	2 27/64	1⅜	1½	—



CATALOG NUMBER	P PIPE	H	F STEM HEX	—	—
-QF12-S-12PF	¾"FPT	1 15/16	1¼	—	—
-QF16-S-16PF	1"FPT	2 21/64	1⅝	—	—



CATALOG NUMBER	P PIPE	H	F STEM HEX	—	—
-QF12-S-12PM	¾"MPT	2 1/32	1 1/16	—	—
-QF16-S-16PM	1"MPT	2 21/64	1⅜	—	—

A dimensions are finger-tight H=overall length All dimensions in inches

BODY AND STEM ORIFICE

"QF12" series—23/32"
"QF16" series—7/8"

UNIFORM SIZE OF O-RING

"QF12" series—#118
"QF16" series—#215

For a complete ordering number, add B for brass and SS for 316 stainless steel as a prefix to the catalog number.

Maximum assembly length is 3-23/32 using body -QF12-B-1210 and stem -QF12-S-1210.

Minimum assembly length is 2-51/64 using body -QF12-B-12PF and stem -QF12-S-12PF.

Maximum assembly length is 4-17/64 using body -QF16-B-1610 and stem -QF16-S-1610.

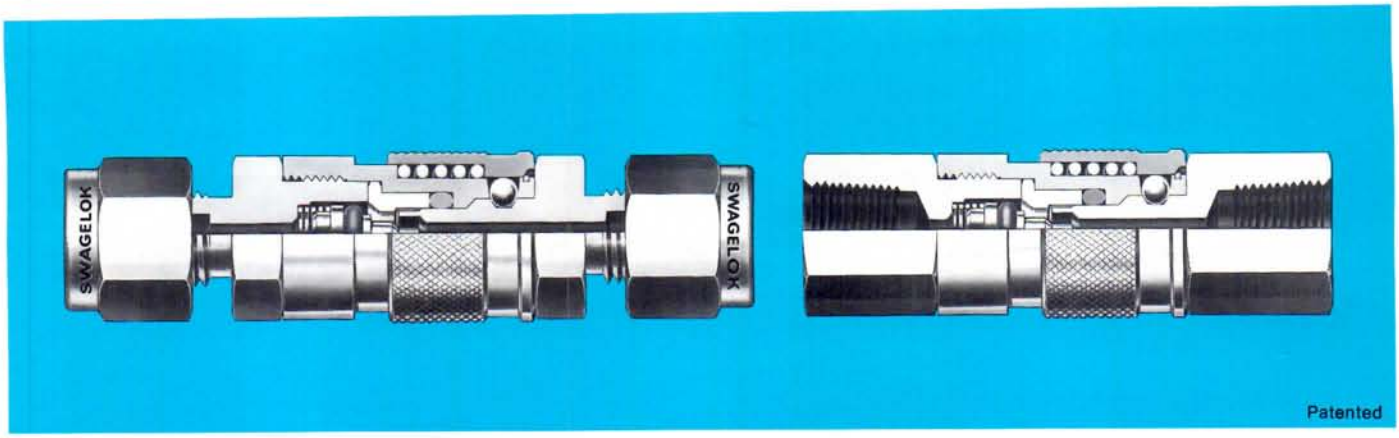
Minimum assembly length is 3-13/32 using body -QF16-B-16PF and stem -QF16-S-16PF.

NOTE: To calculate overall length in connected position, subtract the following from any overall stem and body combination length to allow for insertion depth:

SERIES	DEDUCT
"QF12"	.891" (approx.)
"QF16"	.918" (approx.)

Swagelok®

MINIATURE QUICK-CONNECTS, "QM" SERIES



PURPOSE

SWAGELOK "QM" Series Miniature Quick-Connects are designed to fill the need for a lightweight, extremely compact, high performance unit to be used in various fluid handling systems. Where single end shut-off is required, the "QM" series provides a reliable connection with all types of instruments and systems.

SPECIAL FEATURES

- Positive leak-tight seal
- Finger-tip operation
- Lightweight
- Compact
- Allows 360° swivel action
- Low deadspace

APPLICATIONS

Vacuum and pressure systems, electrical coolant lines, chromatographs, control panels, sampling systems, instruments and gauges.

TECHNICAL DATA

Materials

Body & Stem—Brass or 316 stainless steel

Snap Ring & Springs—302 stainless steel

Balls—316 stainless steel

Insert—Brass in brass bodies & 316 stainless steel in 316 stainless steel bodies.

O-Ring—Buna (Viton and other O-Ring materials available on request)

All Other Parts—Same material as body

Dead Space—.011 $in.^3$

Pressure Ratings

SWAGELOK Miniature Quick-Connects may be connected and disconnected at pressures from vacuum to 100 psi. Miniature Quick-Connects may be used at higher pressures in the connected position using the following recommended maximum safe working pressures: Brass—2000 psi
316 SS—4000 psi

Temperature Ratings

250°F (121°C) with Buna O-Rings
450°F (232°C) with Viton O-Rings
Other O-Ring materials available on request

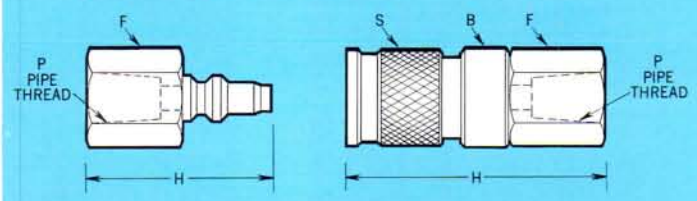
FLOW CAPACITY

"QM" SERIES		
MAXIMUM FLOW FOR Cv=.07		
PRESSURE DROP TO ATMOSPHERE (△P) PSI	AIR SCFM @ 70°F (21°C)	WATER GPM @ 70°F (21°C)
10	.97	.22
25	1.64	.35
100	4.75	.70

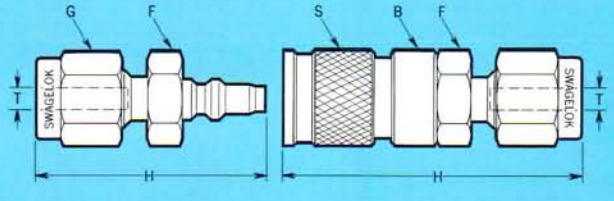
For a complete ordering number, add B for brass and SS for 316 stainless steel as a prefix to the catalog number.

TABLE OF DIMENSIONS

FEMALE BODY & STEM



TUBE TO TUBE BODY & STEM



STEM CATALOG NUMBER	BODY CATALOG NUMBER	T TUBE	P PIPE	B	F	G	H STEM	H BODY	S	COMPLETE ASSEMBLY LENGTH
-QM2-S-1PF	-QM2-B-1PF	—	1/16	1/2	7/16	—	31/32	19/32	33/64	1 27/32
-QM2-S-200	-QM2-B-200	1/8	—	1/2	7/16	7/16	1 21/64	1 43/64	33/64	2 1/2

SWAGELOK QUICK-CONNECTS

The catalog numbers shown on the preceding pages contain the designator codes shown below. In all cases the catalog number must be preceded by a material designator; followed by a dash: B- (Brass) and SS- (316 stainless steel).

QUICK-CONNECT SERIES DESIGNATOR	
DESIGNATOR	DENOTES
-QC-	Standard Quick-Connect
-QF-	Full Flow Quick-Connect
-QM-	Miniature Quick-Connect

QUICK-CONNECT SERIES SIZE DESIGNATOR	
DESIGNATOR	DESIGN SIZES
-2	1/8"
-4	1/4"
-6	3/8"
-8	1/2"
-12	3/4"
-16	1"

QUICK-CONNECT MODEL DESIGNATOR		
MODEL DESIGNATOR	DENOTES	SEE PAGE NO.
-B-	Body	3
-B1-	Bulkhead Body	3
-S-	Stem	3
-S1-	Bulkhead Stem	3
-D-	Double End Shut-Off Stem	3
-D1-	Bulkhead Double End Shut-Off Stem	3
-DC-	Dust Cap (polyethylene only)	4
-BP-	Body Protector	4
-SP-	Stem Protector	4

QUICK-CONNECT END CONNECTION SIZE DESIGNATOR	
DESIGNATOR	SIZE
-1	1/16"
-2	1/8"
-4	1/4"
-6	3/8"
-8	1/2"
-12	3/4"
-16	1"

QUICK-CONNECT END CONNECTION TYPE	
DESIGNATOR	DENOTES TYPE OF END
00	SWAGELOK Tube 1/16" to 3/8"
10	SWAGELOK Tube 1/2" to 1"
PM	Pipe, Male NPT
PF	Pipe, Female NPT
AN	37° AN Flare

QUICK-CONNECT SPECIAL DESIGNATOR SUFFIXES	
DESIGNATOR	DENOTES
VT	Viton O-Rings
EP	Ethylene-Propylene O-Rings
SL	Silicone O-Rings
NE	Neoprene O-Rings

Note: All assemblies with O-Rings other than Buna will have inserts made of same material as the body (brass or stainless steel)

TYPICAL SWAGELOK QUICK-CONNECT PART NUMBERS

MATERIAL	MATERIAL DESIGNATOR	SERIES DESIGNATOR	SERIES SIZE DESIGNATOR	MODEL DESIGNATOR	END CONNECTION SIZE	END CONNECTION TYPE	COMPLETE PART NUMBER	SEE PAGE NO.
BRASS	B	QC STANDARD	4 1/4"	D DESO STEM	4 1/4"	00 SWAGELOK	B-QC4-D-400	3, 4
316 STAINLESS STEEL	SS	QC STANDARD	4 1/4"	B1 BULKHEAD BODY	4 1/4"	00 SWAGELOK	SS-QC4-B1-400	3, 4
BRASS	B	QF FULL FLOW	12 3/4"	S STEM	12 3/4"	10 SWAGELOK	B-QF12-S-1210	6
316 STAINLESS STEEL	SS	QF FULL FLOW	16 1"	B BODY	16 1"	PM PIPE, MALE	SS-QF16-B-16PM	6
BRASS	B	QM MINIATURE	2 1/8"	S STEM	2 1/8"	00 SWAGELOK	B-QM2-S-200	7
316 STAINLESS STEEL	SS	QM MINIATURE	2 1/8"	B BODY	1 1/16"	PF PIPE, FEMALE	SS-QM2-B-1PF	7

MANDATORY DASHES

CREDITS: Delrin-Viton, TM DuPont

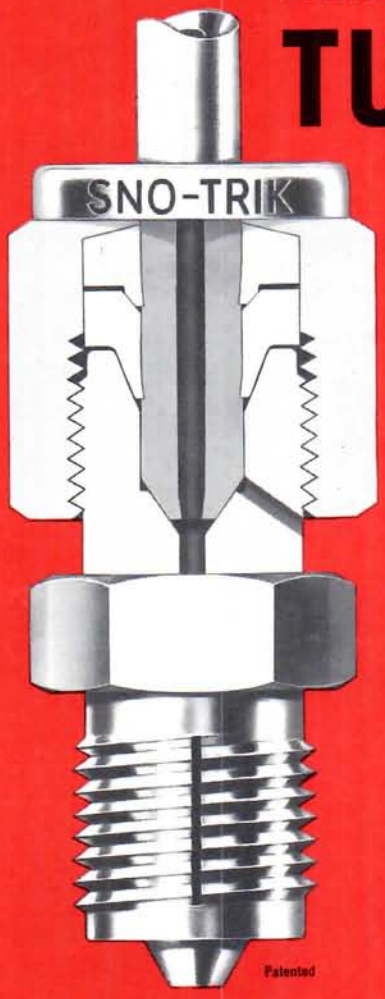
YOUR LOCAL SALES & SERVICE REPRESENTATIVE:

2-74-100M-100M-BL
PRINTED IN U.S.A.

Catalog No. S9-72

'Sno-Trik®

HIGH PRESSURE TUBE FITTINGS



Fitting at 1¼ turn position

A New, Proven Technique for Making Safe High Pressure Connections With Ease.

PURPOSE

The design and rugged construction of SNO-TRIK Tube Fittings provide dependable service on all systems using heavy wall tubing. (Heavy wall tubing can be generally defined as any tube in which the wall thickness is at least 30% of the tube O.D.)

APPLICATIONS

High Pressure

Test stands • Hydrostatic and isostatic presses • Petrochemical processing • Cutting and cleaning equipment • Pump and compressor connections • Underwater technology • Calibration equipment • Destructive testing.

Research & Development

Chemical engineering • Liquid chromatography • Geology • Metallurgy • Ceramics.

High Safety Factors

Processing of hazardous, abrasive or high temperature fluids • Systems requiring greater mechanical strength in order to be self supporting • Life support systems.

FEATURES

Standard SNO-TRIK Tube Fittings are machined from type 316 stainless steel. Other materials are available for special applications • Weep hole for safety and immediate leak detection • Positive assurance of proper make-up with inspection gauges • Minimum user experience needed—SNO-TRIK connections are easily made, disconnected, and remade to provide a reliable leak-tight seal every time • SNO-TRIK fittings come completely assembled and ready for use, eliminating the danger of improper arrangement of fitting components • Tube fitting adapters, reducers, and special configurations are available • Exacting tolerances throughout.

TECHNICAL DESCRIPTION

SNO-TRIK prevents weakening of the system caused by reduction of tube wall thickness common to threaded systems • Unique design and precise manufacturing permit use of an inspection gauge for positive check of proper fitting pull-up • At 1¼ turns pull-up, the ferrules exert an axial force or pre-load on the tube end which is greater than the rated burst pressure of the tubing • Back ferrule is manufactured of hardened stainless steel to insure a secure grip on tempered or annealed tubing • SNO-TRIK provides a weep hole in the fitting body to avoid tube blow-out caused by improper installation • SNO-TRIK Fittings grip the tubing without introducing potential failure points inherent with stress risers in threaded tube connections • The ferrule design provides a high degree of system stability not possible in threaded connections, where gaps exist between tube and sleeve threads. See Technical Data Section for specific information on "System Stability" • The SNO-TRIK male connector and the wide variety of adapters make SNO-TRIK readily compatible with any existing system • SNO-TRIK prevents excessive deformation of the seal area of tube end and body. If overtightened, a positive controlled advance closes the space between the ferrules rather than overloading and damaging the tube end • The SNO-TRIK controlled phase sequential gripping action provides holding ability in the first stages of ferrule advance. See Technical Data Section for Specific information.

Safety demands respect for high pressure

SNO-TRIK COMPANY • 32550 Old South Miles Road • Cleveland, Ohio 44139

'Sno-Trik® Tube Fittings are installed in 4 easy steps

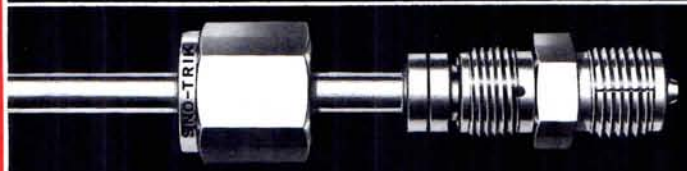
1 Insert properly coned tubing into the SNO-TRIK Tube Fitting. Make sure tube cone rests firmly into the matching internal cone of the fitting. Due to the variation of tubing diameters, snug up the nut until the tubing will not turn (by hand) in the fitting.

2 Then, before tightening the SNO-TRIK nut, scribe a line at the 6:00 o'clock position.

3 While holding the fitting body with a back-up wrench, tighten the nut one-and-one-quarter turns, watching the scribe mark make one complete revolution and continue to the 9:00 o'clock position.

4 Finally, use SNO-TRIK Inspection Gauge. Insert between the nut and body shoulder to check for proper pull-up of fitting.

1. Fitting shown in disconnected position.



2. Tubing with pre-set ferrules inserted into the fitting until front ferrule seats in fitting.

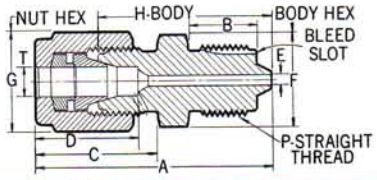
3. Tighten nut by hand. Rotate nut about one quarter turn with wrench (or to original one-and-one-quarter tight position), then snug slightly with wrench.

Re-tightening Instructions

Connections can be disconnected and re-tightened many, many times and the same reliable, leakproof seal obtained every time the reconnection is made.

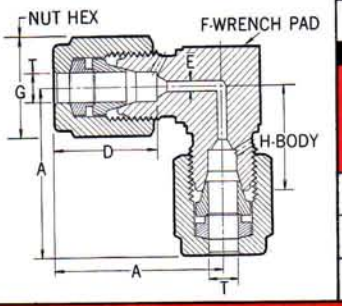
Pre-setting Instructions

When SNO-TRIK Tube Fittings are to be installed in cramped quarters or overhead where ladders must be used, it is sometimes found advantageous to use a pre-setting tool on the tubing in an open ground area, thus pre-setting the ferrules. The tubing is then removed from the pre-setting tool and the tubing with nut and pre-set ferrules can now be attached to a fitting merely by following the re-tightening instructions.



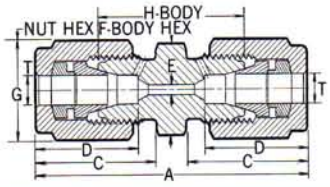
'Sno-Trik' MALE CONNECTOR

T TUBE O. D.	UNIFIED THREAD SIZE	CATALOG NUMBER	A	B	C	D*	E MIN. OPENING	F	G	H	ALLOWABLE WORKING PRESSURE (PSIG) (SS) 316	
1/4"	9/16-18	-440-1-44M	1 29/32	9/16	31/32	7/8	3/32	5/8	3/4	1 13/32	60,000	
3/8"	3/4-16	-640-1-64M	2 13/32	23/32	1 3/16	1 3/32	1/8	13/16	15/16	1 51/64	60,000	
9/16"	1 1/8-12	-940-1-94M	3 17/64	7/8	1 21/32	1 9/16	3/16†	1 1/4	1 3/8	2 1/16	60,000	



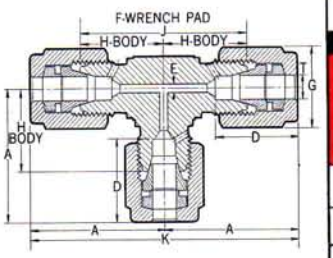
'Sno-Trik' UNION ELBOW

T TUBE O. D.	CATALOG NUMBER	A	D*	E MIN. OPENING	F	G	H	ALLOWABLE WORKING PRESSURE PSIG (SS) 316	
1/4"	-440-9	1 11/32	7/8	3/32	5/8	3/4	27/32	60,000	
3/8"	-640-9	1 23/32	1 3/32	1/8	13/16	15/16	1 7/64	60,000	
9/16"	-940-9	2 17/32	1 9/16	3/16†	1 1/4	1 3/8	1 45/64	60,000	



'Sno-Trik' UNION

T TUBE O. D.	CATALOG NUMBER	A	C	D*	E MIN. OPENING	F	G	H	ALLOWABLE WORKING PRESSURE (PSIG) (SS) 316	
1/4"	-440-6	2 3/16	31/32	7/8	3/32	5/8	3/4	1 3/16	60,000	
3/8"	-640-6	2 23/32	1 3/16	1 3/32	1/8	13/16	15/16	1 1/2	60,000	
9/16"	-940-6	3 25/32	1 21/32	1 9/16	3/16†	1 1/4	1 3/8	2 1/8	60,000	



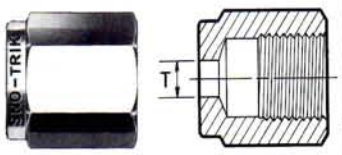
'Sno-Trik' UNION TEE

T TUBE O. D.	CATALOG NUMBER	A	D*	E MIN. OPENING	F	G	H	J	K	ALLOWABLE WORKING PRESSURE (PSIG) (SS) 316	
1/4"	-440-3	1 11/32	7/8	3/32	5/8	3/4	27/32	1 11/16	2 11/16	60,000	
3/8"	-640-3	1 23/32	1 3/32	1/8	13/16	15/16	1 7/64	2 7/32	3 7/16	60,000	
9/16"	-940-3	2 17/32	1 9/16	3/16†	1 1/4	1 3/8	1 45/64	3 13/32	5 1/16	60,000	

†940 Series also available with 5/16" "E" dimension on special order. Working pressure is reduced to 30,000 psi. Use designator -MO as suffix. *Tube Engagement Length

NUT & FERRULE INFORMATION

NUT



T TUBE O. D.	CATALOG NUMBER
1/4"	-442-1
3/8"	-642-1
9/16"	-942-1

BACK FERRULE

Standard Back Ferrule material is 17-4PH. To order spare ferrules, use prefix material designator 174PH-. All fittings shown are assembled with 17-4PH Back Ferrules unless otherwise requested. 316 stainless steel Back Ferrules are available on special order. Use prefix SS- when ordering.

T TUBE O. D.	CATALOG NUMBER
1/4"	-444-1
3/8"	-644-1
9/16"	-944-1

FRONT FERRULE

T TUBE O. D.	CATALOG NUMBER
1/4"	-443-1
3/8"	-643-1
9/16"	-943-1

Safety demands respect for high pressure

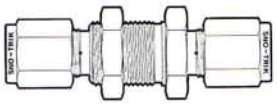
'Sno-Trik® Adaptability

PURPOSE

SNO-TRIK Fittings enable you to connect most existing ports to SNO-TRIK with a minimum number of connections. All of the configurations shown have been manufactured for customers and many of these are available from stock.

Some of the end connection combinations are shown below with typical catalog numbers:

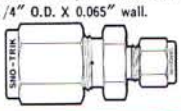
SNO-TRIK Bulkhead Union



TUBE O. D.	CATALOG NUMBER	ALLOWABLE WORKING PRESSURE (PSIG) (SS) 316	
¼″	-440-61	60,000	
⅜″	-640-61	60,000	
9/16″	-940-61	60,000	

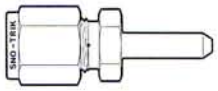
SNO-TRIK to SWAGELOK Union

Based on allowable working pressure for: A 1/16″ O.D. X 0.020″ wall / B 1/8″ O.D. X 0.035″ wall / C 1/4″ O.D. X 0.065″ wall.



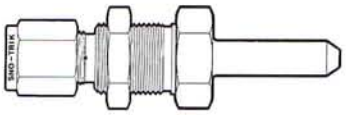
TUBE O. D.	SWAGELOK TUBE O. D.	CATALOG NUMBER	ALLOWABLE WORKING PRESSURE (PSIG) (SS) 316	
¼″	1/16″	-440-6-100	14,500 A	
¼″	⅛″	-440-6-200	12,700 B	
9/16″	¼″	-940-6-400	11,700 C	

SNO-TRIK to Coned Tube Stub Reducer



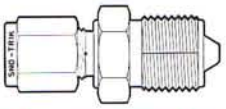
TUBE O. D.	TUBE STUB O. D.	CATALOG NUMBER	ALLOWABLE WORKING PRESSURE (PSIG) (SS) 316	
¼″	⅜″	-440-R-641	60,000	
⅜″	¼″	-640-R-441	60,000	
9/16″	⅜″	-940-R-641	60,000	

SNO-TRIK Bulkhead to Coned Tube Stub Adapter



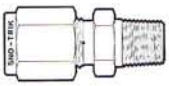
TUBE O. D.	TUBE STUB O. D.	CATALOG NUMBER	ALLOWABLE WORKING PRESSURE (PSIG) (SS) 316	
¼″	⅜″	-440-A1-441	60,000	
⅜″	¼″	-640-A1-641	60,000	
9/16″	⅜″	-940-A1-941	60,000	

SNO-TRIK to High Pressure Male Thread Reducing Connector



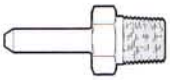
TUBE O. D.	UNIFIED THREAD SIZE	CATALOG NUMBER	ALLOWABLE WORKING PRESSURE (PSIG) (SS) 316	
¼″	¾-16	-440-1-64M	60,000	
¼″	1⅛-12	-440-1-94M	60,000	
⅜″	9/16-18	-640-1-44M	60,000	

SNO-TRIK to Male Pipe Thread Connector



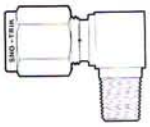
TUBE O. D.	MALE PIPE THREAD	CATALOG NUMBER	ALLOWABLE WORKING PRESSURE (PSIG) ① (SS) 316	
¼″	¼″	-440-1-4	30,000	
⅜″	⅜″	-640-1-6	30,000	
9/16″	½″	-940-1-8	30,000	

Coned Tube Stub to Male Pipe Thread Adapter



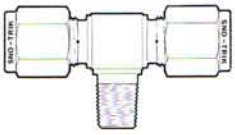
TUBE STUB O. D.	MALE PIPE THREAD	CATALOG NUMBER	ALLOWABLE WORKING PRESSURE (PSIG) ① (SS) 316	
¼″	¼″	-441-A-4	30,000	
⅜″	⅜″	-641-A-6	30,000	
9/16″	½″	-941-A-8	30,000	

Male Elbow



TUBE O. D.	MALE PIPE THREAD	CATALOG NUMBER	ALLOWABLE WORKING PRESSURE (PSIG) ① (SS) 316	
¼″	¼″	-440-2-4	30,000	
⅜″	⅜″	-640-2-6	30,000	
9/16″	½″	-940-2-8	30,000	

Male Branch Tee



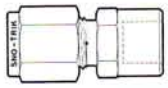
TUBE O. D.	MALE PIPE THREAD	CATALOG NUMBER	ALLOWABLE WORKING PRESSURE (PSIG) ① (SS) 316	
¼″	¼″	-440-3-4TTM	30,000	
⅜″	⅜″	-640-3-6TTM	30,000	
9/16″	½″	-940-3-8TTM	30,000	

Safety demands respect for high pressure

① Working pressure is based on thread leakage, with both male and female threads manufactured by SNO-TRIK.

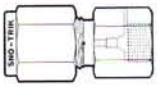
'Sno-Trik' Adaptability

SNO-TRIK to Tube Socket Weld Union



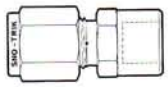
TUBE O. D.	TUBE SOCKET	CATALOG NUMBER	ALLOWABLE WORKING PRESSURE (PSIG) ① (SS) 316	
1/4"	1/4"	-440-6-4TSW	20,000	
3/8"	3/8"	-640-6-6TSW	20,000	
9/16"	9/16"	-940-6-9TSW	20,000	

SNO-TRIK to High Pressure Female Thread



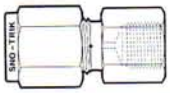
TUBE O. D.	UNIFIED THREAD SIZE	CATALOG NUMBER	ALLOWABLE WORKING PRESSURE (PSIG) (SS) 316	
1/4"	9/16-18	-440-7-44F	60,000	
3/8"	3/4-16	-640-7-64F	60,000	
9/16"	1 1/16-12	-940-7-94F	60,000	

SNO-TRIK to Pipe Socket Weld Female Connector



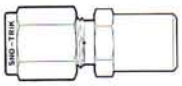
TUBE O. D.	PIPE SOCKET	CATALOG NUMBER	ALLOWABLE WORKING PRESSURE (PSIG) ① (SS) 316	
1/4"	1/4"	-440-7-4PSW	10,000	
3/8"	3/8"	-640-7-6PSW	10,000	
9/16"	1/2"	-940-7-8PSW	10,000	

SNO-TRIK to Female Pipe Thread Connector



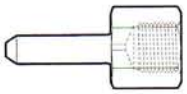
TUBE O. D.	FEMALE PIPE THREAD	CATALOG NUMBER	ALLOWABLE WORKING PRESSURE (PSIG) ① (SS) 316	
1/4"	1/4"	-440-7-4	30,000	
3/8"	3/8"	-640-7-6	30,000	
9/16"	1/2"	-940-7-8	30,000	

SNO-TRIK to Male Pipe Weld Connector



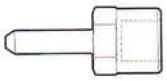
TUBE O. D.	PIPE SIZE	CATALOG NUMBER	ALLOWABLE WORKING PRESSURE (PSIG) ② (SS) 316	
1/4"	1/4"	-440-1-4MPW	30,000	
3/8"	3/8"	-640-1-6MPW	30,000	
9/16"	1/2"	-940-1-8MPW	30,000	

Coned Tube Stub to Female Pipe Thread Adapter



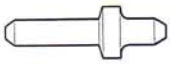
TUBE STUB O. D.	FEMALE PIPE THREAD	CATALOG NUMBER	ALLOWABLE WORKING PRESSURE (PSIG) ① (SS) 316	
1/4"	1/4"	-441-A-4F	30,000	
3/8"	3/8"	-641-A-6F	30,000	
9/16"	1/2"	-941-A-8F	30,000	

Coned Tube Stub to Tube Socket Weld Adapter



TUBE STUB O. D.	TUBE SOCKET	CATALOG NUMBER	ALLOWABLE WORKING PRESSURE (PSIG) ② (SS) 316	
1/4"	3/8"	-441-A-6TSW	20,000	
3/8"	1/4"	-641-A-4TSW	20,000	
9/16"	3/8"	-941-A-6TSW	20,000	

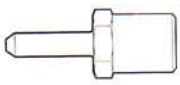
SNO-TRIK Port Connector



NOTE: Reducing Port Connectors also available on request.

PORT SIZE TUBE	TUBE STUB O. D.	CATALOG NUMBER	ALLOWABLE WORKING PRESSURE (PSIG) (SS) 316	
1/4"	1/4"	-441-PC	60,000	
3/8"	3/8"	-641-PC	60,000	
9/16"	9/16"	-941-PC	60,000	

Coned Tube Stub to Male Pipe Weld Adapter



TUBE STUB O. D.	PIPE SIZE	CATALOG NUMBER	ALLOWABLE WORKING PRESSURE (PSIG) ② (SS) 316	
1/4"	1/4"	-441-A-4MPW	30,000	
3/8"	3/8"	-641-A-6MPW	30,000	
9/16"	1/2"	-941-A-8MPW	30,000	

SNO-TRIK Versatility

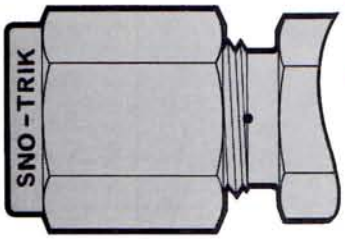
SNO-TRIK welcomes the opportunity to quote on customer specials. The information included on pages 4 thru 6 will be helpful in determining part numbers for such special fittings. Further information can be obtained by contacting your local stocking distributor.

Safety demands respect for high pressure

① Working pressure is based on thread leakage, with both male and female threads manufactured by SNO-TRIK. ② Working pressure of weld fittings is contingent on the integrity of the weld.

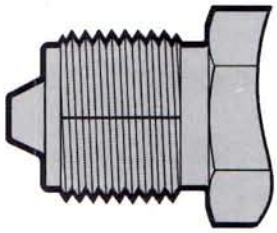
'Sno-Trik® Ordering Instructions

'Sno-Trik' Tube Connector



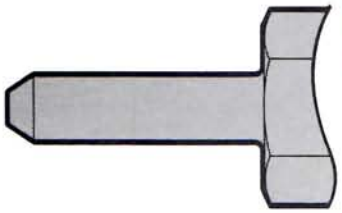
TUBE O. D.	SIZE DESIGNATOR
1/4"	-440-
3/8"	-640-
9/16"	-940-

'Sno-Trik' High Pressure Male End



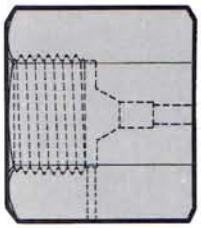
MALE THREAD SIZE	SIZE DESIGNATOR
9/16-18NF	-44M-
3/4-16NF	-64M-
1 1/8-12NF	-94M-

'Sno-Trik' Coned Tube Stub



TUBE O. D.	SIZE DESIGNATOR
1/4"	-441-
3/8"	-641-
9/16"	-941-

'Sno-Trik' High Pressure Female End



FEMALE THREAD SIZE	SIZE DESIGNATOR
9/16-18NF	-44F-
3/4-16NF	-64F-
1 1/8-12NF	-94F-

MATERIALS—Type 316 stainless steel=SS-

Other materials available on special order. (For other materials see reverse side of FITTINGS tab in Master Catalog Binder.)

MATERIAL DESIGNATOR		SNO-TRIK SIZE & TYPE DESIGNATOR		FITTING TYPE		SECOND END SIZE & TYPE DESIGNATOR	SEE PAGE
SS	—	440	—	1	—	44M	3
SS	—	440	—	1	—	8	4
SS	—	941	—	A	—	8	4
SS	—	440	—	R	—	641	4

SUMMARY OF TYPES OF FITTINGS

Number used to designate type of fitting in Part Number	TYPE OF FITTING
-1-	Male Connector
-2-	Male Elbow
-3-	Tee, Union
-3TTF	Tee, Female Pipe Branch
-3TFT	Tee, Female Pipe Run
-3TTM	Tee, Male Pipe Branch
-3TMT	Tee, Male Pipe Run
-4	Cross, Union
-6	Union
-6-	Reducing Union
-7-	Female Connector
-8-	Female Elbow
-9	Union Elbow

Number used to designate type of fitting in Part Number	TYPE OF FITTING
-11-	Bulkhead Male Connector
-61-	Bulkhead Union
-71-	Bulkhead Female Connector
-A-	Male Adapter
-A- -F	Female Adapter
-A1-	Bulkhead Adapter
-C	Cap
-P	Plug
-PC	Port Connector
-R-	Reducer
-TSW	Tube Socket Weld
-MPW	Male Pipe Weld
-PSW	Pipe Socket Weld
-MO	Maximum Orifice Fitting

PSI Conversion Table

1 ATM = 14.69 PSI

Individuals working in high pressure often use atmospheres as a unit of pressure measurement. If an exact conversion of ATM's to PSI is required, the figures shown above should be used. However, to facilitate conversion, the following table is based on 1 ATM being equal to approximately 14.7 PSI.

ATM	PSI	ATM	PSI
1	14.7	7,000	102,900
100	1,470	8,500	124,950
500	7,350	10,000	147,000
1,000	14,700	12,000	176,400
3,000	44,100	14,000	205,800
5,000	73,500		

NOTE: At times the term *BAR* may also be used as a unit of pressure measurement. One *BAR* is equal to 14.5 PSI, however, for our purposes, the above table can also be used for approximate conversion of BAR's to PSI.

Glossary of Terms

THRUST—This is the force trying to push the tube out of the fitting. It results from system pressure against the exposed tube area. Example: If a system has 100 PSI working against 1 square inch of area, the thrust is equal to 100 lbs.

SEAL FORCE—The force that presses the coned end of the tube into the conical seat of the fitting (pre-load).

RADIAL MOVEMENT—The expansion or contraction of the tube diameter.

AXIAL MOVEMENT—Any movement along the axis of the tube. Example: Lengthening or shortening of the tubing.

YIELD POINT—The stress at which elongation takes place with little or no increase in applied force. Once a material has gone beyond the yield point, permanent deformation takes place, and it will not return to its original dimension when the force is removed.

ULTIMATE STRENGTH—Force required to cause a certain material to fail. This is usually expressed in pounds per square inch.

ELASTIC LIMIT—The greatest stress which can be applied to a material (loaded, bent, etc.) below yield and still return to its original size or shape upon removal of the load.

PLASTIC—The stress range where the material will take on permanent deformation due to some load above yield.

STRESS—The amount of load placed on material, usually expressed in pounds per square inch.

STRAIN—The movement of material within a fixed length or dimension. That is, inches per inch.

COMPRESSIVE FORCE—The squeezing together of material.

TENSILE FORCE—The stretching or pulling apart of material.

LOAD TRAIN—Combination of fitting components that generate the seal force (mechanical drive train).

Sealing on Heavy Wall Tubing

In a tube fitting designed for high pressure applications, it is desirable to effect the seal so that the smallest possible area will be exposed to system pressure. This is based on the formula: Force = Pressure x Area. Since the fitting manufacturer has no control over the system pressure, the seal area is minimized in order to control the amount of force exerted against the seal.

This limiting of force is accomplished by coning the tube end, and making the seal on the reduced area of the tube cone. As a safety factor, SNO-TRIK provides a weep hole in all tube fittings. This insures that system pressure would be relieved before exerting greatly increased forces on the larger area of the tube O.D. The inherent safety of the SNO-TRIK Tube Fitting can be demonstrated by the following example:

SNO-TRIK Fitting at 1¼ turns

EXAMPLE 1.
A—Area exposed to pressure (.0123 in.²)
B—Seal Line
C—¼" OD tube
P—System pressure 50,000 PSI
F—Thrust against tube (pounds)

SNO-TRIK Fitting Finger-Tight

EXAMPLE 2.
A—Area exposed to pressure (.049 in.²)
C—¼" OD tube
P—System pressure 50,000 PSI
F—Thrust against tube (pounds)

Using the formula: Force = Pressure x Area (F = P x A)

In Example 1
F = 50,000 x .0123 in.²
F = 615 lbs.

In Example 2
F = 50,000 x .049 in.²
F = 2,450 lbs.

SNO-TRIK Fitting incorporates a weep hole which serves as a leak detector port.

SNO-TRIK Provides Increased Safety

The tube connection must not be a system's weakest link. For this reason, the cone seal design was developed for heavy wall tube applications.

The rating of tubing depends on its diameter, wall thickness, and the mechanical properties of the material. After wall thickness was increased for higher pressure applications the tube rating then became more dependent on the material strength. Increasing material strength was the next logical step in achieving high pressures.

With the increase in tubing strength, through suitable material processing, the yield strength now approached ultimate strength. This produced a condition of low safety factors for high pressure systems, and now requires an optimum fitting to match the tubing capabilities.

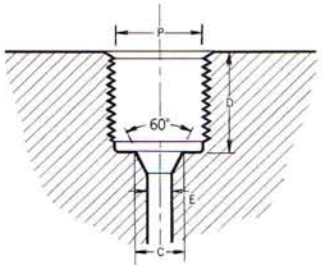
Since the SNO-TRIK Tube Fitting does not reduce the tube wall or introduce stress risers into the tube, there are no added stresses to weaken the system. Through its inherent stability, the SNO-TRIK Fitting provides the safest fitting to match tubing capabilities.

SNO-TRIK Tube Fittings Provide Increased Stability

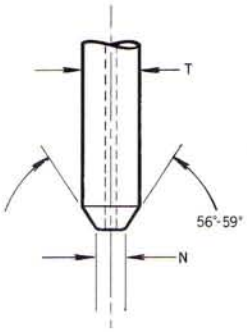
1. In SNO-TRIK Tube Fittings, the tubing is supported in the fitting body by the cone seat, front ferrule, and back ferrule. This provides tube support over a greater length than is possible with a threaded connection, and therefore improves resistance to vibration.

2. The design of SNO-TRIK Tube Fittings prevents leakage due to tube yield. In a threaded tube system, gaps always exist between threaded members. When under sustained high pressure, the tubing is stressed, and the strain will cause the tube to yield into these gaps. As the tube yields the seal is lost and the fitting leaks. This potential problem cannot occur in SNO-TRIK Fittings, since the ferrules do not begin their movement onto the tubing until they are in intimate contact with the ramp angles and tube. This ferrule action eliminates gaps, and provides added tubing support. The stress/strain/time relationship is thus prevented, giving a high degree of performance and reliability under pressure cycling, sustained high pressure and vibration.

Tube Preparation



We recommend that high pressure tubing, used with SNO-TRIK Tube Fittings, be coned with a SNO-TRIK Coning Tool. For additional information contact your local SNO-TRIK Sales & Service Representative.



Female Port for Male Connector

TYPICAL HIGH PRESSURE CONNECTIONS				
TUBING	P	D	E	C
1/4	9/16-18NF	7/16	3/32	3/16
3/8	3/4-16NF	5/8	1/8	9/32
9/16	1 1/8-12NF	3/4	3/16	13/32

TUBE PREPARATION	
T	N
1/4	1/8
3/8	7/32
9/16	9/32

Standard pre-coned tube lengths are available in 2", 4", 8", and 12" lengths. Tube lengths are precisely coned to the proper angle with a high quality finish for perfect high pressure connections every time.

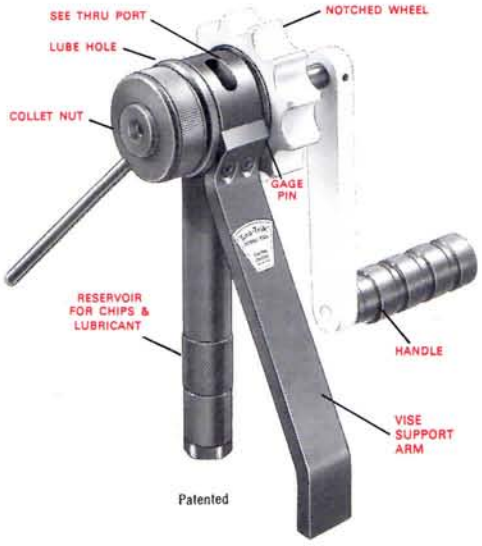
Sno-Trik® Coning Tool

The SNO-TRIK Coning Tool was designed to be used in the preparation of heavy wall tubing. There are two models available. Model #1 will prepare 1/4" O.D. tube only. Model #2 will prepare tube O.D. range of 1/4", 3/8", and 9/16".

Some of the features designed into this tool are:

• Built-in gauge pin to show where to start and finish the tube cone • Easily controlled feed of cutting tool • Port for cutting lubricant (CL60) • Ground surfaces for accuracy • Collet grips tube without causing damage to the tube surface during machining • Rust-proof finish • Provision to hold coning tool in bench vise • Easily re-sharpened tool bit • Container to capture chips and used lubricant • Tube cone and tube face machined in one operation.

It is important that the tube cone be prepared correctly since it is one-half of the fitting seal. The SNO-TRIK Coning Tool was designed to do this specific job with extreme accuracy.



Patented

Coning Tool Accessories

A fitting to adapt CL60 to the Coning Tool is provided.

CL60 Cutting Lubricant was specially developed for use with the SNO-TRIK Coning Tool when hand machining stainless steel and other tube materials. A bottle of CL60 is provided with each Coning Tool.

Collets Furnished with Model #2:

1/4" 3/8" 9/16"

Tool Bits Furnished with Model #2:

1/4" 3/8" 9/16"

Cone Profiles

One reamer is supplied with each Coning Tool for use in deburring I.D. of the tube.

The Coning Tool and accessories are packaged in a permanent carrying case.

Safety demands respect for high pressure

YOUR LOCAL SALES & SERVICE REPRESENTATIVE

8-73-125M-125M-MI

Printed in USA

For valving in high pressure ranges, see subsection on High Pressure Valves.

CATALOG NO. CA-1171

CAJON®

Vacuum Products

ULTRA-TORR® FITTINGS

Pages 2, 3, 4

VCO® O-RING VACUUM COUPLINGS

Pages 5, 6, 7

VCR® VACUUM COUPLINGS

Pages 8, 9, 10, 11

FLEXIBLE TUBING

Pages 12, 13

FLEXIBLE GLASS-END TUBING

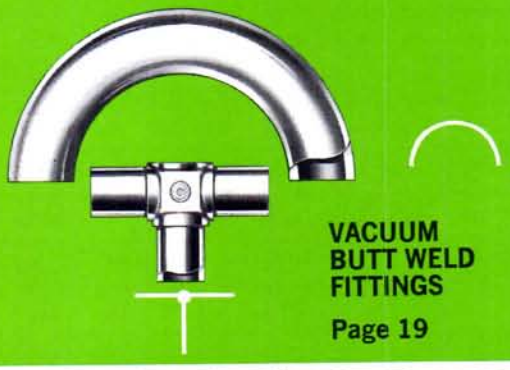
Page 14

GLASS/METAL TRANSITION TUBES

Page 15

VACUUM FLANGES

Pages 16, 17, 18



VACUUM BUTT WELD FITTINGS

Page 19

GENERAL INFORMATION

Page 20

CAJON COMPANY • 32550 Old South Miles Road • Cleveland, Ohio 44139

CAJON® Ultra-Torr® Fittings

PURPOSE

CAJON Ultra-Torr Fittings are designed to provide a vacuum-tight seal with quick, finger-tight assembly and reusability on glass, metal or plastic tubing.

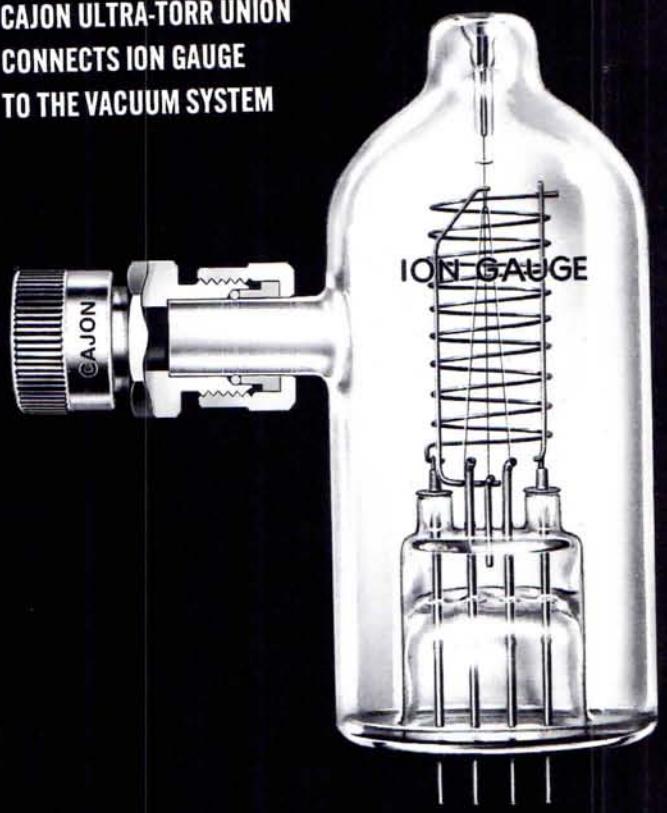
APPLICATIONS

CAJON Ultra-Torr Fittings can be used on all vacuum systems except where bake-out temperatures would damage the O-Ring. Ultra-Torr Fittings can also be used on any system utilizing glass, metal or plastic tubing.

FEATURES

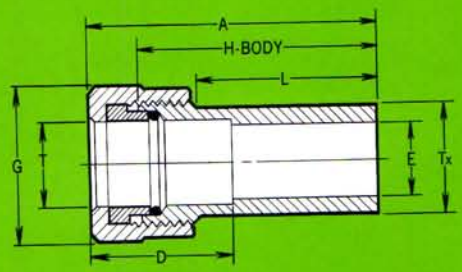
- **Helium leak-tight seal for use on low, medium, and high vacuum service.**
- **Reusable without changing fitting components.**
- **Perfect alignment of O-Ring, sleeve and nut for positive sealing and easy assembly.**
- **Can be used on any system utilizing glass, metal, or plastic tubing.**
- **Finger-tight assembly and disassembly without distortion of tubing.**
- **Can be used with tubing O.D. as much as 1/32″ under-size.**
- **Ideal for use with millimeter tubing (such as glass) where the O.D. may vary.**
- **Can be used on all vacuum applications except where bake-out temperatures would damage the O-Ring.**
- **Variety of shapes include unions, adapters, connectors, elbows, tees, crosses, etc.**
- **Furnished in sizes from 1/16″ to 2 inches.**
- **Standard materials are brass and 316 stainless steel. Ultra-Torr Fittings can be provided in many other metals and plastics.**
- **One-piece forgings used on tees, elbows, crosses, etc.**

CAJON ULTRA-TORR UNION CONNECTS ION GAUGE TO THE VACUUM SYSTEM



CAJON ULTRA-TORR UNION provides a vacuum-tight seal on IONIZATION GAUGE TUBES. ULTRA-TORR Fittings can be disconnected repeatedly and reconnected to provide a vacuum-tight seal in any system.

ULTRA-TORR ADAPTER

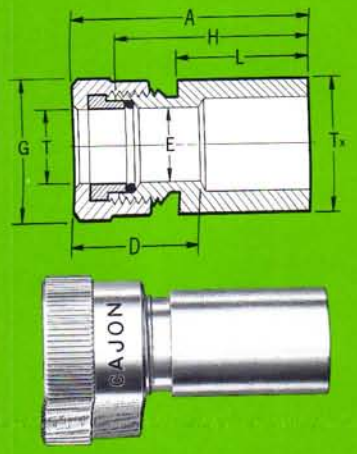


PATENTED

T Tube O.D.	Tx	Catalog Number	A	D	E Min.	G	H Body	L	O-Ring Uniform Size No.
1/16	1/4	-1-UT-A-4	1 1/8	7/16	3/64	3/8	15/16	5/8	Special
1/8	1/4	-2-UT-A-4	1 13/64	7/16	3/32	9/16	1 1/64	5/8	006
3/16	3/8	-3-UT-A-6	1 5/16	5/8	1/8	5/8	1 1/32	21/32	008
1/4	1/4	-4-UT-A-4	1 11/32	5/8	3/16	11/16	1 1/16	5/8	010
1/4	3/8	-4-UT-A-6	1 21/64	5/8	3/16	11/16	1 3/64	21/32	010
1/4	1/2	-4-UT-A-8	1 15/32	5/8	3/16	11/16	1 3/16	13/16	010
3/8	3/8	-6-UT-A-6	1 15/32	21/32	9/32	13/16	1 3/16	21/32	012
3/8	1/2	-6-UT-A-8	1 37/64	21/32	9/32	13/16	1 19/64	13/16	012
1/2	5/8	-8-UT-A-10	1 41/64	13/16	13/32	15/16	1 23/64	7/8	014
1/2	3/4	-8-UT-A-12	1 11/16	13/16	13/32	15/16	1 13/32	15/16	014
3/4	1	-12-UT-A-16	1 25/32	15/16	5/8	1 1/4	1 1/2	15/16	116
1	1 1/4	-16-UT-A-20	1 51/64	15/16	7/8	1 9/16	1 33/64	15/16	120

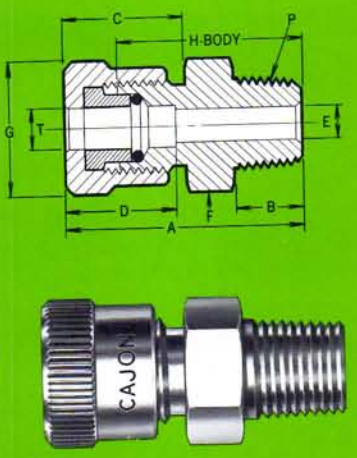
All dimensions in inches. Dimensions for reference only—subject to change.

ULTRA-TORR BORE-THROUGH ADAPTER



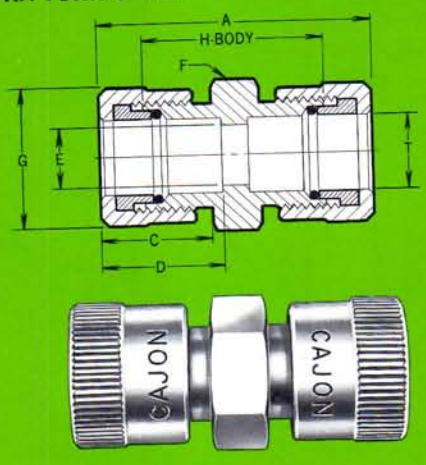
T Tube O.D.	Tx	Catalog Number	A	G	H Body	L	O-Ring Uniform Size No.
1/8	1/4	-2-UT-A-4BT	1 13/64	9/16	1 1/64	5/8	006
1/8	3/8	-2-UT-A-6BT	1 7/32	9/16	1 1/32	21/32	006
1/4	3/8	-4-UT-A-6BT	1 21/64	11/16	1 3/64	21/32	010
1/4	1/2	-4-UT-A-8BT	1 15/32	11/16	1 3/16	13/16	010
3/8	1/2	-6-UT-A-8BT	1 37/64	13/16	1 19/64	13/16	012
1/2	3/4	-8-UT-A-12BT	1 11/16	15/16	1 13/32	15/16	014
3/4	1	-12-UT-A-16BT	1 25/32	1 1/4	1 1/2	15/16	116
1	1 1/4	-16-UT-A-20BT	1 51/64	1 9/16	1 33/64	15/16	120

ULTRA-TORR MALE CONNECTOR



T Tube O.D.	P Male Pipe Thr'd	Catalog Number	A	B	C	D	E Min.	F Hex Flat	G	H Body	O-Ring Uniform Size No.
1/16	1/8	-1-UT-1-2	1 1/16	3/8	1/2	7/16	3/64	7/16	3/8	7/8	Special
1/8	1/8	-2-UT-1-2	1 1/8	3/8	9/16	7/16	3/32	1/2	9/16	15/16	006
1/4	1/8	-4-UT-1-2	1 9/32	3/8	21/32	5/8	3/16	5/8	11/16	1	010
1/4	1/4	-4-UT-1-4	1 15/32	9/16	21/32	5/8	3/16	5/8	11/16	1 3/16	010
3/8	1/8	-6-UT-1-2	1 13/32	3/8	3/4	21/32	3/16	3/4	13/16	1 1/8	012
3/8	1/4	-6-UT-1-4	1 19/32	9/16	3/4	21/32	9/32	3/4	13/16	1 5/16	012
1/2	3/8	-8-UT-1-6	1 5/8	9/16	3/4	13/16	13/32	7/8	15/16	1 11/32	014
1/2	1/2	-8-UT-1-8	1 13/16	3/4	3/4	13/16	13/32	7/8	15/16	1 17/32	014
3/4	3/4	-12-UT-1-12	1 31/32	3/4	27/32	15/16	5/8	1 3/16	1 1/4	1 11/16	116
1	1	-16-UT-1-16	2 7/32	15/16	27/32	15/16	7/8	1 1/2	1 9/16	1 15/16	120

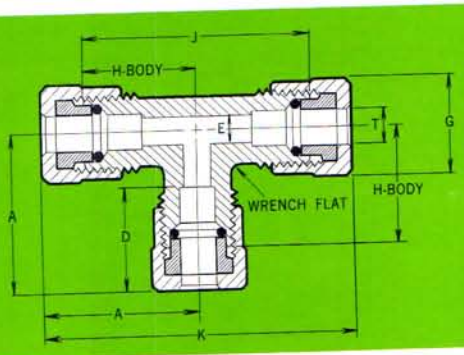
ULTRA-TORR UNION



T Tube O.D.	Catalog Number	A	C	D	E Min.	F Hex Flat	G	H Body	O-Ring Uniform Size No.
1/16	-1-UT-6	1 3/16	1/2	7/16	3/64	3/8	3/8	13/16	Special
1/8	-2-UT-6	1 5/16	9/16	7/16	3/32	1/2	9/16	15/16	006
1/4	-4-UT-6	1 9/16	21/32	5/8	3/16	5/8	11/16	1	010
3/8	-6-UT-6	1 3/4	3/4	21/32	9/32	3/4	13/16	1 3/16	012
1/2	-8-UT-6	1 13/16	3/4	13/16	13/32	7/8	15/16	1 1/4	014
5/8	-10-UT-6	1 7/8	25/32	7/8	1/2	1 1/16	1 1/8	1 5/16	114
3/4	-12-UT-6	2 1/16	27/32	15/16	5/8	1 3/16	1 1/4	1 1/2	116
1	-16-UT-6	2 1/8	27/32	15/16	7/8	1 1/2	1 9/16	1 9/16	120

All dimensions in inches. Dimensions for reference only—subject to change.

ULTRA-TORR TEE



T Tube O.D.	Catalog Number	A	D	E	G	H Body	J	K	Wrench Flat	O-Ring Uniform Size No.
1/8	-2-UT-3	29/32	7/16	3/32	9/16	23/32	17/16	113/16	7/16	006
1/4	-4-UT-3	13/32	5/8	3/16	11/16	13/16	1 5/8	2 3/16	1/2	010
3/8	-6-UT-3	115/64	21/32	9/32	13/16	31/32	115/16	2 15/32	11/16	014
1/2	-8-UT-3	19/32	13/16	13/32	15/16	1	2	2 9/16	11/16	116
3/4	-12-UT-3	133/64	15/16	5/8	1 1/4	17/32	27/16	3 1/32	1	120
1	-16-UT-3	111/16	15/16	7/8	19/16	113/32	213/16	3 3/8	1 1/4	

All dimensions in inches. Dimensions for reference only—subject to change.

TECHNICAL DATA

MATERIALS

BODY—Brass and type 316 stainless steel as standard.
O-RING—70 Durometer Viton as standard. Other materials and hardnesses on request.

ALL OTHER PARTS—Same material as the body.

TEMPERATURE RATING

Maximum Temperature rating using a Viton O-Ring is 232°C (450°F).

PRESSURE RATINGS

CAJON Ultra-Torr Fittings have been specifically designed for use on low, medium and high vacuum service. They have also been used in some pressurized systems by mechanically containing the tubing to prevent the tubing from being forced from the fitting.

SEALANTS

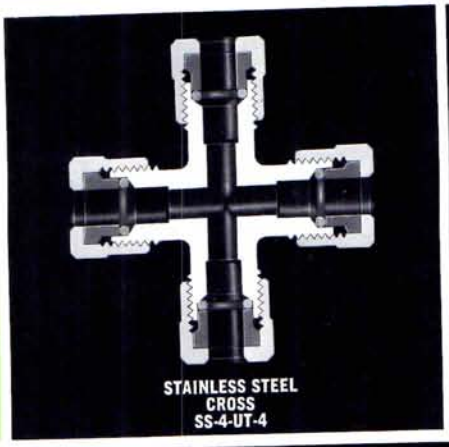
For efficient seal performance in vacuum applications, the Ultra-Torr O-Ring is wetted with a very thin film of silicone vacuum grease. Replacement O-Rings should be wetted with lubricants or sealants compatible with the system.

TESTING

CAJON Ultra-Torr Fittings with finger-tight assembly have been consistently helium leak-tested to a rate of 0.0004 M.C.F.H. or 4.14 x 10^{-9} atm. cc/sec. without leakage.

ultra-torr specials

Special CAJON ULTRA-TORR Fittings can be furnished in a variety of shapes, sizes and materials to meet the most critical requirements. Your local CAJON Sales and Service Representative will welcome the opportunity to work with you in the selection of the particular fitting to serve your needs.



STAINLESS STEEL CROSS
SS-4-UT-4

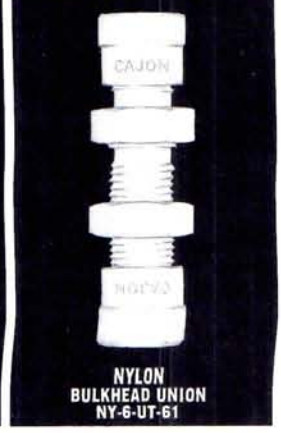
BRASS MALE ELBOW
B-8-UT-2-8

STAINLESS STEEL REDUCING UNION
SS-8-UT-6-4

STAINLESS STEEL ULTRA-TORR TO SWAGELOK REDUCING UNION
SS-4-UT-6-200

BRASS O-RING CONNECTOR
B-4-UT-1-OR

BRASS FEMALE CONNECTOR
B-6-UT-7-4



NYLON BULKHEAD UNION
NY-6-UT-61

Part numbers shown here are typical examples.

PURPOSE

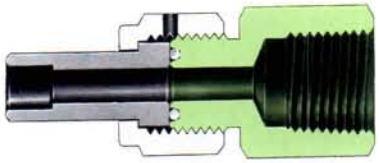
The CAJON VCO Coupling is designed for rapid make-up in low, medium and high vacuum applications as well as positive pressure applications.

The CAJON VCO Coupling design allows repositioning of components through 360 degrees. No axial clearance is required for component removal or repositioning.

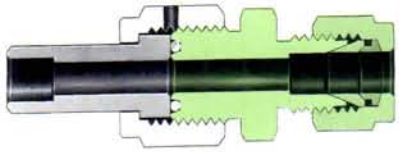
BENEFITS OF COMPONENT STOCK

CAJON VCO Coupling parts are stocked as separate items to allow the user maximum convenience and flexibility in making up a system or connecting a component. Common parts, such as the nut and gland (see black panel below), can be purchased in larger quantities at lower cost. Inventories can be greatly reduced by eliminating the duplication of these common parts. Each body style (green tint below) can be combined with a gland and nut of the same size to make up the required coupling. Sizes are designated by the first digit of the catalog number. The standard Viton O-Ring is always included with the body.

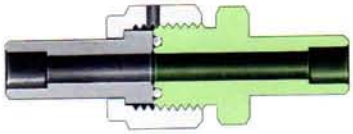
VCO FEMALE CONNECTOR



VCO TO SWAGELOK CONNECTOR

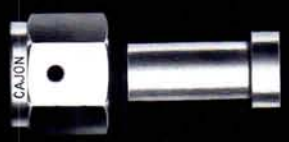


VCO COUPLING

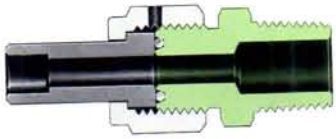


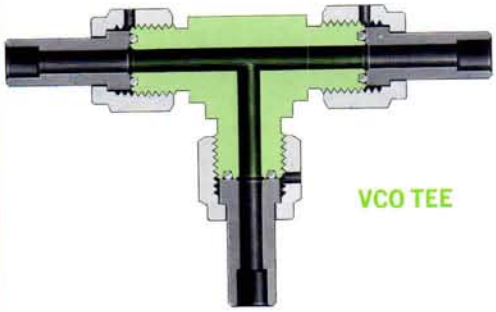
PATENTED

VCO NUT VCO GLAND



VCO MALE CONNECTOR





VCO TEE

VCO ELBOW

APPLICATIONS

Vacuum and pressure systems • Pump port connections • Auxiliary ports • Sampling lines • Valve port connections • Portable equipment coupling • Transfer line connection • Used in brazed or welded systems.

FEATURES

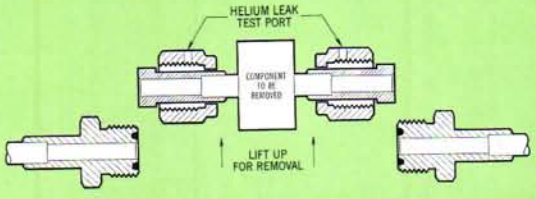
No axial clearance needed for disassembly • Minimum dead space to reduce contamination • Cannot be over-tightened • Metal-to-metal contact contains O-Ring • Leak test port at seal to provide immediate leak detection • Precision mating parts for dependable seal • Quality thread form for repeated makeup • Available in high strength forged tees, elbows and crosses • Standard O-Rings can be used for replacement • Various end connections available from 1/8" through 1" • Low inventories through separate component stock.

INSTALLATION INSTRUCTIONS

When soldering, brazing or welding is performed on the body end of the coupling, the O-Ring should be removed to prevent damage.

The coupling should be tightened no less than 1/8 turn past finger-tight to assure metal-to-metal contact for both vacuum and pressure applications.

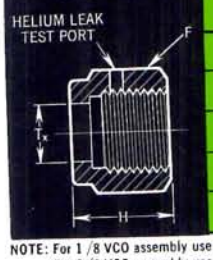
NO AXIAL CLEARANCE NEEDED FOR DISASSEMBLY
The coupling can be disconnected and a section removed from the system without disturbing other components or connections.



CAJON® VCO® O-Ring Vacuum Couplings

VCO COMMON PARTS

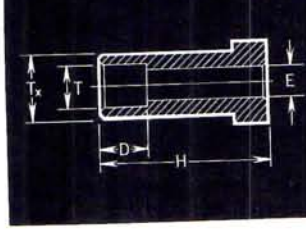
VCO NUT



Catalog Number	F Hex Flat	H	Tx	Uniform Thread Size
-4-VCO-4	11/16	21/32	25/64	9/16-18
-8-VCO-4	1	11/16	39/64	7/8-14
-10-VCO-4	1 1/8	11/16	3/4	1-14
-12-VCO-4	1 1/2	7/8	15/16	1 1/4-18
-16-VCO-4	1 3/4	7/8	1 13/64	1 1/2-20

NOTE: For 1/8 VCO assembly use -4VCO Nut
For 3/8 VCO assembly use -8VCO Nut

VCO GLAND

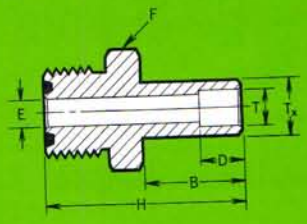


T Tube Socket	Catalog Number	D	E	H	Tx	Allowable Working Pressure PSIG 316SS	Brass
1/8	-2-VCO-3	7/32	3/32	1	3/8	11,500	6,100
1/4	-4-VCO-3	9/32	3/16	1	3/8	6,300	3,600
3/8	-6-VCO-3	5/16	9/32	1 1/16	19/32	7,600	4,400
1/2	-8-VCO-3	3/8	13/32	1 1/16	19/32	2,800	1,600
5/8	-10-VCO-3	3/8	7/16	1 1/16	3/4	2,900	1,700
3/4	-12-VCO-3	3/8	5/8	1 1/8	59/64	3,500	2,000
1	-16-VCO-3	3/8	7/8	1 1/4	1 13/16	2,800	1,600

VCO BODIES

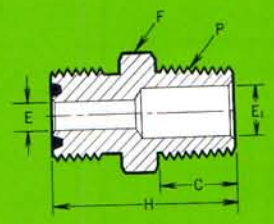
TABLE OF DIMENSIONS

VCO BODY



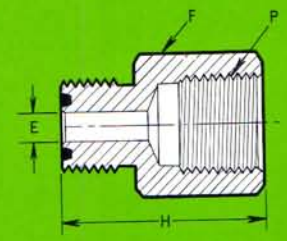
T Tube Socket	Catalog Number	B	D	E	F Hex Flat	H	Tx	Uniform Thread Size	O-Ring Uniform Size No.	Allowable Working Pressure PSIG 316SS	Brass
1/8	-2-VCO-1	11/16	7/32	3/32	5/8	1 7/16	3/8	9/16-18	010	14,300	8,400
1/4	-4-VCO-1	11/16	9/32	3/16	5/8	1 7/16	3/8	9/16-18	010	6,300	3,600
3/8	-6-VCO-1	3/4	5/16	9/32	15/16	1 5/8	19/32	7/8-14	111	7,600	4,400
1/2	-8-VCO-1	3/4	3/8	13/32	15/16	1 5/8	19/32	7/8-14	111	2,800	1,600
5/8	-10-VCO-1	3/4	3/8	7/16	1 1/16	1 11/16	3/4	1-14	113	2,900	1,700
3/4	-12-VCO-1	3/4	3/8	5/8	1 5/16	1 25/32	59/64	1 1/4-18	116	3,500	2,000
1	-16-VCO-1	7/8	3/8	7/8	1 1/2	1 15/16	1 3/16	1 1/2-20	215	2,800	1,600

MALE CONNECTOR BODY



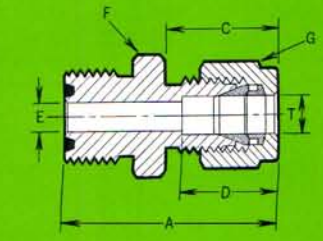
P Male Pipe Thread	Catalog Number	C	E	E1	F Hex Flat	H	Uniform Thread Size	O-Ring Uniform Size No.	Allowable Working Pressure PSIG 316SS	Brass
1/8	-2-VCO-1-2	3/8	3/32	3/16	5/8	1 1/8	9/16-18	010	9,100	5,300
1/4	-4-VCO-1-4	9/16	3/16	3/16	5/8	1 5/16	9/16-18	010	12,900	7,500
3/8	-6-VCO-1-6	9/16	9/32	9/32	15/16	1 7/16	7/8-14	111	11,300	6,600
1/2	-8-VCO-1-8	3/4	13/32	13/32	15/16	1 5/8	7/8-14	111	9,100	5,300
1/2	-10-VCO-1-8	3/4	7/16	1/2	1 1/16	1 5/8	1-14	113	5,600	3,300
3/4	-12-VCO-1-12	3/4	5/8	5/8	1 5/16	1 25/32	1 1/4-18	116	6,400	3,700
1	-16-VCO-1-16	15/16	7/8	7/8	1 1/2	2	1 1/2-20	215	4,600	2,700

FEMALE CONNECTOR BODY



P Female Pipe Thread	Catalog Number	E	F Hex Flat	H	Uniform Thread Size	O-Ring Uniform Size No.	Allowable Working Pressure PSIG 316SS	Brass
1/8	-2-VCO-7-2	3/32	5/8	1 1/8	9/16-18	010	7,200	4,200
1/4	-4-VCO-7-4	3/16	3/4	1 9/32	9/16-18	010	8,900	5,200
3/8	-6-VCO-7-6	9/32	15/16	1 1/2	7/8-14	111	5,600	3,300
1/2	-8-VCO-7-8	13/32	1 1/16	1 13/16	7/8-14	111	4,000	2,500
1/2	-10-VCO-7-8	7/16	1 1/16	1 13/16	1-14	113	4,000	2,500
3/4	-12-VCO-7-12	5/8	1 5/16	1 13/16	1 1/4-18	116	3,800	2,200
1	-16-VCO-7-16	7/8	1 5/8	1 7/8	1 1/2-20	215	3,700	2,800

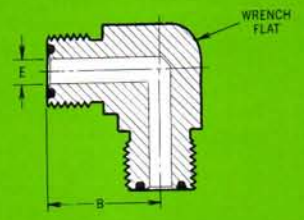
VCO TO SWAGELOK CONNECTOR BODY



T Tube O.D.	Catalog Number	A▲	C▲	D▲	E	F Hex Flat	G Hex Flat	Uniform Thread Size	O-Ring Uniform Size No.	Allowable Working Pressure PSIG 316SS	Brass
1/8	-2-VCO-6-200	1 11/32	5/8	17/32	3/32	5/8	7/16	9/16-18	010	12,600	4,000
1/4	-4-VCO-6-400	1 15/32	23/32	5/8	3/16	5/8	9/16	9/16-18	010	11,700	3,700
3/8	-6-VCO-6-600	1 21/32	25/32	11/16	9/32	15/16	11/16	7/8-14	111	7,500	2,400
1/2	-8-VCO-6-810	1 1/4	7/8	29/32	13/32	15/16	7/8	7/8-14	111	7,100	2,200
5/8	-10-VCO-6-1010	1 25/32	7/8	31/32	1/2	1 1/16	1	1-14	113	6,400	2,000
3/4	-12-VCO-6-1210	1 27/32	7/8	31/32	5/8	1 5/16	1 1/8	1 1/4-18	116	6,100	1,900
1	-16-VCO-6-1610	2 19/64	1 1/32	1 7/32	7/8	1 1/2	1 1/2	1 1/2-20	215	4,900	1,600

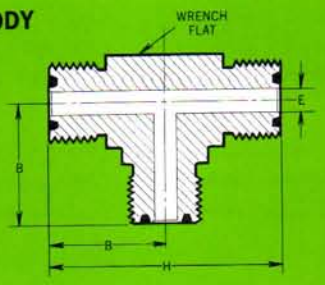
All dimensions in inches. Dimensions for reference only—subject to change. / The nut, ferrules and the Viton O-Ring are provided assembled as shown ▲Dimensions shown with SWAGELOK nuts finger-tight.

ELBOW BODY



Catalog Number	B	E	Wrench Flat	Uniform Thread Size	O-Ring Uniform Size No.	Allowable Working Pressure PSIG 316SS	Brass
-2-VCO-9	53/64	3/16	1/2	9/16-18	010	14,300	7,800
-4-VCO-9	53/64	3/16	1/2	9/16-18	010	14,300	7,800
-6-VCO-9	1 1/8	9/32	13/16	7/8-14	111	12,100	7,100
-8-VCO-9	1 1/8	13/32	13/16	7/8-14	111	12,100	7,100
-10-VCO-9	1 7/32	7/16	1	1-14	113	10,200	6,000
-12-VCO-9	1 3/8	5/8	1 1/4	1 1/4-18	116	7,600	4,400
-16-VCO-9	1 5/8	7/8	1 11/16	1 1/2-20	215	5,600	3,200

TEE BODY



Catalog Number	B	E	H	Wrench Flat	Uniform Thread Size	O-Ring Uniform Size No.	Allowable Working Pressure PSIG 316SS	Brass
-2-VCO-T	53/64	3/16	1 21/32	1/2	9/16-18	010	14,300	7,800
-4-VCO-T	53/64	3/16	1 21/32	1/2	9/16-18	010	14,300	7,800
-6-VCO-T	1 1/8	9/32	2 1/4	13/16	7/8-14	111	12,100	7,100
-8-VCO-T	1 1/8	13/32	2 1/4	13/16	7/8-14	111	12,100	7,100
-10-VCO-T	1 7/32	7/16	2 7/16	1	1-14	113	10,200	6,000
-12-VCO-T	1 3/8	5/8	2 3/4	1 1/4	1 1/4-18	116	7,600	4,400
-16-VCO-T	1 5/8	7/8	3 1/4	1 11/16	1 1/2-20	215	5,600	3,200

All dimensions in inches. Dimensions for reference only—subject to change.

TECHNICAL DATA

MATERIALS

BODY, GLAND, NUT—Brass or 316 stainless steel as standard.
O-RING—70 Durometer Viton as standard. Other materials and hardnesses on request.

TEMPERATURE RATINGS

Maximum temperature rating using a Viton O-Ring is 232°C (450°F).

PRESSURE RATINGS

Pressure ratings listed in dimensional tables are calculated in accordance with power piping code per A.S.A. B31.3 paragraph 304.1.2. Allowable working pressures listed include a safety factor of four (4:1).

SEALANTS

For efficient seal performance, the VCO O-Ring is wetted with a very thin film of silicone vacuum grease. Replacement O-Rings should be wetted with lubricants or sealants compatible with the system.

TESTING

CAJON VCO Couplings have been consistently helium leak tested to a rate of 0.0004 M.C.F.H. or 4.14 x 10^{-9} atm. cc/sec. without leakage.

Special VCO Accessories

Special CAJON VCO components can be furnished in a variety of shapes, sizes and materials to meet the most critical requirements.

Your local CAJON Sales and Service Representative will welcome the opportunity to work with you in the selection of the particular fitting to serve your needs.

Special accessories for VCO Couplings can be ordered as follows:

SS-4-VCO-1-PL

PLATE MOUNTING BODIES—To order add (Plate) after body part number.

SS-8-VCO-1-BL

BLIND BODIES—Blind bodies are undrilled and are used to cap the end of a gland. To order, add (Blind) after body part number. Viton O-Ring is included.

SS-4-VCO-3-BL

BLIND GLANDS—Blind glands are undrilled and are used to plug a body to prevent dirt entry or to close off the open port so that the system can be evacuated. To order, add (Blind) after gland part number.

SS-6-VCO-4-BL

BLIND NUTS—Blind nuts are undrilled and are used to plug a body to prevent dirt entry or to close off the open port so that the system can be evacuated. To order, add (Blind) after nut part number.

SS-8-VCO-3M-*

MALE PIPE THREAD GLANDS—are useful to eliminate welding or soldering when connecting VCO Couplings directly to female pipe connections on valves or instruments.

SS-8-VCO-3F-*

FEMALE PIPE THREAD GLANDS—are useful to eliminate welding or soldering when connecting VCO Couplings directly to male pipe connections on valves, gauges or instruments.

*Thread size must be shown following catalog number.

Part numbers shown here are typical examples.

PURPOSE

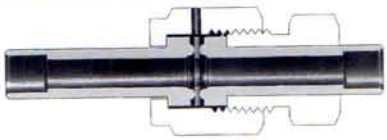
CAJON VCR Couplings allow component removal or repositioning without the need for axial clearance. When space is at a premium, VCR components greatly simplify system layout and installation.

This versatile design is suitable for ultra-high vacuum applications as well as high pressure systems. All metal seals permit VCR Couplings to be used with low or high operating temperatures. Helium leak-tight systems can be rapidly assembled or disassembled and components can be reused many times.

BENEFITS OF COMPONENT STOCK

CAJON VCR Coupling parts are stocked as separate items to allow the user maximum convenience and flexibility in making up a system or connecting a component. Common parts, such as the nuts, glands and gaskets (see black panels below), can be purchased in larger quantities at lower cost. Inventories can be greatly reduced by eliminating the duplication of common parts necessary for assembled stocks. The various bodies (green tint below) can be combined with nuts, glands and gaskets of the same size to make up many different combinations of assembled couplings. Sizes are designated by the first digit of the part number.

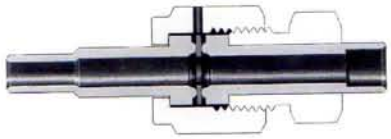
VCR COUPLING



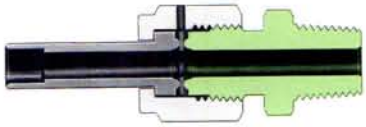
PATENTED

VCR MALE NUT

VCR COUPLING WITH MALE WELD GLAND

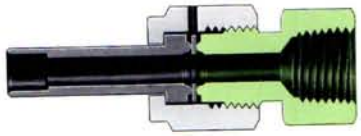


VCR MALE CONNECTOR

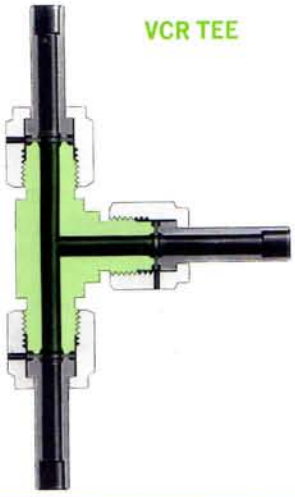


VCR FEMALE NUT · VCR GLAND · VCR GASKET · VCR MALE WELD GLAND

VCR FEMALE CONNECTOR



VCR TEE



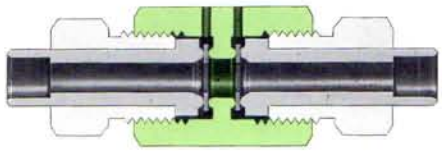
VCR CROSS

VCR ELBOW

VCR DOUBLE MALE UNION

VCR Double Male Unions can be used to form a union joint between two components that have VCR Glands and Female Nuts attached.

VCR DOUBLE FEMALE UNION



VCR Double Female Unions can be used to connect two components that have VCR Glands and Male Nuts attached.

APPLICATIONS

Industrial and research vacuum systems • Low and high pressure systems • Pump port connections • Valve port connections • Auxiliary ports • Sampling systems • Transfer line connection • Steam lines • Refrigeration lines • Corrosive fluid lines • Cylinder connections • Cryogenics • High temperature applications • Used in brazed or welded systems.

FEATURES

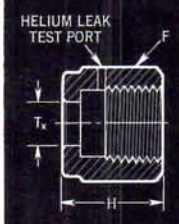
Practically no axial clearance needed for disassembly • Gasket position eliminates virtual leaks and allows fast pump down • Test port at seal provides for immediate positive leak testing • Mirror finished sealing surface for positive, repetitive seals • Lapped gasket surfaces for minimum torque make-up and helium leak-tight sealing • Variety of gasket materials • Contained seal for safety in pressurized systems • Quality thread form for repeated make-up • Precision mating parts for dependable seal • Plated threads for repeated make-up • Available in high strength forged tees, elbows and crosses • Various end connections available in sizes from 1/16" through 1". • Low inventories through separate component stock.

INSTALLATION INSTRUCTIONS

The Coupling should be tightened no less than 1/8 turn past finger-tight for stainless steel and nickel gaskets, and 1/4 turn past finger-tight for OFHC copper, aluminum and TFE gaskets.

TABLE OF DIMENSIONS

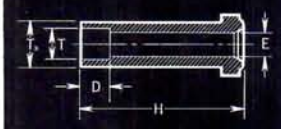
FEMALE NUT



Part Number	F Hex Flat	H	Tx	Uniform Thread Size
SS-2-VCR-1	7/16	17/32	13/64	5/16-24
SS-4-VCR-1	3/4	13/16	23/64	9/16-18
SS-8-VCR-1	1 1/16	7/8	39/64	7/8-14
SS-10-VCR-1	1 3/16	7/8	47/64	1-14
SS-12-VCR-1	1 1/2	1 1/8	57/64	1 1/4-18
SS-16-VCR-1	1 3/4	1 11/32	1 13/64	1 1/2-20

NOTE: For 1/16 VCR assembly use -2VCR Nut
For 3/8 VCR assembly use -8VCR Nut

GLAND



T Tube Socket	Part Number	D	E	H	Tx	Allowable Working Pressure PSIG
1/16	SS-1-VCR-3	3/32	.052	45/64	1/8	10,600
1/8	SS-2-VCR-3	3/32	3/32	45/64	13/64	6,600
1/4	SS-4-VCR-3	9/32	3/16	1 5/16	11/32	5,200
3/8	SS-6-VCR-3	5/16	9/32	1 1/2	19/32	7,700
1/2	SS-8-VCR-3	3/8	13/32	1 1/2	19/32	2,800
5/8	SS-10-VCR-3	13/32	1/2	1 9/16	23/32	2,300
3/4	SS-12-VCR-3	7/16	5/8	2	7/8	2,600
1	SS-16-VCR-3	5/8	7/8	2 7/32	1 3/16	2,600

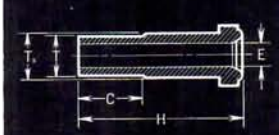
GASKET

Part Number*	E	H	Tx
Ni-2-VCR-2	1/8	1/32	1/4
Ni-4-VCR-2	7/32	1/32	15/32
Ni-8-VCR-2	7/16	1/32	25/32
Ni-10-VCR-2	37/64	1/32	29/32
Ni-12-VCR-2	43/64	1/32	1 1/8
Ni-16-VCR-2	57/64	1/32	1 13/32

*Part Numbers shown are for Nickel. For other materials substitute A for aluminum, Cu for OFHC copper and T for TFE as a prefix to the Part Number.

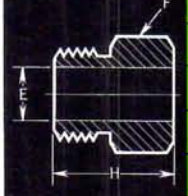
NOTE: For 1/16 VCR assembly use -2VCR Gasket
For 3/8 VCR assembly use -8VCR Gasket

MALE WELD GLAND



T	Part Number	C	E	H	Tx	Allowable Working Pressure PSIG
1/8	SS-2-VCR-3-2MTW	9/32	.055	45/64	13/64	5,300
1/4	SS-4-VCR-3-4MTW	13/32	1/8	1 5/16	11/32	10,400
3/8	SS-6-VCR-3-6MTW	13/32	9/32	1 1/2	19/32	5,200
1/2	SS-8-VCR-3-8MTW	1/2	13/32	1 1/2	19/32	3,800
5/8	SS-10-VCR-3-10MTW	5/8	7/16	1 9/16	23/32	6,400
3/4	SS-12-VCR-3-12MTW	3/4	17/32	2	7/8	6,100
1	SS-16-VCR-3-16MTW	3/4	3/4	2 7/32	1 3/16	5,200

MALE NUT

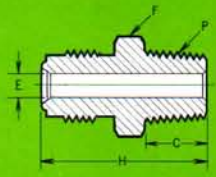


Part Number	E	F Hex Flat	H	Uniform Thread Size
SS-2-VCR-4	13/64	3/8	1/2	5/16-24
SS-4-VCR-4	23/64	5/8	23/32	9/16-18
SS-8-VCR-4	39/64	15/16	7/8	7/8-14
SS-10-VCR-4	47/64	1 1/16	7/8	1-14
SS-12-VCR-4	57/64	1 1/4	1 1/8	1 1/4-18
SS-16-VCR-4	1 13/64	1 1/2	1 1/4	1 1/2-20

NOTE: For 1/16 VCR assembly use -2VCR Nut
For 3/8 VCR assembly use -8VCR Nut

VCR BODIES

MALE CONNECTOR BODY

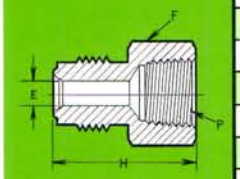


P Male Pipe Thr'd	Part Number	C	E	F Hex Flat	H	Uniform Thr'd Size	Allowable Working Pressure PSIG
1/16	SS-1-VCR-1-1	3/8	3/32	3/8	1 1/32	5/16-24	9,900
1/8	SS-2-VCR-1-2	3/8	3/32	7/16	1 1/32	5/16-24	9,100
1/4	SS-4-VCR-1-4	9/16	3/16	5/8	1 15/32	9/16-18	13,000
3/8	SS-6-VCR-1-6	9/16	3/8	15/16	1 5/8	7/8-14	6,800
1/2	SS-8-VCR-1-8	3/4	13/32	15/16	1 13/16	7/8-14	9,000
1/2	SS-10-VCR-1-8	3/4	1/2	1 1/16	1 13/16	1-14	5,600
3/4	SS-12-VCR-1-12	3/4	5/8	1 1/4	2 1/8	1 1/4-18	6,600
1	SS-16-VCR-1-16	15/16	7/8	1 1/2	2 9/16	1 1/2-20	4,600

All dimensions in inches.—Dimensions for reference only—subject to change.

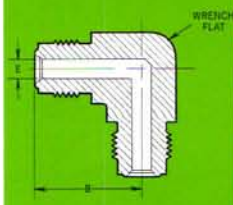
VCR BODIES

FEMALE CONNECTOR BODY



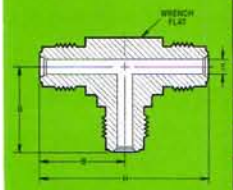
P Female Pipe Thread	Part Number	E	F Hex Flat	H	Uniform Thr'd Size	Allowable Working Pressure PSIG
1/16	SS-1-VCR-7-1	3/32	7/16	15/32	5/16-24	5,900
1/8	SS-2-VCR-7-2	3/32	9/16	13/16	5/16-24	5,800
1/4	SS-4-VCR-7-4	3/16	3/4	17/16	9/16-18	5,900
3/8	SS-6-VCR-7-6	9/32	15/16	1 5/8	1/8-14	6,900
1/2	SS-8-VCR-7-8	13/32	1 1/16	1 29/32	7/8-14	4,200
1/2	SS-10-VCR-7-8	1/2	1 1/16	1 29/32	1-14	4,200
3/4	SS-12-VCR-7-12	5/8	1 1/4	2 3/16	1 1/4-18	3,200
1	SS-16-VCR-7-16	7/8	1 5/8	2 5/16	1 1/2-20	3,800

ELBOW BODY



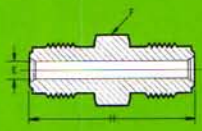
Part Number	B	E	Wrench Flat	Uniform Thr'd Size	Allowable Working Pressure PSIG
SS-1-VCR-9	3/4	3/32	7/16	5/16-24	15,600
SS-2-VCR-9	3/4	3/32	7/16	5/16-24	15,600
SS-4-VCR-9	1 1/32	3/16	11/16	9/16-18	14,300
SS-6-VCR-9	1 3/8	9/32	1	7/8-14	16,000
SS-8-VCR-9	1 3/8	13/32	1	7/8-14	10,900
SS-10-VCR-9	1 3/8	1/2	1	1-14	10,000
SS-12-VCR-9	1 25/32	5/8	1 1/4	1 1/4-18	7,500
SS-16-VCR-9	1 31/32	7/8	1 11/16	1 1/2-20	4,600

TEE BODY



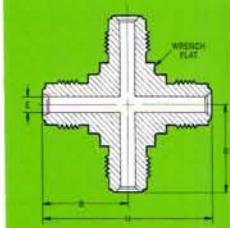
Part Number	B	E	H	Wrench Flat	Uniform Thr'd Size	Allowable Working Pressure PSIG
SS-1-VCR-T	3/4	3/32	1 1/2	7/16	5/16-24	15,600
SS-2-VCR-T	3/4	3/32	1 1/2	7/16	5/16-24	15,600
SS-4-VCR-T	1 1/32	3/16	2 1/16	11/16	9/16-18	14,300
SS-6-VCR-T	1 3/8	9/32	2 3/4	1	7/8-14	16,000
SS-8-VCR-T	1 3/8	13/32	2 3/4	1	7/8-14	10,900
SS-10-VCR-T	1 3/8	1/2	2 3/4	1	1-14	10,000
SS-12-VCR-T	1 25/32	5/8	3 9/16	1 1/4	1 1/4-18	7,500
SS-16-VCR-T	1 31/32	7/8	3 15/16	1 11/16	1 1/2-20	4,600

DOUBLE MALE UNION BODY



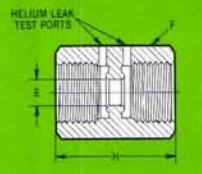
Part Number	E	F Hex Flat	H	Uniform Thr'd Size	Allowable Working Pressure PSIG
SS-1-VCR-6-DM	3/32	3/8	1 3/32	5/16-24	15,600
SS-2-VCR-6-DM	3/32	3/8	1 3/32	5/16-24	15,600
SS-4-VCR-6-DM	3/16	5/8	1 17/32	9/16-18	14,300
SS-6-VCR-6-DM	9/32	15/16	1 13/16	7/8-14	16,000
SS-8-VCR-6-DM	13/32	15/16	1 13/16	7/8-14	10,900
SS-10-VCR-6-DM	1/2	1 1/16	1 13/16	1-14	10,000
SS-12-VCR-6-DM	5/8	1 1/4	2 3/8	1 1/4-18	7,500
SS-16-VCR-6-DM	7/8	1 1/2	2 3/4	1 1/2-20	4,600

CROSS BODY



Part Number	B	E	H	Wrench Flat	Uniform Thr'd Size	Allowable Working Pressure PSIG
SS-1-VCR-CS	3/4	3/32	1 1/2	7/16	5/16-24	15,600
SS-2-VCR-CS	3/4	3/32	1 1/2	7/16	5/16-24	15,600
SS-4-VCR-CS	1 1/32	3/16	2 1/16	11/16	9/16-18	14,300
SS-6-VCR-CS	1 3/8	9/32	2 3/4	1	7/8-14	16,000
SS-8-VCR-CS	1 3/8	13/32	2 3/4	1	7/8-14	10,900
SS-10-VCR-CS	1 3/8	1/2	2 3/4	1	1-14	10,000
SS-12-VCR-CS	1 25/32	5/8	3 9/16	1 1/4	1 1/4-18	7,500
SS-16-VCR-CS	1 31/32	7/8	3 15/16	1 11/16	1 1/2-20	4,600

DOUBLE FEMALE UNION BODY

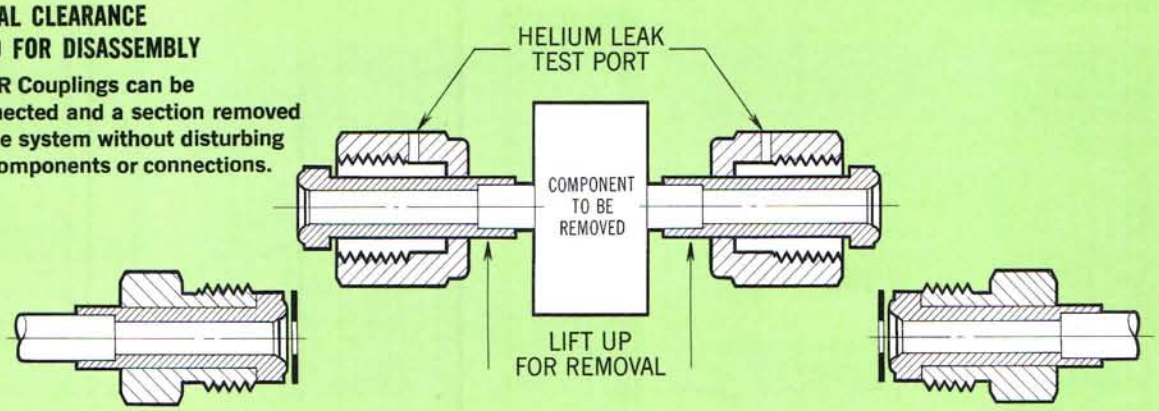


Part Number	E	F Hex Flat	H	Uniform Thr'd Size	Allowable Working Pressure PSIG
SS-1-VCR-6-DF	1/8	7/16	7/8	5/16-24	15,600
SS-2-VCR-6-DF	1/8	7/16	7/8	5/16-24	15,600
SS-4-VCR-6-DF	1/4	3/4	1 3/16	9/16-18	14,300
SS-6-VCR-6-DF	35/64	1 1/16	1 5/16	7/8-14	16,000
SS-8-VCR-6-DF	35/64	1 1/16	1 5/16	7/8-14	10,900
SS-10-VCR-6-DF	43/64	1 5/16	1 5/16	1-14	10,000
SS-12-VCR-6-DF	53/64	1 1/2	1 3/4	1 1/4-18	7,500
SS-16-VCR-6-DF	1 1/32	1 3/4	2 3/32	1 1/2-20	4,600

All dimensions in inches. Dimensions for reference only—subject to change.

NO AXIAL CLEARANCE NEEDED FOR DISASSEMBLY

The VCR Couplings can be disconnected and a section removed from the system without disturbing other components or connections.



TECHNICAL DATA

MATERIALS

BODIES, FEMALE NUTS, GLANDS, MALE NUTS—316 stainless steel.
GASKETS—Nickel is standard. Type 316 stainless steel, OFHC copper, TFE and aluminum are available on request.

TEMPERATURE RATINGS

Maximum temperature ratings for VCR 316 stainless steel couplings are based on the gasket material used as follows:

Aluminum	343°C (650°F)
Nickel	593°C (1100°F)
OFHC Copper	370°C (700°F)
Stainless Steel	537°C (1000°F)
TFE	232°C (450°F)

PRESSURE RATINGS:

Pressure ratings listed for each component are calculated in accordance with power piping code per A.S.A. B31.3 paragraph 304.1.2. All pressure ratings listed are for 316 stainless steel components with nickel gaskets at room temperature and include a safety factor of four (4:1).

TESTING

CAJON VCR Couplings have been consistently helium leak tested to a rate of 0.0004 M.C.F.H. or 4.14×10^{-9} atm. cc/sec. without detectable leakage.

Special VCR Accessories

Special CAJON VCR Components can be furnished in a variety of shapes, sizes and materials to meet the most critical requirements.

Your local CAJON Sales and Service Representative will welcome the opportunity to work with you in the selection of the particular fitting to serve your needs.

Special Accessories for VCR Couplings can be ordered as follows:

SS-4-VCR-1-BL

BLIND FEMALE NUT—The ends of blind female nuts are undrilled and are used to cap the end of a gland. To order, add (Blind) after body part number.

SS-4-VCR-3-BL

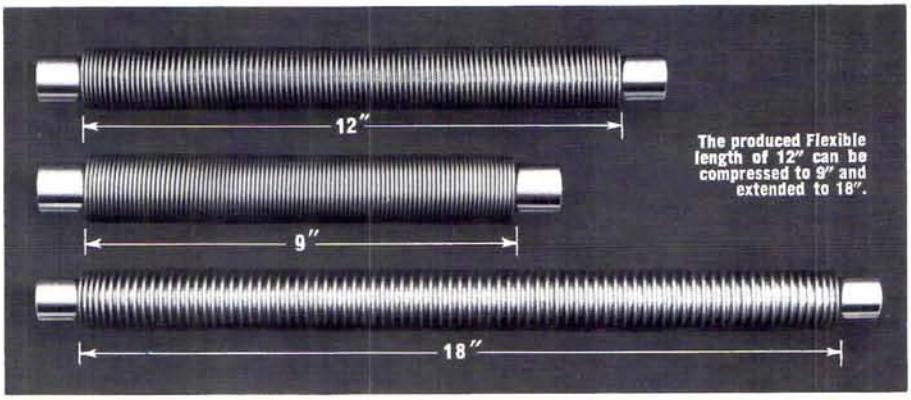
BLIND GLANDS—Blind Glands are undrilled and are used to plug a body to prevent dirt entry or to close off the open port so that the system can be evacuated. To order, add (Blind) after gland part number.

SS-4-VCR-1-PL

PLATE MOUNTED FEMALE NUT — To order add (Plate) after Female Nut part number.

Part numbers shown here are typical examples.

321 STAINLESS STEEL TUBING WITH RUBBER HOSE FLEXIBILITY



PURPOSE

CAJON Flexible Tubing is the ideal replacement for rubber, plastic and glass tubing in high vacuum applications.

APPLICATIONS

Vibration absorbers • Relief for thermal expansion • Low pressure, high purity systems • Industrial & research vacuum applications • Replace expensive vacuum fittings • Adjustable-length static metal seal • Excellent as a heat transfer device • Permits connection of misaligned components.

FEATURES

The extremely flexible nature of CAJON Flexible Tubing provides compensation for misalignment, expansion and contraction in fabricated systems. CAJON Flexible Tubing is compressible by at least 20% and extendable by 50% of its nominal produced flexible length (see table of dimensions).

TECHNICAL DATA

MATERIAL

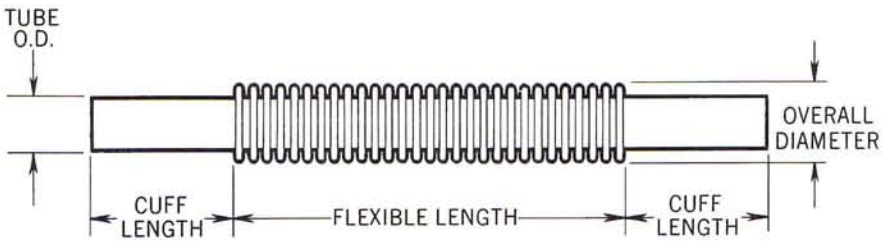
321 stainless steel.

TEMPERATURE RATING

Operating temperature ratings are dependent on application and installation methods, cycle life required, O.D. and nominal length of tubing, angular displacement and other variables. Contact factory for additional information.

PRESSURE RATING

Ultra-High Vacuum to 25 psig.

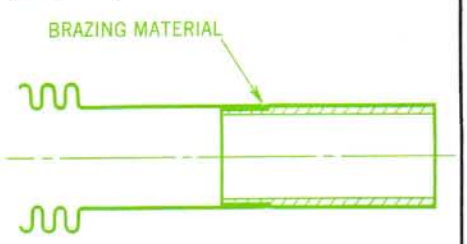


Tube O.D. (Inches)	Nominal Produced Flexible Length (Inches)	Part Number	Compressed Flexible Length (Inches)	Extended Flexible Length (Inches)	Cuff Length (Inches)	Overall Diameter (Inches)	Angular* Displacement
¼	2	321-4-X-2	1½	3	¾	⅜	180°
¼	4	321-4-X-4	3¼	6	¾	⅜	360°
¼	6	321-4-X-6	4¾	9	¾	⅜	360°
¼	12	321-4-X-12	9	18	¾	⅜	360°
¼	24	321-4-X-24	18	36	¾	⅜	360°
⅜	1	329-6-X-1	¾	1½	¾	9/16	90°
⅜	3	321-6-X-3	2½	4½	¾	9/16	225°
⅜	6	321-6-X-6	4¾	9	¾	9/16	360°
⅜	12	321-6-X-12	9	18	¾	9/16	360°
⅜	24	321-6-X-24	18	36	¾	9/16	360°
½	1	321-8-X-1	¾	1½	1	¾	45°
½	3	321-8-X-3	2½	4½	1	¾	180°
½	6	321-8-X-6	4¾	9	1	¾	360°
½	12	321-8-X-12	9	18	1	¾	360°
½	24	321-8-X-24	18	36	1	¾	360°
½	36	321-8-X-36	24	54	1	¾	360°
¾	1	321-12-X-1	¾	1½	1	1 1/16	30°

Tube O.D. (Inches)	Nominal Produced Flexible Length (Inches)	Part Number	Compressed Flexible Length (Inches)	Extended Flexible Length (Inches)	Cuff Length (Inches)	Overall Diameter (Inches)	Angular* Displacement
¾	3	321-12-X-3	2½	4½	1	1 1/16	90°
¾	6	321-12-X-6	4¾	9	1	1 1/16	180°
¾	12	321-12-X-12	9	18	1	1 1/16	360°
¾	24	321-12-X-24	18	36	1	1 1/16	360°
¾	36	321-12-X-36	24	54	1	1 1/16	360°
1	1	321-16-X-1	¾	1½	1	1⅜	20°
1	3	321-16-X-3	2½	4½	1	1⅜	90°
1	6	321-16-X-6	4¾	9	1	1⅜	180°
1	12	321-16-X-12	9	18	1	1⅜	360°
1	24	321-16-X-24	18	36	1	1⅜	360°
1	36	321-16-X-36	24	54	1	1⅜	360°
1½	1	321-24-X-1	¾	1½	1	2	15°
1½	3	321-24-X-3	2½	4½	1	2	60°
1½	6	321-24-X-6	4¾	9	1	2	120°
1½	12	321-24-X-12	9	18	1	2	240°
1½	24	321-24-X-24	18	36	1	2	360°
1½	36	321-24-X-36	24	54	1	2	360°

*Angular displacements shown are based on the nominal produced flexible length.
Displacements over 360° are sometimes possible depending on the actual installation. Contact factory for additional information.
All dimensions in inches. Dimensions for reference only—subject to change.

BRAZE ADAPTER and Swagelok® ADAPTER



PURPOSE

Provides a length of standard wall tubing at the end of the flexible tubing.

APPLICATIONS

Can be brazed or soldered into:

- CAJON Vacuum Flanges
- CAJON VCR Couplings
- CAJON VCO Couplings
- CAJON Socket Weld Fittings

Can be used with SWAGELOK Fittings

MATERIAL

304 stainless steel

BRAZING TECHNIQUE

Brazing should be done in a dry Hydrogen atmosphere or vacuum. A wide variety of copper, nickel, silver, palladium or gold based alloys may be used. See Guthrie's "VACUUM TECHNOLOGY" (published by John Wiley) for a list of brazing materials.

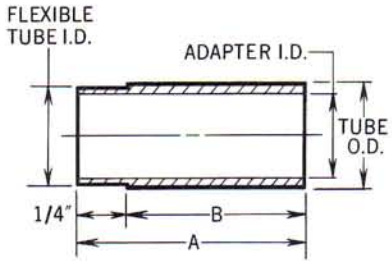
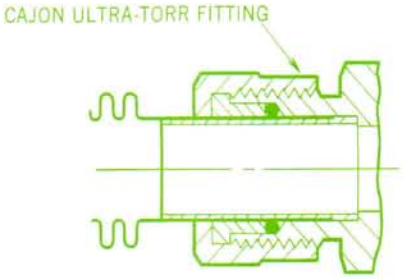


TABLE OF DIMENSIONS

Tube O.D. (In.)	Part Number	Adapter I.D. (In.)	A (In.)	B (In.)
¼	304-4-XBA	.194	15/16	11/16
⅜	304-6-XBA	.305	1	¾
½	304-8-XBA	.430	1 3/16	15/16
¾	304-12-XBA	.652	1 9/32	1 1/32
1	304-16-XBA	.870	1 9/16	1 5/16
1½	304-24-XBA	1.334	2 5/16	2 1/16

O-RING ADAPTER



PURPOSE

Supports Flexible Tube Cuff.

APPLICATION

Support for Flexible Tubing used with CAJON Ultra-Torr Fittings.

FEATURES

No welding or brazing required. Helium leak-tight seal. Easily re-usable.

MATERIAL

304 stainless steel

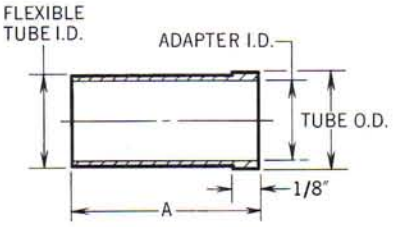
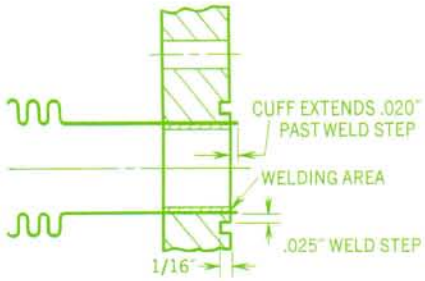


TABLE OF DIMENSIONS

Tube O.D. (In.)	Part Number	Adapter I.D. (In.)	A (In.)
¼	304-4-XOA	.194	¾
⅜	304-6-XOA	.319	¾
½	304-8-XOA	.444	1
¾	304-12-XOA	.694	1
1	304-16-XOA	.944	1
1½	304-24-XOA	1.402	1

WELD RINGS



PURPOSE

Protect the Tube Cuff from warping during welding.

APPLICATION

Flexible Tube Cuffs can be welded directly to flanges or through ports using CAJON Weld Rings.

MATERIAL

304 stainless steel

WELDING TECHNIQUE

Tungsten-inert gas (T.I.G.) welding should always be used on CAJON Flexible Tubing with Weld Rings. (This is also called heli-arc or argon-arc welding depending on the gas used to purge the weld.)

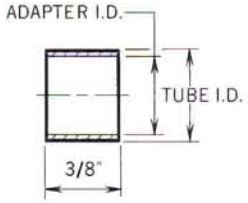
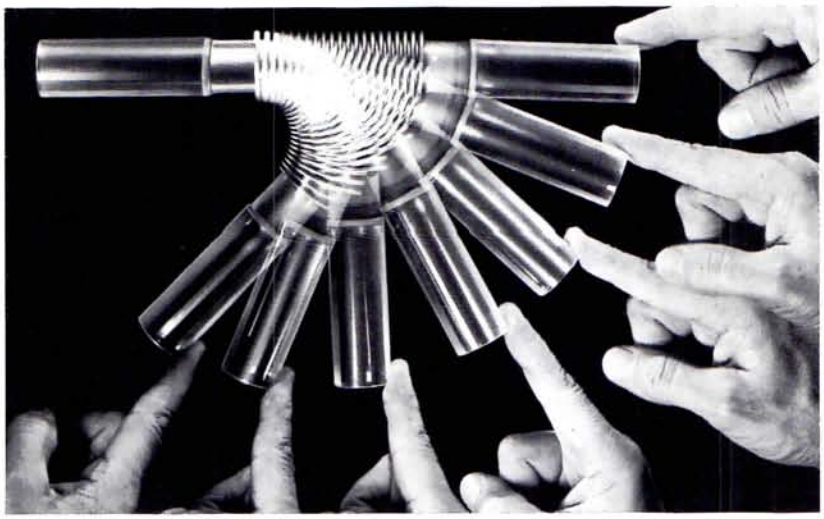


TABLE OF DIMENSIONS

Flexible Tube O.D. (In.)	Part Number	Adapter I.D. (In.)
¼	304-4-XWR	.194
⅜	304-6-XWR	.319
½	304-8-XWR	.444
¾	304-12-XWR	.694
1	304-16-XWR	.944
1½	304-24-XWR	1.402

All dimensions in inches. Dimensions for reference only—subject to change.

flexible glass-end tubing



PURPOSE

CAJON Flexible Glass-end Tubing is designed to isolate vibration from glass systems.

APPLICATIONS

Vibration absorbers • Relief for thermal expansion • Low pressure, high purity systems • Industrial and research vacuum systems • Replace expensive vacuum fittings • Permits connection of misaligned components

FEATURES

CAJON Flexible Glass-end Tubing compensates for expansion, misalignment and vibration in glass systems. The one step glass-to-stainless transition utilizes only the parent materials. No overlapping seams to entrap gases. The nominal produced flexible length is compressible by at least 20% and extendable by 50% (see table of dimensions).

CAJON Flexible Tubing is available with glass on both ends or on one end for glass-to-metal transitions. The glass end is flame cut for smooth edges. Glass ends are stress relieved.

TECHNICAL DATA

MATERIAL:

321 stainless steel fused to type 7740 Pyrex glass tube.

TEMPERATURE RATING:

Operating temperature ratings are dependent on application and installation methods, cycle life required, O.D. and nominal length of tubing, angular displacement and other variables. Contact factory for additional information.

PRESSURE RATING:

Ultra-high vacuum to 25 psig.

TABLE OF DIMENSIONS

	Cuff O.D. (Inches)	Glass O.D.	Nominal Produced Flexible Length (Inches)	Part Number	Compressed Flexible Length (Inches)	Extended Flexible Length (Inches)	Glass Length (Inches)	Cuff Length (Inches)
Glass Both Ends	¼	6mm	2	G321-4-GXG-2	1½	3	3	¾
	⅜	9mm	3	G321-6-GXG-3	2½	4½	3	¾
	½	12mm	3	G321-8-GXG-3	2½	4½	3	1
	¾	19mm	3	G321-12-GXG-3	2½	4½	3	1
	1	25mm	3	G321-16-GXG-3	2½	4½	3	1
Glass One End	¼	6mm	2	G321-4-GX-2	1½	3	3	¾
	⅜	9mm	3	G321-6-GX-3	2½	4½	3	¾
	½	12mm	3	G321-8-GX-3	2½	4½	3	1
	¾	19mm	3	G321-12-GX-3	2½	4½	3	1
	1	25mm	3	G321-16-GX-3	2½	4½	3	1

All dimensions in inches. Dimensions for reference only—subject to change.

PURPOSE

CAJON Glass/Metal Transition Tubes are designed for converting from a glass to a metal system through a transition which utilizes only the parent materials.

APPLICATIONS

Transition from a glass system to a metal system • Industrial and research vacuum systems • Corrosive fluid lines • Connect ionization gauges to stainless steel vacuum systems • Either end adaptable to CAJON Ultra-Torr Fittings • Stainless steel end adaptable to SWAGELOK Fittings • Connecting valves to glass systems • Sight gauges • Manometers • Low pressure, high purity systems • High temperature applications.

FEATURES

One step glass-to-stainless transition eliminates troublesome graded seals • Smooth internal surface for high conductance • No overlapping seams to entrap gases • Nonporous transition area to prevent absorption and outgassing • Transition structure stronger than parent glass • Transition area offers thermal compatibility with parent materials • Glass end is flame cut for smooth edges • Glass ends are stress relieved.

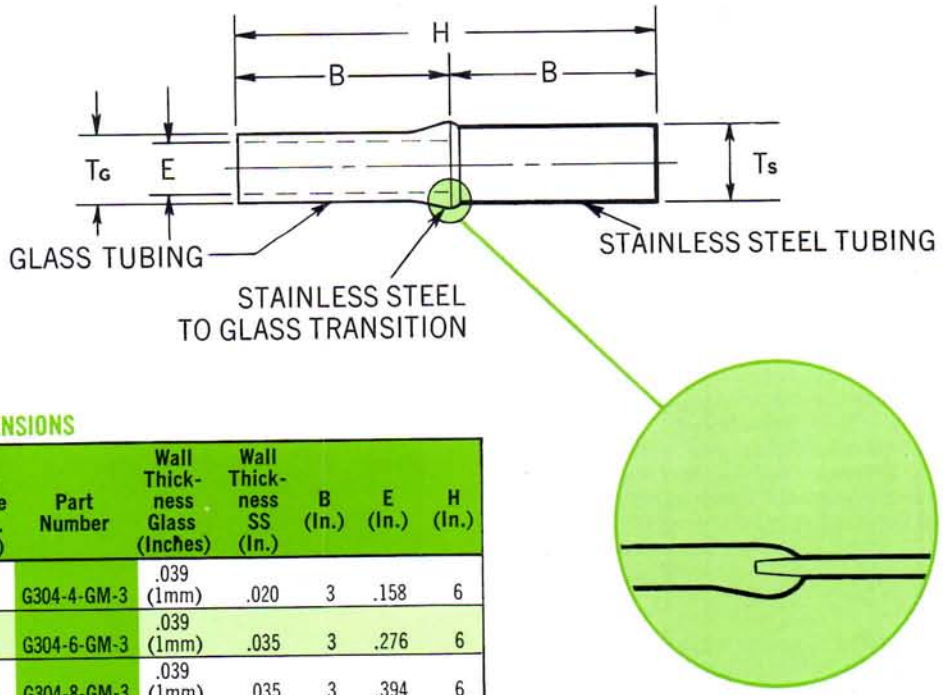


TABLE OF DIMENSIONS

Tg Tube O.D. (Inches)	Ts Tube O.D. (In.)	Part Number	Wall Thickness Glass (Inches)	Wall Thickness SS (In.)	B (In.)	E (In.)	H (In.)
.236 (6mm)	¼	G304-4-GM-3	.039 (1mm)	.020	3	.158	6
.354 (9mm)	⅜	G304-6-GM-3	.039 (1mm)	.035	3	.276	6
.472 (12mm)	½	G304-8-GM-3	.039 (1mm)	.035	3	.394	6

TECHNICAL DATA

MATERIAL

GLASS TUBE — 7740 Pyrex
METAL TUBE — 304 stainless steel

TEMPERATURE RATING

Temperatures are limited to the strain point of the glass end which is 515°C (959°F).

PRESSURE LIMITS

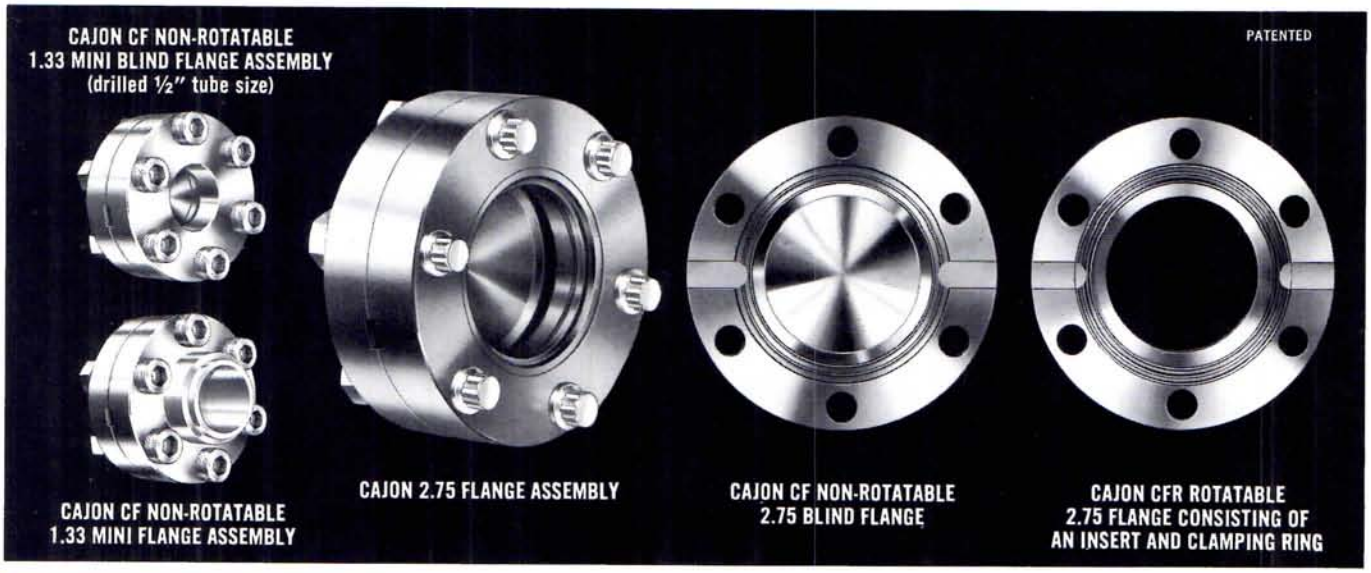
Ultra-high vacuum to 25 psig.

TESTING

All CAJON Glass/Metal Transition Tubes are 100% stress relieved, thermal shock tested and leak tested before leaving the factory.

All dimensions in inches. Dimensions for reference only—subject to change.

CAJON® Vacuum Flanges



PURPOSE

CAJON Vacuum Flanges provide single-seal reliability for Ultra-high vacuum systems using tubing up to 1-1/2 inches outside diameter. This unique all metal sealing principle provides consistent performance at high or low temperatures in vacuum or positive pressure applications. Practically no axial clearance is required for removing or re-installing system components.

CAJON CF Vacuum Flanges are designed for use as a non-rotatable unit to hold the tubing or components in a fixed relationship.

CAJON CFR Vacuum Flanges are rotatable units made up of an insert and clamping ring that allow for alignment of system components. Re-alignment or repositioning of components such as valves and pumps can also be accomplished.

APPLICATIONS

Industrial and research vacuum systems • Pump and valve port connections • Auxiliary ports • Vacuum test chamber ports • Mass spectrometers, gas analyzers, particle accelerators • Space and environmental test equipment • Epitaxial reactors, thin film evaporators, semi-conductor equipment • Refrigeration lines • Corrosive fluid lines • Cryogenics • High temperature applications • Used in brazed or welded systems.

FEATURES

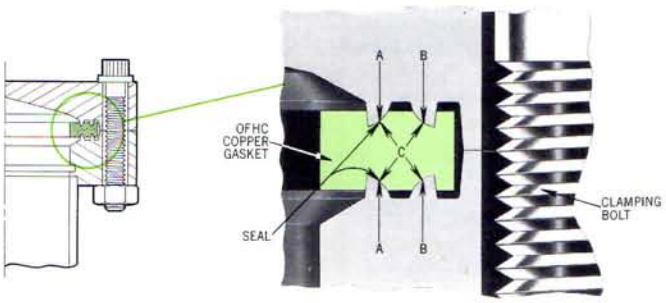
A unique double toroid design results in double gripping on the face of the gasket • The inner toroid provides a single positive vacuum seal • The outer toroid provides seal compression which improves vibration resistance and thermal cycling capabilities • Positive vent to atmosphere between inner and outer toroids avoids virtual leaks sometimes caused by double sealing • Lapped gasket and flange sealing surfaces lower the bolt torque required for a positive vacuum seal • Seal area protected from damage during handling and installation by a projecting ridge • The gasket O.D. is guided during assembly by the projecting ridge • Flange to flange make-up for a visual check of proper assembly —no torque reading required • Combination helium test port and axial wedge slot • Stress-relief groove at tube weld area of the 2.75 flanges • Lubricated bolts to reduce torque and prevent galling during assembly • CAJON Flanges can be used with other types of flanges on existing equipment • Assembly, disassembly and welding instructions are shown on a card included with each flange.

SEALING PRINCIPLE

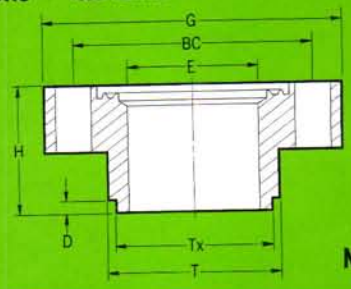
The CAJON Flange makes a positive vacuum seal through a unique geometry which retains high compressive pressures upon its sealing surface. A quad toroid arrangement grips the gasket face and places a portion of the gasket under biaxial compression (C). This design eliminates the need for vertical wall containment of the gasket O.D. All sealing pressures acting upon the gasket are controlled by the high tensile clamping bolts.

Expansion and contraction caused by thermal cycling are limited at the seal by placing the gasket in compression with a single member. The quad toroid arrangement contains the gasket to prevent loss of seal at high temperatures.

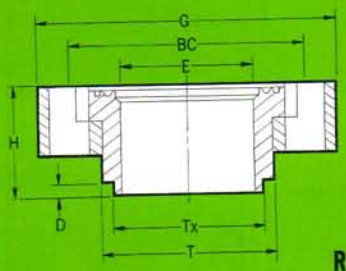
A positive vacuum seal is effected at the inner toroid (A). A groove between (A) and (B) provides a positive vent to atmosphere. The outer toroid (B) provides seal compression which improves vibration resistance, and thermal cycling capabilities.



DIMENSIONS • 1.33 FLANGE FOR 0.75 O.D. TUBE AND SMALLER



Non-Rotatable — CF

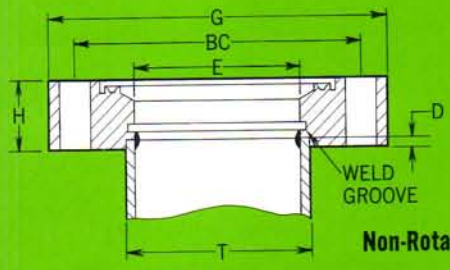


Rotatable — CFR

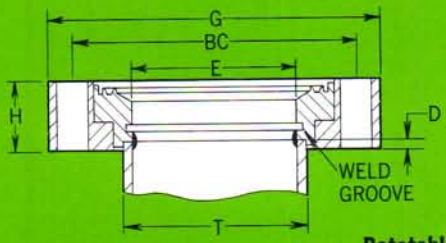
T Tube O.D.	Tx	Part Number	BC	D	E	G	H	Bolt Hole
¾	.661	304L-12-CF-133 304L-12-CFR-133	1 1/16	1/16	19/32	1.33	.560	11/64

For Blind Flanges add -BL as a suffix to the part number

DIMENSIONS • 2.75 FLANGE FOR 1.50 O.D. TUBE AND SMALLER



Non-Rotatable — CF



Rotatable — CFR

T Tube O.D.	Part Number	BC	D	E	G	H	Bolt Hole
1½	304L-24-CF-275 304L-24-CFR-275	2 5/16	1/16	1⅜	2.75	½	17/64

For Blind Flanges add BL as a suffix to the part number

ACCESSORIES FOR CAJON CF AND CFR VACUUM FLANGES

METAL GASKET

Flange O.D. (Inches)	Catalog Number	E	H	Tx	Packaging Quantity*
1.33	-12-CF-133G	.630	.080	.842	10
2.75	-24-CF-275G	1.451	.080	1.895	10

*Metal gaskets other than copper are packaged in quantities of one.

VITON GASKET

Flange O.D. (Inches)	Part Number	E	H	Tx	Packaging Quantity*
1.33	VITON-12-CF-133G	.625	.125	.837	10
2.75	VITON-24-CF-275G	1.582	.125	1.895	10

NOTE: To complete part numbers, material designator must be added. The prefix CU is used for copper, Ni for nickel and Viton for viton.

All dimensions in inches. Dimensions for reference only—subject to change.

NUTS & BOLTS

Flange O.D. (Inches)	Part Number	Bolt With Plated Nut	Packaging Quantity
1.33	SS-12-CF-133NB	8-32x¾"	25
2.75	A286-24-CF-275NB	¼-28x1¼"	25

We recommend CAJON Gaskets and Bolts be used with CAJON Vacuum Flanges for maximum reliability. Metal gaskets are lapped for positive vacuum sealing. Viton gaskets are properly dimensioned for easy sealing with CAJON Vacuum Flanges. The bolt lubrication helps prevent galling on assembly or disassembly, especially with high temperatures. Make-up torque is reduced considerably. For strength and temperature compatibility, nuts are made of high tensile, silver plated 316 stainless steel, and lubricated bolts are of Alloy A286 for the 2.75 flange and 316 stainless steel for the 1.33 flange.

TECHNICAL DATA

MATERIALS

FLANGE CLAMP RINGS, FLANGE INSERTS and NON-ROTATABLE FLANGES—304L stainless steel
BOLTS—A286 high strength alloy steel, 316 stainless steel.
NUTS—Silver plated 316 stainless steel.
GASKETS—OFHC Copper, Viton or Nickel.

TEMPERATURE RATINGS

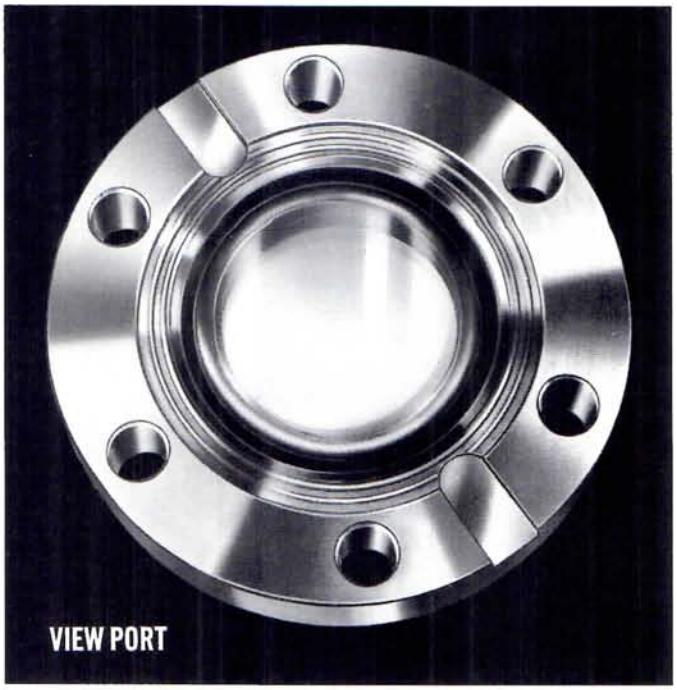
Maximum Temperature Ratings are based on the gasket material used, as follows: OFHC Copper Gasket—500°C(932°F)
Viton Gasket—232°C(450°F)
Nickel Gasket—537°C(1,000°F)

PRESSURE RATING

1.33—Ultra-high vacuum to 6800 psig.
2.75—Ultra-high vacuum to 2500 psig.

TESTING

CAJON CF and CFR Flanges have been consistently helium leak tested to a rate of .0004 M.C.F.H. or 4.14 x 10^{-9} atm. cc/sec. without detectable leakage.


VIEW PORT

PURPOSE

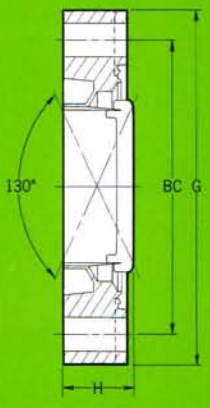
The CAJON View Port is designed to provide visual access to vacuum systems operating at high or low temperatures.

APPLICATIONS

Industrial and research vacuum systems • Mass spectrometers • Gas analyzers • Space and environmental test equipment.

FEATURES

The unique double toroid design provides the excellent sealing capabilities of the CAJON Flange. The one-step glass-to-stainless window seal eliminates problems inherent to graded seals. Window placement increases viewing angle.



Flange O.D. (Inches)	Part Number	View Diameter	BC	G	H
2.75	304L-24-CFVP-275	1¼	2 5/16	2.75	.550

TECHNICAL DATA

MATERIALS

FLANGE — 304L stainless steel.
WINDOW — 7056 Pyrex.
GASKETS — OFHC Copper, VITON, or Nickel.
NUTS & BOLTS — See Flange Technical Data.

TEMPERATURE RATINGS

Maximum temperature ratings are based on either the gasket or window material.

OFHC Copper Gasket	—	500°C (932°F)
VITON Gasket	—	232°C (450°F)
Nickel Gasket	—	537°C (1000°F)
7056 Pyrex Window	—	470°C (887°F)

PRESSURE RATING

Ultra-high vacuum to 15 psig (3:1 safety factor on positive pressure).

TESTING

CAJON View Ports have been consistently helium leak tested to a rate of .0004 M.C.F.H. or 4.14 x 10^{-9} atm. cc/sec. without detectable leakage.

MINI FLANGE ASSEMBLIES

CAJON can supply a variety of flange shape assemblies. These assemblies are fabricated using ¾" CAJON Vacuum Tube Butt Weld Fittings (VTBW) and 1.33 rotatable CAJON Mini Flanges. CAJON Mini Flange assemblies provide a high degree of conductance combined with superior sealing capabilities of the CAJON quad toroid sealing principle.

ELBOW

TEE

PURPOSE

CAJON Vacuum Butt Weld Fittings are designed to provide light weight, high conductance connections for vacuum and positive pressure systems.

APPLICATIONS

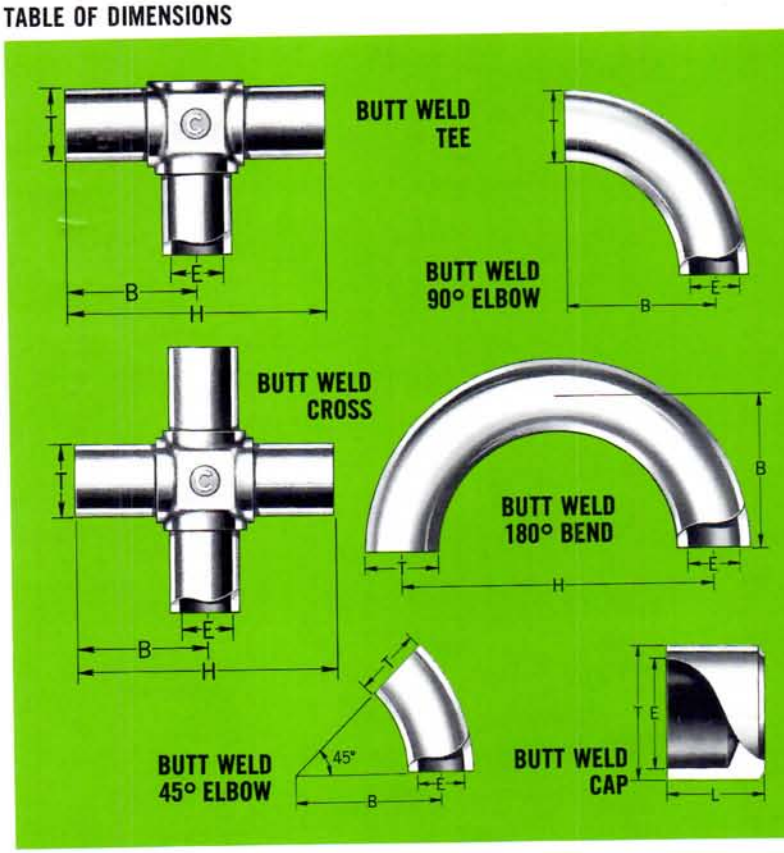
• Industrial and research vacuum systems • Vacuum coating and plating equipment • High purity gases • Cryogenics • High temperature applications • Vacuum instruments • Environmental testing • Positive pressure systems • Tubular heating and cooling lines using 180° tube bends • Refrigeration lines • Manifold branches • Tees and crosses are adaptable to CAJON Socket Weld Gland Ends and Socket Weld Fittings.

- All configurations are adaptable to:
  - CAJON Flanges (rotatable and non-rotatable)
  - CAJON Flexible Tubing—(use braze adapter)
  - CAJON Glass/Metal Transition Tubes
  - CAJON VCO and VCR Weld Glands
  - CAJON Butt Weld Fittings

FEATURES

- Lightweight, butt weld fittings to avoid virtual leaks
- Smooth, controlled internal finish for maximum conductance and minimum condensation or adsorption of gases
- 316 stainless steel to prevent absorption and outgassing
- Uniform wall for good weld consistency
- Rigid tolerance control for ease of fabrication alignment
- Uniform branch lengths in each size
- Available in crosses, tees, caps, 45° and 90° elbows and 180° bends in a variety of tube sizes
- Caps are designed for easy drilling to be used as reducer couplings
- Crosses and tees to ¾" are machined from forgings—no production welds
- All CAJON Vacuum Butt Weld Fittings are electro-polished

TABLE OF DIMENSIONS



	T Tube O.D.	Part Number	Wall Thickness (Inches)	B	E	H	L
TEE	¼	SS-4-VTBW-3	.035	¾	11/64	1½	—
	⅜	SS-6-VTBW-3	.035	13/16	19/64	1⅝	—
	½	SS-8-VTBW-3	.049	1 1/16	13/32	2⅛	—
	¾	SS-12-VTBW-3	.065	1¼	⅝	2½	—
CROSS	¼	SS-4-VTBW-4	.035	¾	11/64	1½	—
	⅜	SS-6-VTBW-4	.035	13/16	19/64	1⅝	—
	½	SS-8-VTBW-4	.049	1 1/16	13/32	2⅛	—
	¾	SS-12-VTBW-4	.065	1¼	⅝	2½	—
45° ELBOW	¼	SS-4-VTBW-5	.035	¾	3/16	—	—
	⅜	SS-6-VTBW-5	.035	13/16	5/16	—	—
	½	SS-8-VTBW-5	.049	1 1/16	13/32	—	—
	¾	SS-12-VTBW-5	.065	1¼	⅝	—	—
90° ELBOW	¼	SS-4-VTBW-9	.035	¾	3/16	—	—
	⅜	SS-6-VTBW-9	.035	13/16	5/16	—	—
	½	SS-8-VTBW-9	.049	1 1/16	13/32	—	—
	¾	SS-12-VTBW-9	.065	1¼	⅝	—	—
180° BEND	¼	SS-4-VTBW-18	.035	¾	3/16	1½	—
	⅜	SS-6-VTBW-18	.035	13/16	5/16	1⅝	—
	½	SS-8-VTBW-18	.049	1 1/16	13/32	2⅛	—
	¾	SS-12-VTBW-18	.065	1¼	⅝	2½	—
CAP	¼	SS-4-VTBW-CP	.035	—	11/64	—	3/16
	⅜	SS-6-VTBW-CP	.035	—	19/64	—	7/32
	½	SS-8-VTBW-CP	.049	—	25/64	—	¼
	¾	SS-12-VTBW-CP	.065	—	⅝	—	11/32

TECHNICAL DATA

MATERIALS

CROSSES, TEES — 316 stainless steel forgings.

45° and 90° ELBOWS, and 180° BENDS — 316 stainless steel seamless tubing.

CAPS — 316 stainless steel bar stock.

All material listed has a .05% carbon content maximum.

PRESSURE RATINGS:

Pressures listed are calculated in accordance with power piping code per A.S.A. B31.3 paragraph 304.1.2.

Fitting Size (T)	Allowable Working Pressure PSIG
1/4	5,600
3/8	3,600
1/2	3,800
3/4	3,000

Allowable working pressures listed include a safety factor of four (4:1).

O-RING DIMENSIONAL TABLE

Uniform Size Number	Nominal Dimensions I.D. (Inches)	Cross Section (Inches)	O.D. (Inches)
006	.114	.070	.254
007	.145	.070	.285
008	.176	.070	.316
009	.208	.070	.348
010	.239	.070	.379
011	.301	.070	.441
012	.364	.070	.504
013	.426	.070	.566
014	.489	.070	.629
111	.424	.103	.630
112	.487	.103	.693
113	.549	.103	.755
114	.612	.103	.818
115	.674	.103	.880
116	.737	.103	.943
117	.799	.103	1.005
118	.862	.103	1.068
119	.924	.103	1.130
120	.987	.103	1.193
121	1.049	.103	1.255
122	1.112	.103	1.318
123	1.174	.103	1.380
125	1.299	.103	1.505
126	1.362	.103	1.568
128	1.487	.103	1.693
130	1.612	.103	1.818
132	1.737	.103	1.943
133	1.799	.103	2.005
134	1.862	.103	2.068
136	1.987	.103	2.193
212	.859	.139	1.137
215	1.046	.139	1.324
219	1.296	.139	1.574
223	1.609	.139	1.887
902	.239	.064	.367
902½	.070	.040	.150
916	1.171	.116	1.403

NOTE: CAJON supplies 70 durometer Viton O-Rings as standard.

The numbering system for all CAJON Products is designed so that all part numbers are prefixed by a MATERIAL DESIGNATOR code followed by a dash. Examples: B - (brass), SS - (316 stainless steel), etc.

See complete list of fitting materials and designator codes on reverse side of FITTINGS tab in Master Catalog Binder.

TEMPERATURE CONVERSION TABLE

°C	°F	°C	°F	°C	°F	°C	°F
−200	−328	25	77	240	464	540	1004
−180	−292	30	86	250	482	550	1022
−160	−256	35	95	260	500	560	1040
−140	−220	40	104	270	518	570	1058
−120	−184	45	113	280	536	580	1076
−100	−148	50	122	290	554	590	1094
− 95	−139	55	131	300	572	600	1112
− 90	−130	60	140	310	590	610	1130
− 85	−121	65	149	320	608	620	1148
− 80	−112	70	158	330	626	630	1166
− 75	−103	75	167	340	644	640	1184
− 70	− 94	80	176	350	662	650	1202
− 65	− 85	85	185	360	680	660	1220
− 60	− 76	90	194	370	698	670	1238
− 55	− 67	95	203	380	716	680	1256
− 50	− 58	100	212	390	734	690	1274
− 45	− 49	110	230	400	752	700	1292
− 40	− 40	120	248	410	770	710	1310
− 35	− 31	130	266	420	788	720	1328
− 30	− 22	140	284	430	806	730	1346
− 25	− 13	150	302	440	824	740	1364
− 20	− 4	160	320	450	842	750	1382
− 15	5	170	338	460	860	760	1400
− 10	14	180	356	470	878	770	1418
− 5	23	190	374	480	896	780	1436
0	32	200	392	490	914	790	1454
5	41	210	410	500	932	800	1472
10	50	212	414	510	950	810	1490
15	59	220	428	520	968	820	1508
20	68	230	446	530	986	830	1526

TEMPERATURE CONVERSION FORMULAS

$°C = 5/9\ (°F - 32)$ $\qquad$ $°F = 9/5\ °C + 32$

PRESSURE CONVERSION TABLE

From \ To	Atm.	in. Hg	in. H_2O	Microns	mm. Hg	PSIA	Torr
Atm.	1	29.92	406.8	760,000	760	14.7	760
in. Hg	.03342	1	13.60	25,400	25.40	.4912	25.40
in. H_2O	.00246	.07355	1	1,868.3	1.868	.03613	1.868
Microns	.00000132	.00003937	.000535	1	.001	.00001934	.001
mm. Hg	.00132	.03937	.5353	1,000	1	.01934	1
PSIA	.06805	2.036	27.67	51,715	51.71	1	51.71
Torr	.00132	.03937	.5353	1,000	1	.01934	1

EXAMPLES

(1) Change FROM 25 microns vacuum TO torr units: $25\ \text{microns} \times .001\ \frac{\text{torr}}{\text{micron}} = .025$ torr.

(2) Change FROM .025 torr TO in. Hg: $.025\ \text{torr} \times .03937\ \frac{\text{in. Hg}}{\text{torr}} = .0009842$ in. Hg.

(3) Change FROM .0009842 in. Hg TO mm. Hg: $.0009842\ \text{in. Hg} \times 25.40\ \frac{\text{mm. Hg}}{\text{in. Hg}} = .025$ mm. Hg.

GRAPHIC SYMBOLS IN VACUUM TECHNOLOGY

The purpose of this standard is to establish a uniform system of graphic symbols in vacuum technology. ¶The graphic symbols are a shorthand method used to show graphically the functioning and interconnections of vacuum components in a single-line schematic or flow diagram. ¶A single line diagram is one in which the graphic symbols are shown without regard to the actual physical location, size, or shape of the components. ¶A symbol shall be considered as the aggregate of all its parts. ¶The orientation of a symbol on a drawing, including a mirror image presentation, does not alter the meaning of the symbol. ¶A symbol may be drawn to any scale that suits a particular drawing. ¶Arrows should be omitted unless necessary for clarification. ¶Parts from two or more symbols may be combined.

PUMPS

MECHANICAL general symbol

DIFFUSION general symbol

SORPTION general symbol

FEED-THROUGHS

general symbol

VACUUM GAUGES

general symbol

BAFFLES

general symbol

LINES AND CONNECTIONS

connected

not connected

flexible line

demountable coupling

VALVES

general symbol

poppet or globe, in-line or angle

ball

butterfly or quarter swing

pneumatic

bellows-sealed

throttling or calibrated leak

air admittance

stopcock 2-way, 2-position

stopcock 3-way, 2-position

stopcock 3-way, 3-position

VACUUM CHAMBERS AND ACCESSORIES

general symbol (VACUUM CHAMBER)

bell jar

view port

blind flange port or door

Note: This list of symbols is reprinted from the AVS Tentative Standard 7.1-1966.

For Vacuum Sealants see Lubricants / Sealants subsection of Master Catalog Binder.

Credits: OFHC—Reg. TM American Metal Climax, Inc. PYREX—Reg. TM Corning Glass VITON—Reg. TM E. I. DuPont

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See the VALVE section of this binder for many different types of valves used in vacuum service.

CAJON® HOSE CONNECTORS FOR SOFT POLYVINYL CHLORIDE TUBING

PURPOSE:

CAJON has developed hose connectors specifically for optimum gripping and simple installation on all soft PVC tubing used in low pressure applications.

MALE HOSE CONNECTOR

SOFT PVC TUBING:

Soft PVC tubing, such as Tygon, is very flexible and has the appearance of crystal clear, glass-like tube. Various formulations are offered to obtain required chemical resistance and preferred color or opacity. Varying tube strengths and pressure ratings are available by controlling the tube wall thickness and durometer (hardness) range. Soft PVC tubing will perform at temperatures up to 180° F (82° C) and at pressures to approximately 150 psi. With its "see through" qualities and smooth interior, it offers fine flow characteristics and ideal conditions for flush type cleaning. CAJON now provides **one** line of hose connectors to handle **all** of the above tubing variables.

APPLICATIONS:

New CAJON Hose Connectors are designed for such low pressure applications as:

- Fluidics—Fluidic monitoring, fluidic instrumentation, fluidic control
- Gravity Feed Lines—Reservoir transfer, reservoir level indicators (clear tubing), drain lines
- Vacuum systems—Test labs, printing machines, industrial siphoning
- Medical—Blood machines, hospitals, dental equipment
- Food Processing—Soup manufacturing, frozen food manufacturing, cake mix manufacturing, canneries
- Beverage Processing—Soft drink processing, dairies, vending machines
- Machine Tool Manufacturing—Lubrication lines, coolant lines

CAJON Hose Connectors can be used in chemical research, test stands, analytical instruments, control panels with instrument air and in many other laboratory and research applications. Movable or portable equipment is an excellent application.

SPECIAL FEATURES:

- Easy installation—Less time to install
- Designed specifically for soft PVC tubing
- Usable with or without sleeve
- Shank design properly holds tubing I.D.
- Sleeve does not cut tubing O.D.
- Reusable
- Variety of materials, sizes and models

MALE HOSE CONNECTOR

INSTALLATION: Cajon Hose Connector

The connector shank design provides the right stress in the tube material to retain the connector up to 50% of the tube rated working pressure. To install, simply insert connector shank into tubing, without lubricant. Connector is reusable. To remove, cut off tubing slightly past shank. Then slice carefully without cutting all the way through. Spread cut section until it splits through and remove.

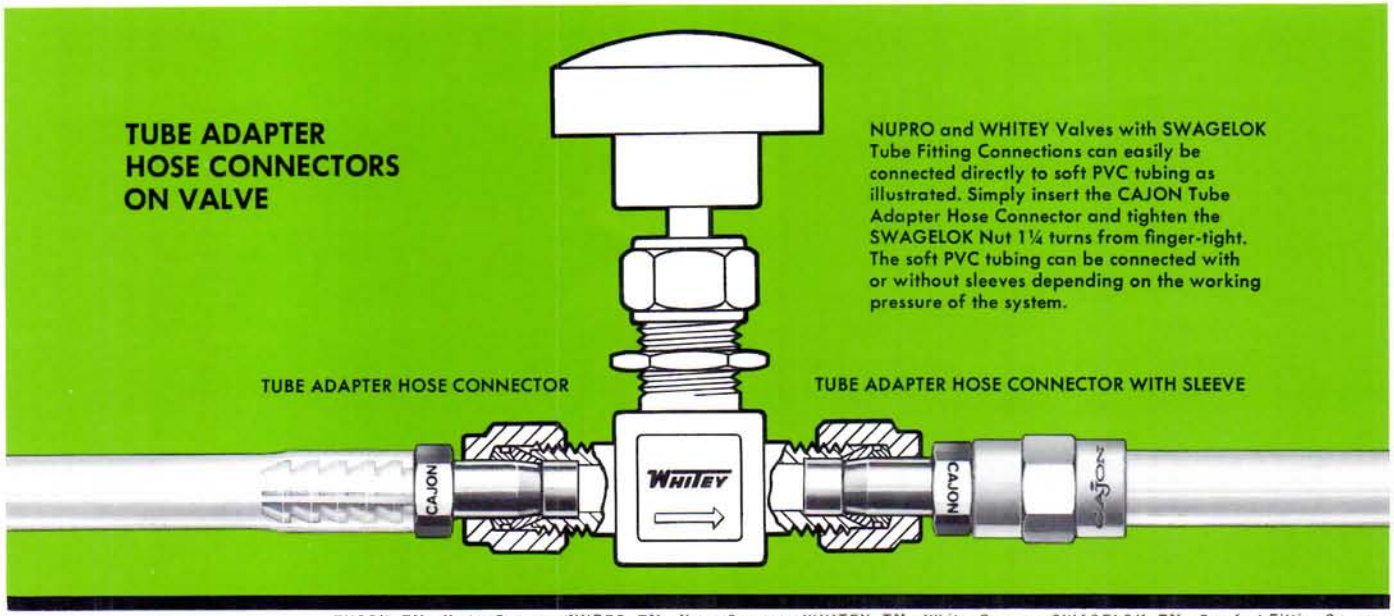
MALE HOSE CONNECTOR WITH SLEEVE

INSTALLATION: Cajon Hose Connector with Sleeve

The new CAJON sleeve extends hose connector ratings to 100% of maximum tube rated working pressure. Unlike common hose clamps and wires, it will not cut the outer tube surface, and takes much less time to install. The sleeve is placed over the tube before the connector is inserted. The sleeve can then be screwed over the connector shank by hand or using a wrench. The sleeve is reusable, and is removed by unscrewing and cutting tubing as previously described.

TUBE ADAPTER HOSE CONNECTORS ON VALVE

NUPRO and WHITEY Valves with SWAGELOK Tube Fitting Connections can easily be connected directly to soft PVC tubing as illustrated. Simply insert the CAJON Tube Adapter Hose Connector and tighten the SWAGELOK Nut 1¼ turns from finger-tight. The soft PVC tubing can be connected with or without sleeves depending on the working pressure of the system.



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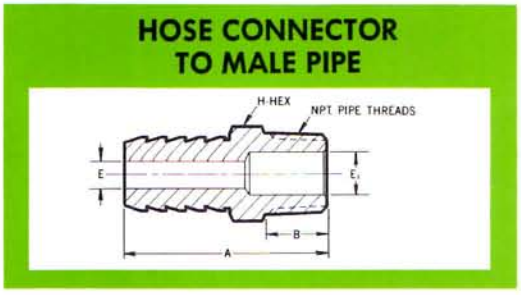
HOSE CONNECTOR TO MALE PIPE

Use with Hose I.D.	Male Pipe Size	Catalog Number	Dimensions				
			A	B	E	E_1	H
1/8	1/8	- 2-HC-1-2	1	3/8	5/64	3/16	7/16
1/8	1/4	- 2-HC-1-4	1 7/32	9/16	5/64	9/32	9/16
1/4	1/8	- 4-HC-1-2	1 13/32	3/8	3/16	3/16	7/16
1/4	1/4	- 4-HC-1-4	1 19/32	9/16	3/16	3/16	9/16
5/16	1/8	- 5-HC-1-2	1 15/32	3/8	3/16	3/16	7/16
5/16	1/4	- 5-HC-1-4	1 11/16	9/16	15/64	9/32	9/16
3/8	1/4	- 6-HC-1-4	1 11/16	9/16	9/32	9/32	9/16
3/8	3/8	- 6-HC-1-6	1 23/32	9/16	19/64	3/8	1 1/16
3/8	1/2	- 6-HC-1-8	1 15/16	3/4	19/64	1/2	7/8
7/16	3/8	- 7-HC-1-6	1 25/32	9/16	11/32	3/8	1 1/16
1/2	1/2	- 8-HC-1-8	2	3/4	3/8	1/2	7/8
3/4	3/4	- 12-HC-1-12	2 1/8	3/4	5/8	5/8	1 1/16

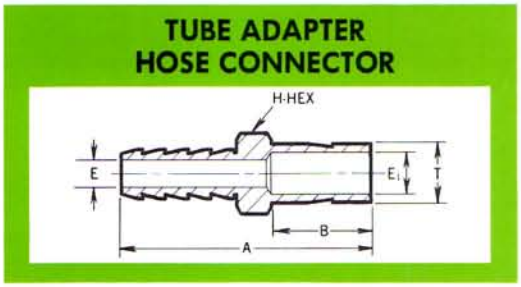
Add prefix B for Brass—Add prefix SS for 316 Stainless Steel



TUBE ADAPTER HOSE CONNECTOR

Use with Hose I.D.	Use with Tube Fitting Size	Catalog Number	Dimensions					
			A	B	E	E_1	H	T
1/4	1/4	- 4-HC-A-401	1 5/8	5/8	3/16	3/16	7/16	1/4
1/4	3/8	- 4-HC-A-601	1 11/16	11/16	3/16	9/32	7/16	3/8

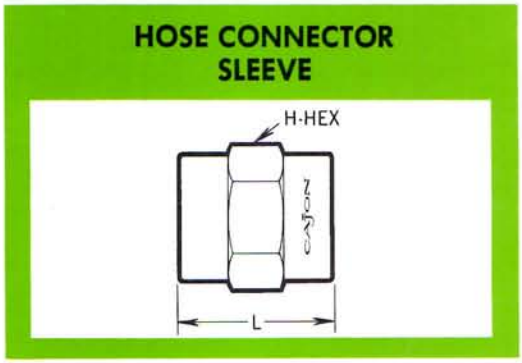
Add prefix B for Brass—Add prefix SS for 316 Stainless Steel



HOSE CONNECTOR SLEEVE

Use on Hose with Dimensions:		Sleeve Part Number	Dimensions	
Hose I.D.	Hose O.D.		H (Hex)	L
1/8	1/4	A-2-L4	3/8	13/32
1/4	3/8	A-4-L6	9/16	25/32
1/4	7/16	A-4-L7	5/8	25/32
1/4	1/2	A-4-L8	11/16	25/32
5/16	7/16	A-5-L7	5/8	7/8
3/8	1/2	A-6-L8	11/16	7/8
3/8	9/16	A-6-L9	3/4	7/8
7/16	5/8	A-7-L10	13/16	15/16
1/2	11/16	A-8-L11	7/8	15/16
3/4	1	A-12-L16	1 1/4	1 1/16

NOTE: All CAJON Sleeves are manufactured from aluminum and should be ordered as a separate item.



COMPLETE TABLE OF ORDERING INSTRUCTIONS

Soft PVC Hose Dimensions		Male Pipe Size or Tube Size in Inches	Part Number Brass Hose Connector or Adapter	Part Number Stainless Steel Hose Connector or Adapter	Part Number Aluminum Sleeve
I.D. (In.)	O.D. (In.)		Use Alone for 50% of Rated Hose Pressure	Use Alone for 50% of Rated Hose Pressure	Use for Full Rated Hose Pressure
1/8	1/4	1/8 Male Pipe 1/4 Male Pipe	B-2-HC-1-2 B-2-HC-1-4	SS-2-HC-1-2 SS-2-HC-1-4	A-2-L4
1/4	3/8	1/8 Male Pipe 1/4 Male Pipe 1/4 Tube 3/8 Tube	B-4-HC-1-2 B-4-HC-1-4 B-4-HC-A-401 B-4-HC-A-601	SS-4-HC-1-2 SS-4-HC-1-4 SS-4-HC-A-401 SS-4-HC-A-601	A-4-L6
1/4	7/16	1/8 Male Pipe 1/4 Male Pipe 1/4 Tube 3/8 Tube	B-4-HC-1-2 B-4-HC-1-4 B-4-HC-A-401 B-4-HC-A-601	SS-4-HC-1-2 SS-4-HC-1-4 SS-4-HC-A-401 SS-4-HC-A-601	A-4-L7
1/4	1/2	1/8 Male Pipe 1/4 Male Pipe 1/4 Tube 3/8 Tube	B-4-HC-1-2 B-4-HC-1-4 B-4-HC-A-401 B-4-HC-A-601	SS-4-HC-1-2 SS-4-HC-1-4 SS-4-HC-A-401 SS-4-HC-A-601	A-4-L8
5/16	7/16	1/8 Male Pipe 1/4 Male Pipe	B-5-HC-1-2 B-5-HC-1-4	SS-5-HC-1-2 SS-5-HC-1-4	A-5-L7
3/8	1/2	1/4 Male Pipe 3/8 Male Pipe 1/2 Male Pipe	B-6-HC-1-4 B-6-HC-1-6 B-6-HC-1-8	SS-6-HC-1-4 SS-6-HC-1-6 SS-6-HC-1-8	A-6-L8
3/8	9/16	1/4 Male Pipe 3/8 Male Pipe 1/2 Male Pipe	B-6-HC-1-4 B-6-HC-1-6 B-6-HC-1-8	SS-6-HC-1-4 SS-6-HC-1-6 SS-6-HC-1-8	A-6-L9
7/16	5/8	3/8 Male Pipe	B-7-HC-1-6	SS-7-HC-1-6	A-7-L10
1/2	11/16	1/2 Male Pipe	B-8-HC-1-8	SS-8-HC-1-8	A-8-L11
3/4	1	3/4 Male Pipe	B-12-HC-1-12	SS-12-HC-1-12	A-12-L16

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CAJON® TAPERED AND SERRATED HOSE CONNECTORS

TAPERED HOSE CONNECTORS

SERRATED HOSE CONNECTORS

PURPOSE

CAJON Hose Connectors are designed specifically for optimum gripping and simple installation of all types of soft plastic and rubber tubing. Common hose clamps are often used for higher pressures.

MATERIALS

CAJON Serrated and Tapered Hose Connectors are stocked in brass and 316 stainless steel. Other materials are available on request. For other materials see reverse side of FITTINGS tab in Master Catalog Binder.

Chrome plated Hose Connectors are available for clinical or medical use.

APPLICATIONS

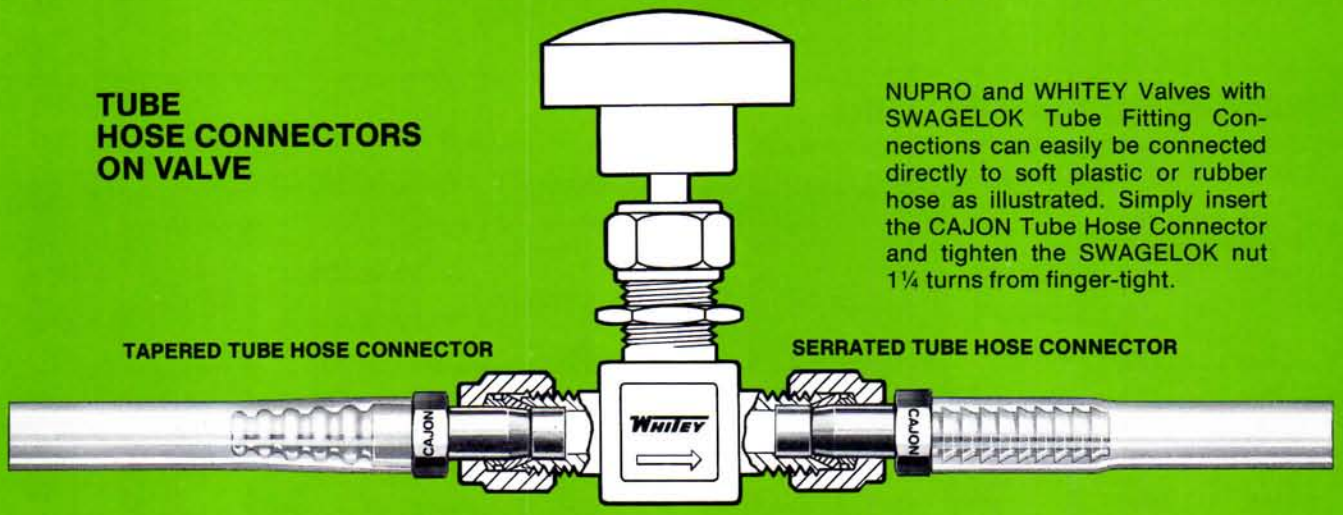
CAJON Hose Connectors are used for such low pressure applications as . . .

- Fluidics
- Medical labs
- Gravity feed lines
- Fluid transfer
- Chemistry labs
- Photocopy equipment
- Vacuum systems
- Dental equipment
- Food processing
- Beverage equipment
- Portable equipment
- Printing machinery

TUBE HOSE CONNECTOR (THC)

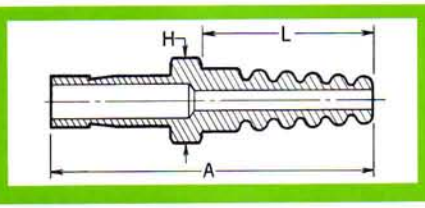
TUBE HOSE CONNECTORS ON VALVE

NUPRO and WHITEY Valves with SWAGELOK Tube Fitting Connections can easily be connected directly to soft plastic or rubber hose as illustrated. Simply insert the CAJON Tube Hose Connector and tighten the SWAGELOK nut 1¼ turns from finger-tight.

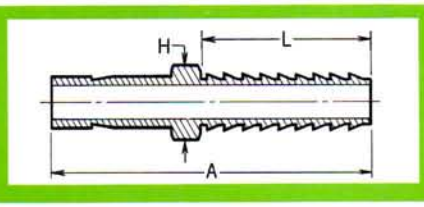


TUBE HOSE CONNECTORS

Used to connect soft plastic or rubber hose to a SWAGELOK Tube Fitting or tube end of WHITEY or NUPRO valves.



TAPERED



SERRATED

SWAGELOK TUBE SIZE	HOSE ID	CATALOG NUMBER	A	L	H
1/8	1/8	-2-THC-2T	1 1/32	5/8	5/16
1/4	1/8	-4-THC-2T	1 13/32	5/8	5/16
1/4	1/4	-4-THC-4T	1 3/4	15/16	3/8

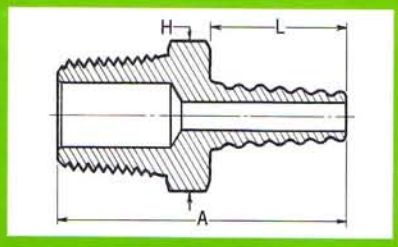
SWAGELOK TUBE SIZE	HOSE ID	CATALOG NUMBER	A	L	H
1/8	1/8	-2-THC-2S	1 5/32	27/64	5/16
1/4	1/8	-4-THC-2S	1 1/4	27/64	5/16
1/4	1/4	-4-THC-4S	1 1/2	45/64	5/16

All dimensions in inches. Dimensions for reference only, subject to change.

CAJON COMPANY • 32550 Old South Miles Road • Cleveland, Ohio 44139

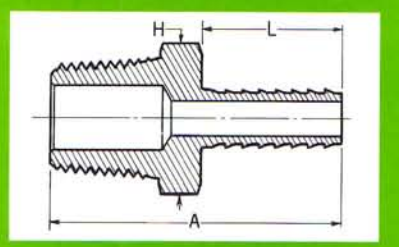
MALE HOSE CONNECTORS

Used to connect soft plastic or rubber hose to a female pipe port.



TAPERED

MALE SIZE	HOSE ID	CATALOG NUMBER	A	L	H
1/8	1/8	-2-MHC-2T	17/32	5/8	7/16
1/8	3/16	-2-MHC-3T	17/32	5/8	7/16
1/8	1/4	-2-MHC-4T	17/32	15/16	7/16
1/4	1/8	-4-MHC-2T	17/16	5/8	9/16
1/4	3/16	-4-MHC-3T	17/16	5/8	9/16
1/4	1/4	-4-MHC-4T	1 3/4	15/16	9/16
1/4	3/8	-4-MHC-6T	1 3/4	15/16	9/16
3/8	1/4	-6-MHC-4T	1 25/32	15/16	11/16
3/8	3/8	-6-MHC-6T	1 25/32	15/16	11/16
3/8	1/2	-6-MHC-8T	1 31/32	1 1/8	11/16
1/2	3/8	-8-MHC-6T	2 1/32	15/16	7/8
1/2	1/2	-8-MHC-8T	2 3/16	1 1/8	7/8

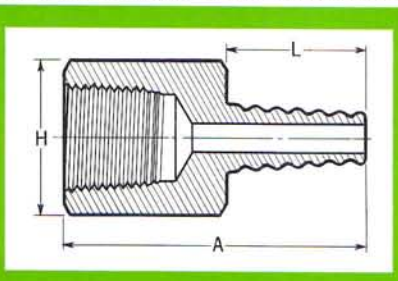


SERRATED

MALE SIZE	HOSE ID	CATALOG NUMBER	A	L	H
1/8	1/8	-2-MHC-2S	1 1/16	27/64	7/16
1/8	3/16	-2-MHC-3S	17/32	5/8	7/16
1/8	1/4	-2-MHC-4S	1 5/16	45/64	7/16
1/4	1/8	-4-MHC-2S	1 13/64	27/64	9/16
1/4	3/16	-4-MHC-3S	17/16	5/8	9/16
1/4	1/4	-4-MHC-4S	1 17/32	45/64	9/16
1/4	3/8	-4-MHC-6S	1 11/16	57/64	9/16
1/4	1/2	-4-MHC-8S	1 11/16	57/64	9/16
3/8	3/8	-6-MHC-6S	1 3/4	57/64	11/16
3/8	1/2	-6-MHC-8S	1 3/4	57/64	11/16
1/2	3/8	-8-MHC-6S	1 15/16	57/64	7/8
1/2	1/2	-8-MHC-8S	1 15/16	57/64	7/8
1/2	3/4	-8-MHC-12S	1 15/16	57/64	7/8
3/4	3/4	-12-MHC-12S	1 15/16	57/64	1 1/16

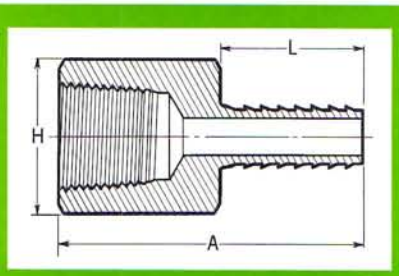
FEMALE HOSE CONNECTORS

Used to connect soft plastic or rubber hose to a male pipe stub.



TAPERED

FEMALE PIPE SIZE	HOSE ID	CATALOG NUMBER	A	L	H
1/8	1/8	-2-FHC-2T	1 3/8	5/8	9/16
1/8	3/16	-2-FHC-3T	1 3/8	5/8	9/16
1/8	1/4	-2-FHC-4T	1 5/8	15/16	9/16
1/4	1/8	-4-FHC-2T	1 9/16	5/8	3/4
1/4	3/16	-4-FHC-3T	1 9/16	5/8	3/4
1/4	1/4	-4-FHC-4T	1 13/16	15/16	3/4
1/4	3/8	-4-FHC-6T	1 13/16	15/16	3/4
3/8	1/4	-6-FHC-4T	1 15/16	15/16	7/8



SERRATED

FEMALE PIPE SIZE	HOSE ID	CATALOG NUMBER	A	L	H
1/8	1/8	-2-FHC-2S	1 3/16	27/64	9/16
1/8	3/16	-2-FHC-3S	1 3/8	5/8	9/16
1/8	1/4	-2-FHC-4S	1 13/32	45/64	9/16
1/4	1/8	-4-FHC-2S	1 5/16	27/64	3/4
1/4	3/16	-4-FHC-3S	1 1/2	5/8	3/4
1/4	1/4	-4-FHC-4S	1 19/32	45/64	3/4
1/4	3/8	-4-FHC-6S	1 3/4	57/64	3/4
3/8	1/4	-6-FHC-4S	1 5/8	45/64	7/8
3/8	3/8	-6-FHC-6S	1 13/16	57/64	7/8

All dimensions in inches. Dimensions for reference only, subject to change.

ORDERING INSTRUCTIONS

CAJON Hose Connectors can be ordered from your local distributor. Prefix the CATALOG NUMBER with B for brass or SS for 316 stainless steel. For a complete list of materials, see reverse side of "FITTINGS" divider in Master Catalog Binder.

YOUR LOCAL SALES & SERVICE REPRESENTATIVE

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8-73-125M-125M-BL

CAJON®

PRECISION PIPE FITTINGS

NIPPLES

CLOSE NIPPLE (CN) Page 2

HEX LONG NIPPLE (HLN) Page 2

HEX NIPPLE (HN) Page 2

HEX NIPPLE (HN)
NPT TO TAPERED ISO Page 3

HEX REDUCING NIPPLE (HRN) Page 2

HEX NIPPLE (HN)
NPT TO STRAIGHT ISO Page 3

TEES & CROSS

TEE (T)
Page 6

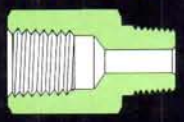
STREET TEE (ST)
Page 6

BRANCH TEE (BT)
Page 7

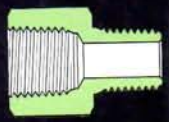
MALE TEE (MT)
Page 7

CROSS (CS)
Page 7

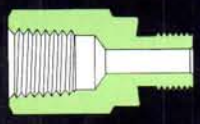
ADAPTERS



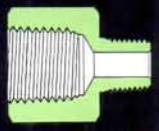
ADAPTER (A)
NPT TO TAPERED ISO
Page 3



ADAPTER (A)
Page 3



ADAPTER (A)
NPT TO STRAIGHT ISO
Page 3



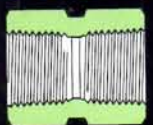
REDUCING ADAPTER
(RA)
Page 4

CAP & PLUG

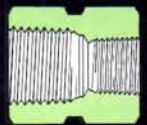
PIPE
CAP (CP)
Page 5

PIPE
PLUG (P)
Page 5

COUPLINGS



HEX COUPLING
(HCG)
Page 4



HEX REDUCING
COUPLING (HRCG)
Page 4

ELBOWS

ELBOW (E)
Page 5

STREET ELBOW (SE)
Page 5

REDUCING
STREET ELBOW (RSE)
Page 6

MALE ELBOW (ME)
Page 6

BUSHING

REDUCING BUSHING (RB) Page 4

UNION BALL JOINT (UBJ)

Page 7

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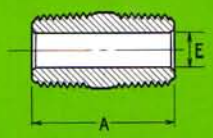
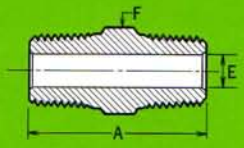
CLOSE NIPPLE (CN)



Male NPT both ends. Used to make a straight line close connection between two female threaded components.

Male Pipe Size	Catalog Number	A	E Min. Opening	Working Pressure (PSIG) (B) Brass	(SS) 316	(S) Carbon Steel
1/16	-1-CN	3/4	1/8	5,200	9,800	10,400
1/8	-2-CN	3/4	3/16	4,800	9,000	9,600
1/4	-4-CN	1 1/8	9/32	3,700	7,000	7,500
3/8	-6-CN	1 1/8	3/8	3,600	6,900	7,300
1/2	-8-CN	1 1/2	15/32	3,000	5,700	6,100
3/4	-12-CN	1 1/2	5/8	3,400	6,400	6,800
1	-16-CN	1 7/8	7/8	2,400	4,600	4,900

HEX NIPPLE (HN)

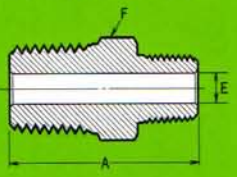


Male NPT both ends. Used to make a straight line connection between two female threaded components. Wrench pad for ease of tightening, removal and reuse.

Male Pipe Size	Catalog Number	A	E Min. Opening	F Hex	Working Pressure (PSIG) (B) Brass	(SS) 316	(S) Carbon Steel
1/16	-1-HN	15/16	1/8	5/16	5,200	9,800	10,400
1/8	-2-HN	1	3/16	7/16	4,800	9,000	9,600
1/4	-4-HN	1 3/8	9/32	9/16	3,700	7,000	7,500
3/8	-6-HN	1 13/32	3/8	11/16	3,600	6,900	7,300
1/2	-8-HN	1 25/32	15/32	7/8	3,000	5,700	6,100
3/4	-12-HN	1 13/16	5/8	1 1/16	3,400	6,400	6,800
1	-16-HN	2 9/32	7/8	1 3/8	2,400	4,600	4,900

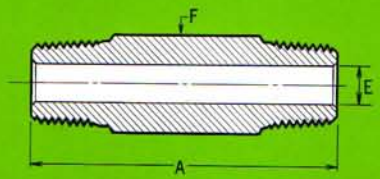
HEX REDUCING NIPPLE (HRN)

Male NPT to reduced Male NPT. Used to make a reduced straight line connection between two different female threads. Furnishes one step reduction (or more) between thread sizes.



Male Pipe Size	Reduced Male Pipe Size	Catalog Number	A	E Min. Opening	F Hex	Working Pressure (PSIG) (B) Brass	(SS) 316	(S) Carbon Steel
1/8	1/16	-2-HRN-1	1	1/8	7/16	4,800	9,000	9,600
1/4	1/16	-4-HRN-1	1 3/16	1/8	9/16	3,700	7,000	7,500
1/4	1/8	-4-HRN-2	1 3/16	3/16	9/16	3,700	7,000	7,500
3/8	1/8	-6-HRN-2	1 7/32	3/16	11/16	3,600	6,900	7,300
3/8	1/4	-6-HRN-4	1 13/32	9/32	11/16	3,600	6,900	7,300
1/2	1/4	-8-HRN-4	1 19/32	9/32	7/8	3,000	5,700	6,100
1/2	3/8	-8-HRN-6	1 5/8	3/8	7/8	3,000	5,700	6,100
3/4	1/4	-12-HRN-4	1 5/8	9/32	1 1/16	3,400	6,400	6,800
3/4	3/8	-12-HRN-6	1 5/8	3/8	1 1/16	3,400	6,400	6,800
3/4	1/2	-12-HRN-8	1 13/16	15/32	1 1/16	3,000	5,700	6,100
1	3/8	-16-HRN-6	1 29/32	3/8	1 3/8	2,400	4,600	4,900
1	1/2	-16-HRN-8	2 3/32	15/32	1 3/8	2,400	4,600	4,900
1	3/4	-16-HRN-12	2 3/32	5/8	1 3/8	2,400	4,600	4,900

HEX LONG NIPPLE (HLN)



Male NPT both ends. Used for gauge mounting and extended mounting through insulation. Can be drilled and tapped in the field to form manifolds.

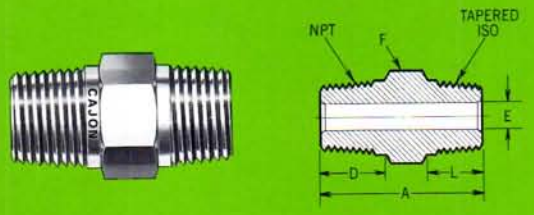
***Specified length to be shown as last designator in part number. Example: SS-1-HLN-1.50 (1.50 = 1½" length).**

Male Pipe Size	Catalog Number	A	E Min. Opening	F Hex	Working Pressure (PSIG) (B) Brass	(SS) 316	(S) Carbon Steel
1/16	-1-HLN-*	*	1/8	5/16	5,200	9,800	10,400
1/8	-2-HLN-*	*	3/16	7/16	4,800	9,000	9,600
1/4	-4-HLN-*	*	9/32	9/16	3,700	7,000	7,500
3/8	-6-HLN-*	*	3/8	11/16	3,600	6,900	7,300
1/2	-8-HLN-*	*	15/32	7/8	3,000	5,700	6,100
3/4	-12-HLN-*	*	5/8	1 1/16	3,400	6,400	6,800
1	-16-HLN-*	*	7/8	1 3/8	2,400	4,600	4,900

All dimensions in inches. Dimensions for reference only—subject to change.

See page 8 for ordering instructions.

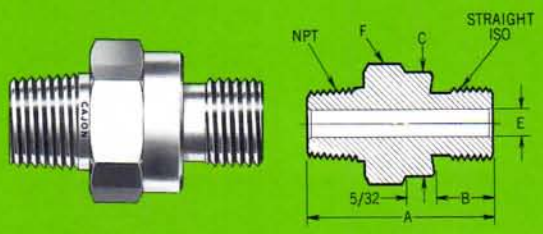
HEX NIPPLE (HN) NPT TO TAPERED ISO



Male NPT to Male Tapered ISO. Used to connect a Female NPT port to a Female Tapered ISO port.

NPT Thread Size	ISO Thread Size	Catalog Number	A	D	E	F Hex	L
1/8	1/8-28 R7	-2-HN-R1/8T	29/32	3/8	5/32	7/16	5/16
1/4	1/4-19 R7	-4-HN-R1/4T	1 9/32	9/16	1/4	9/16	15/32
3/8	3/8-19 R7	-6-HN-R3/8T	1 5/16	9/16	3/8	11/16	15/32
1/2	1/2-14 R7	-8-HN-R1/2T	1 5/8	3/4	15/32	7/8	9/16

HEX NIPPLE (HN) NPT TO STRAIGHT ISO*

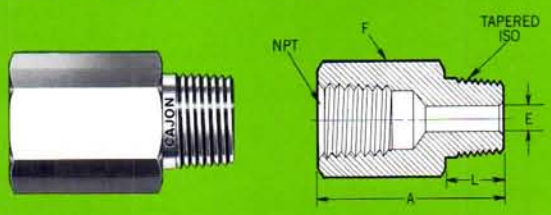


Male NPT to Male Straight ISO. Used to connect a Female NPT port to a Female Straight ISO port.

NPT Thread Size	ISO Thread Size	Catalog Number	A	B	C	E	F Hex
1/8	1/8-28 R228	-2-HN-R1/8	15/64	5/16	.541	5/32	9/16
1/4	1/4-19 R228	-4-HN-R1/4	1 7/16	15/32	.738	3/16	3/4
3/8	3/8-19 R228	-6-HN-R3/8	1 15/32	15/32	.856	5/16	7/8
1/2	1/2-14 R228	-8-HN-R1/2	1 27/32	9/16	1.053	15/32	1 1/16

For Working Pressures refer to HEX NIPPLE, page 2.

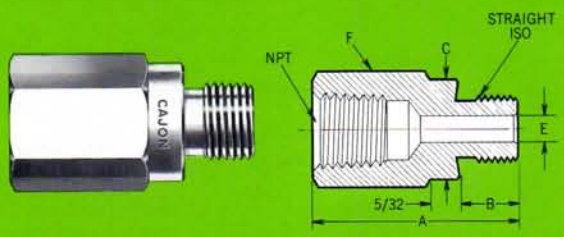
ADAPTER (A) NPT TO TAPERED ISO



Female NPT to Male Tapered ISO. Used to connect a Male NPT to a Female Tapered ISO port.

NPT Thread Size	ISO Thread Size	Catalog Number	A	E	F Hex	L
1/8	1/8-28 R7	-2-A-R1/8T	1	5/32	9/16	5/16
1/4	1/4-19 R7	-4-A-R1/4T	1 9/32	1/4	3/4	15/32
3/8	3/8-19 R7	-6-A-R3/8T	1 3/8	3/8	7/8	15/32
1/2	1/2-14 R7	-8-A-R1/2T	1 23/32	15/32	1 1/16	9/16

ADAPTER (A) NPT TO STRAIGHT ISO*

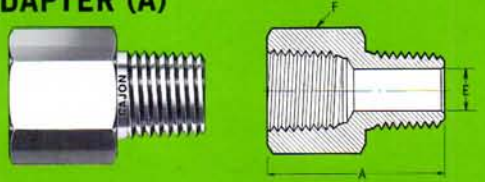


Female NPT to Male Straight ISO. Used to connect a Male NPT to a Female Straight ISO port.

NPT Thread Size	ISO Thread Size	Catalog Number	A	B	C	E	F Hex
1/8	1/8-28 R228	-2-A-R1/8	15/32	5/16	.541	5/32	9/16
1/4	1/4-19 R228	-4-A-R1/4	1 7/16	15/32	.738	3/16	3/4
3/8	3/8-19 R228	-6-A-R3/8	1 17/32	15/32	.856	5/16	7/8
1/2	1/2-14 R228	-8-A-R1/2	1 7/8	9/16	1.053	15/32	1 1/16

NOTE: Catalog Numbers for NPT to ISO Adapters will have the Female end as the first size designator. For Working Pressures refer to ADAPTER below. *ISO Straight Thread Gaskets are also available.

ADAPTER (A)

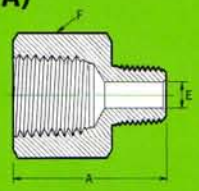


Female NPT to same size Male NPT. Used as a "sacrifice" fitting to protect threads of valves, gauges, instruments. Also suitable for extending a valve away from equipment to allow for handle swing. †SNUBBER ref., page 8.

Pipe Size	Catalog Number	A	E Min. Opening	F Hex	Working Pressure (PSIG) (B) Brass	(SS) 316	(S) Carbon Steel
1/16	-1-A	1	1/8	7/16	3,000	5,700	6,100
1/8	-2-A	1 1/16	3/16	9/16	2,900	5,500	5,900
1/4	-4-A	1 3/8	9/32	3/4	3,000	5,600	6,000
3/8	-6-A	1 9/16	3/8	7/8	2,400	4,500	4,800
1/2	-8-A	1 29/32	15/32	1 1/16	2,100	4,100	4,300
3/4	-12-A	1 15/16	5/8	1 1/4	1,600	3,000	3,200
1	-16-A	2 9/32	7/8	1 5/8	2,000	3,700	4,000

All dimensions in inches. Dimensions for reference only—subject to change.
See page 8 for ordering instructions.

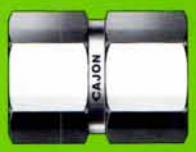
REDUCING ADAPTER (RA)

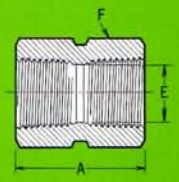


Female NPT to reduced Male NPT. Used like Adapter to increase versatility of various reductions in male to female connections and to eliminate unnecessary connections. †SNUBBER ref., page 8.

Female Pipe Size	Male Pipe Size	Catalog Number	A	E Min. Opening	F Hex	Working Pressure (PSIG) (B) Brass	(SS) 316	(S) Carbon Steel
1/8	1/16	-2-RA-1	13/32	1/8	9/16	2,900	5,500	5,900
1/4	1/16	-4-RA-1	1 1/4	1/8	3/4	3,000	5,600	6,000
1/4	1/8	-4-RA-2	1 1/4	3/16	3/4	3,000	5,600	6,000
3/8	1/8	-6-RA-2	1 7/16	3/16	7/8	2,400	4,500	4,800
3/8	1/4	-6-RA-4	1 9/16	9/32	7/8	2,400	4,500	4,800
1/2	1/8	-8-RA-2	1 11/16	3/16	1 1/16	2,100	4,100	4,300
1/2	1/4	-8-RA-4	1 13/16	9/32	1 1/16	2,100	4,100	4,300
1/2	3/8	-8-RA-6	1 13/16	3/8	1 1/16	2,100	4,100	4,300
3/4	3/8	-12-RA-6	1 31/32	3/8	1 1/4	1,600	3,000	3,200
3/4	1/2	-12-RA-8	2 1/16	15/32	1 1/4	1,600	3,000	3,200
1	3/8	-16-RA-6	2 1/8	3/8	1 5/8	2,000	3,700	4,000
1	1/2	-16-RA-8	2 1/4	15/32	1 5/8	2,000	3,700	4,000
1	3/4	-16-RA-12	2 1/4	5/8	1 5/8	2,000	3,700	4,000

HEX COUPLING (HCG)

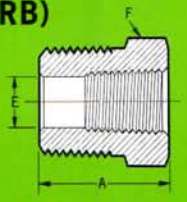




Female NPT both ends. Used to make a straight line connection between two male components.

Female Pipe Size	Catalog Number	A	E Min. Opening	F Hex	Working Pressure (PSIG) (B) Brass	(SS) 316	(S) Carbon Steel
1/16	-1-HCG	13/16	1/4	7/16	3,000	5,700	6,100
1/8	-2-HCG	13/16	11/32	9/16	2,900	5,500	5,900
1/4	-4-HCG	1 3/16	7/16	3/4	3,000	5,600	6,000
3/8	-6-HCG	1 5/16	37/64	7/8	2,400	4,500	4,800
1/2	-8-HCG	1 9/16	23/32	1 1/16	2,100	4,100	4,300
3/4	-12-HCG	1 5/8	59/64	1 1/4	1,600	3,000	3,200
1	-16-HCG	2	1 5/32	1 5/8	2,000	3,700	4,000

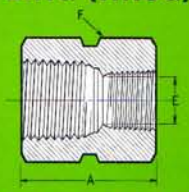
REDUCING BUSHING (RB)



Male NPT to reduced Female NPT. Used to increase versatility of various reductions in female to male connections. Eliminates unnecessary connections and allows use of smaller valves and other system components.

Male Pipe Size	Female Pipe Size	Catalog Number	A	E Min. Opening	F Hex	Working Pressure (PSIG) (B) Brass	(SS) 316	(S) Carbon Steel
1/8	1/16	-2-RB-1	1	3/16	7/16	3,000	5,700	6,100
1/4	1/16	-4-RB-1	13/16	1/4	9/16	3,000	5,700	6,100
1/4	1/8	-4-RB-2	1	9/32	9/16	2,900	5,500	5,900
3/8	1/16	-6-RB-1	27/32	1/4	11/16	3,000	5,700	6,100
3/8	1/8	-6-RB-2	27/32	11/32	11/16	2,900	5,500	5,900
3/8	1/4	-6-RB-4	1 1/8	3/8	3/4	3,000	5,600	6,000
1/2	1/8	-8-RB-2	1 1/16	11/32	7/8	2,900	5,500	5,900
1/2	1/4	8-RB-4	1 1/16	7/16	7/8	3,000	5,600	6,000
1/2	3/8	-8-RB-6	1 5/16	15/32	7/8	2,400	4,500	4,800
3/4	1/8	-12-RB-2	1 1/16	11/32	1 1/16	2,900	5,500	5,900
3/4	1/4	-12-RB-4	1 1/16	7/16	1 1/16	3,000	5,600	6,000
3/4	3/8	-12-RB-6	1 1/16	37/64	1 1/16	2,400	4,500	4,800
3/4	1/2	-12-RB-8	1 9/16	5/8	1 1/16	2,100	4,100	4,300
1	1/8	-16-RB-2	1 11/32	11/32	1 3/8	2,400	4,600	4,900
1	1/4	-16-RB-4	1 11/32	7/16	1 3/8	2,400	4,600	4,900
1	3/8	-16-RB-6	1 11/32	37/64	1 3/8	2,400	4,500	4,800
1	1/2	-16-RB-8	1 11/32	23/32	1 3/8	2,100	4,100	4,300
1	3/4	-16-RB-12	1 3/4	7/8	1 3/8	1,600	3,000	3,200

HEX REDUCING COUPLING (HRCG)



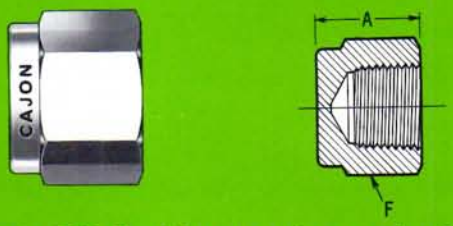
Female NPT to reduced Female NPT. Used for straight line connection between two different size male pipe threads. Furnishes single or multi-step reductions from a basic thread size.

Female Pipe Size	Reduced Female Pipe Size	Catalog Number	A	E Min. Opening	F Hex	Working Pressure (PSIG) (B) Brass	(SS) 316	(S) Carbon Steel
1/8	1/16	-2-HRCG-1	1 1/16	1/4	9/16	2,900	5,500	5,900
1/4	1/16	-4-HRCG-1	1 7/32	1/4	3/4	3,000	5,600	6,000
1/4	1/8	-4-HRCG-2	1 7/32	11/32	3/4	2,900	5,500	5,900
3/8	1/16	-6-HRCG-1	1 5/16	1/4	7/8	2,400	4,500	4,800
3/8	1/8	-6-HRCG-2	1 5/16	11/32	7/8	2,400	4,500	4,800
3/8	1/4	-6-HRCG-4	1 3/8	7/16	7/8	2,400	4,500	4,800
1/2	1/8	-8-HRCG-2	1 9/16	11/32	1 1/16	2,100	4,100	4,300
1/2	1/4	-8-HRCG-4	1 3/4	7/16	1 1/16	2,100	4,100	4,300
1/2	3/8	-8-HRCG-6	1 25/32	37/64	1 1/16	2,100	4,100	4,300
3/4	1/8	-12-HRCG-2	1 23/32	11/32	1 1/4	1,600	3,000	3,200
3/4	1/4	-12-HRCG-4	1 13/16	7/16	1 1/4	1,600	3,000	3,200
3/4	3/8	-12-HRCG-6	1 27/32	37/64	1 1/4	1,600	3,000	3,200
3/4	1/2	-12-HRCG-8	2 1/16	23/32	1 1/4	1,600	3,000	3,200
1	1/8	-16-HRCG-2	1 27/32	11/32	1 5/8	2,000	3,700	4,000
1	1/4	-16-HRCG-4	2	7/16	1 5/8	2,000	3,700	4,000
1	3/8	-16-HRCG-6	2 1/16	37/64	1 5/8	2,000	3,700	4,000
1	1/2	-16-HRCG-8	2 3/16	23/32	1 5/8	2,000	3,700	4,000
1	3/4	-16-HRCG-12	2 1/4	59/64	1 5/8	1,600	3,000	3,200

All dimensions in inches. Dimensions for reference only—subject to change.

See page 8 for ordering instructions.

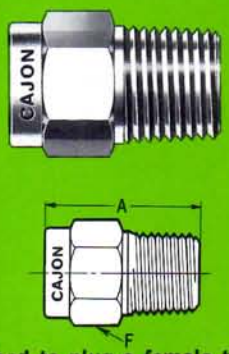
PIPE CAP (CP)



Female NPT. Used to cap a pipe or male pipe threaded component.

Female Pipe Size	Catalog Number	A	F Hex	Working Pressure (PSIG) (B) Brass	(SS) 316	(S) Carbon Steel
1/16	-1-CP	1/2	7/16	3,000	5,700	6,100
1/8	-2-CP	3/4	9/16	2,900	5,500	5,900
1/4	-4-CP	29/32	3/4	3,000	5,600	6,000
3/8	-6-CP	1 1/32	7/8	2,400	4,500	4,800
1/2	-8-CP	1 11/32	1 1/16	2,100	4,100	4,300
3/4	-12-CP	1 7/16	1 1/4	1,600	3,000	3,200
1	-16-CP	1 5/8	1 5/8	2,000	3,700	4,000

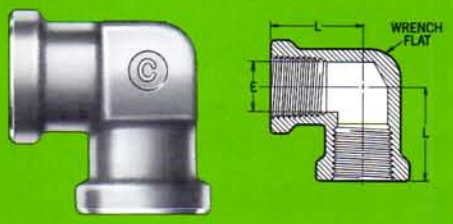
PIPE PLUG (P)



Male NPT. Used to plug a female threaded component. Substantial wrench pad allows easy make and break.

Male Pipe Size	Catalog Number	A	F Hex	Working Pressure (PSIG) (B) Brass	(SS) 316	(S) Carbon Steel
1/16	-1-P	3/4	5/16	5,200	9,800	10,400
1/8	-2-P	3/4	7/16	4,800	9,000	9,600
1/4	-4-P	1	9/16	3,700	7,000	7,500
3/8	-6-P	1 1/16	11/16	3,600	6,900	7,300
1/2	-8-P	1 5/16	7/8	3,000	5,700	6,100
3/4	-12-P	1 3/8	1 1/16	3,400	6,400	6,800
1	-16-P	1 11/16	1 3/8	2,400	4,600	4,900
1 1/4	-20-P	1 27/32	1 3/4	2,600	4,800	5,200
1 1/2	-24-P	2	2	2,100	4,000	4,300
2	-32-P	2 3/16	2 1/2	2,100	4,000	4,300

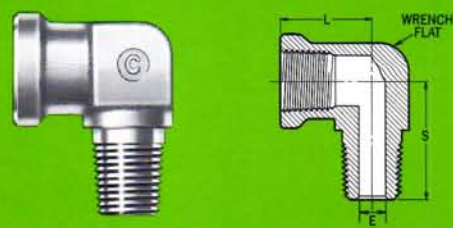
ELBOW (E)



Female NPT both ends. Used to install male NPT pipe or components at a 90° angle.

Female Pipe Size	Catalog Number	L	E Min. Opening	Wrench Flat	Working Pressure (PSIG) (B) Brass	(SS) 316	(S) Carbon Steel
1/16	-1-E	3/4	1/4	7/16	3,000	5,700	6,100
1/8	-2-E	27/32	11/32	11/16	2,900	5,500	5,900
1/4	-4-E	27/32	7/16	11/16	3,000	5,600	6,000
3/8	-6-E	1	37/64	13/16	2,400	4,500	4,800
1/2	-8-E	1 1/8	23/32	1	2,100	4,100	4,300
3/4	-12-E	1 7/16	59/64	1 1/4	1,600	3,000	3,200
1	-16-E	1 5/8	1 5/32	1 11/16	2,000	3,700	4,000

STREET ELBOW (SE)

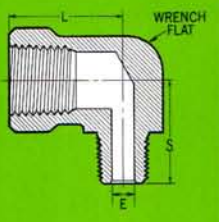


Female to Male NPT. Used to install male to female components at a 90° angle.

Pipe Size	Catalog Number	L	S	E Min. Opening	Wrench Flat	Working Pressure (PSIG) (B) Brass	(SS) 316	(S) Carbon Steel
1/16	-1-SE	3/4	3/4	1/8	7/16	3,000	5,700	6,100
1/8	-2-SE	27/32	27/32	3/16	11/16	2,900	5,500	5,900
1/4	-4-SE	27/32	1	9/32	11/16	3,000	5,600	6,000
3/8	-6-SE	1	1 1/8	3/8	13/16	2,400	4,500	4,800
1/2	-8-SE	1 1/8	1 11/32	15/32	1	2,100	4,100	4,300
3/4	-12-SE	1 7/16	1 1/2	5/8	1 1/4	1,600	3,000	3,200
1	-16-SE	1 5/8	1 7/8	7/8	1 11/16	2,000	3,700	4,000

All dimensions in inches. Dimensions for reference only—subject to change.
See page 8 for ordering instructions.

REDUCING STREET ELBOW (RSE)

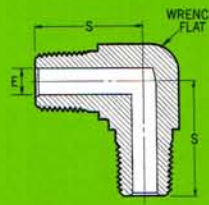


Similar to Street Elbow, but used to install Female to reduced Male NPT at a 90° angle with single or multi-step reductions.

Female Pipe Size	Reduced Male Pipe Size	Catalog Number	L	S	E Min. Opening	Wrench Flat	Working Pressure (PSIG) (B) Brass	(SS) 316	(S) Carbon Steel
1/8	1/16	-2-RSE-1	27/32	27/32	1/8	11/16	2,900	5,500	5,900
1/4	1/16	-4-RSE-1	27/32	27/32	1/8	11/16	3,000	5,600	6,000
1/4	1/8	-4-RSE-2	27/32	27/32	3/16	11/16	3,000	5,600	6,000
3/8	1/16	-6-RSE-1	1	7/8	1/8	13/16	2,400	4,500	4,800
3/8	1/8	-6-RSE-2	1	7/8	3/16	13/16	2,400	4,500	4,800
3/8	1/4	-6-RSE-4	1	1 1/8	9/32	13/16	2,400	4,500	4,800
1/2	1/8	-8-RSE-2	1 1/8	1 3/32	3/16	1	2,100	4,100	4,300
1/2	1/4	-8-RSE-4	1 1/8	1 1/4	9/32	1	2,100	4,100	4,300
1/2	3/8	-8-RSE-6	1 1/8	1 1/4	3/8	1	2,100	4,100	4,300
3/4	1/8	-12-RSE-2	1 7/16	1 1/8	3/16	1 1/4	1,600	3,000	3,200
3/4	1/4	-12-RSE-4	1 7/16	1 5/16	9/32	1 1/4	1,600	3,000	3,200
3/4	3/8	-12-RSE-6	1 7/16	1 5/16	3/8	1 1/4	1,600	3,000	3,200
3/4	1/2	-12-RSE-8	1 7/16	1 1/2	15/32	1 1/4	1,600	3,000	3,200
1	1/8	-16-RSE-2	1 5/8	1 3/8	3/16	1 11/16	2,000	3,700	4,000
1	1/4	-16-RSE-4	1 5/8	1 9/16	9/32	1 11/16	2,000	3,700	4,000
1	3/8	-16-RSE-6	1 5/8	1 9/16	3/8	1 11/16	2,000	3,700	4,000
1	1/2	-16-RSE-8	1 5/8	1 23/32	15/32	1 11/16	2,000	3,700	4,000
1	3/4	-16-RSE-12	1 5/8	1 7/8	5/8	1 11/16	2,000	3,700	4,000

6

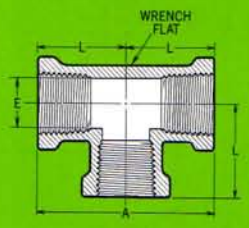
MALE ELBOW (ME)



Male NPT both ends. Used to install female to female components at a 90° angle where space limitations are critical.

Male Pipe Size	Catalog Number	S	E Min. Opening	Wrench Flat	Working Pressure (PSIG) (B) Brass	(SS) 316	(S) Carbon Steel
1/16	-1-ME	3/4	1/8	7/16	5,200	9,800	10,400
1/8	-2-ME	3/4	3/16	7/16	4,800	9,000	9,600
1/4	-4-ME	1	9/32	11/16	3,700	7,000	7,500
3/8	-6-ME	1	3/8	11/16	3,600	6,900	7,300
1/2	-8-ME	1 17/64	15/32	1	3,000	5,700	6,100
3/4	-12-ME	1 1/2	5/8	1 1/4	3,400	6,400	6,800
1	-16-ME	1 3/8	7/8	1 11/16	2,400	4,600	4,900

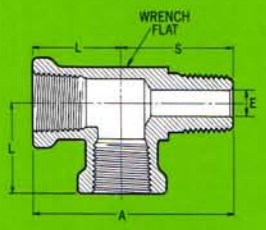
TEE (T)



Female NPT all ports. Used to make a three-way connection of male threaded pipe or components.

Female Pipe Size	Catalog Number	A	L	E Min. Opening	Wrench Flat	Working Pressure (PSIG) (B) Brass	(SS) 316	(S) Carbon Steel
1/16	-1-T	1 1/2	3/4	1/4	7/16	3,000	5,700	6,100
1/8	-2-T	1 11/16	27/32	11/32	11/16	2,900	5,500	5,900
1/4	-4-T	1 11/16	27/32	7/16	11/16	3,000	5,600	6,000
3/8	-6-T	2	1	37/64	13/16	2,400	4,500	4,800
1/2	-8-T	2 1/4	1 1/8	23/32	1	2,100	4,100	4,300
3/4	-12-T	2 7/8	1 7/16	59/64	1 1/4	1,600	3,000	3,200
1	-16-T	3 1/4	1 5/8	1 5/32	1 11/16	2,000	3,700	4,000

STREET TEE (ST)



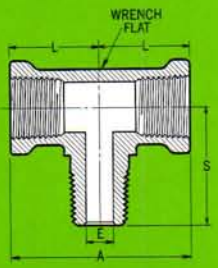
Used to make a three-way connection of Male-to-Female-to-Male NPT threaded components.

Pipe Size	Catalog Number	A	L	S	E Min. Opening	Wrench Flat	Working Pressure (PSIG) (B) Brass	(SS) 316	(S) Carbon Steel
1/16	-1-ST	1 1/2	3/4	3/4	1/8	7/16	3,000	5,700	6,100
1/8	-2-ST	1 11/16	27/32	27/32	3/16	11/16	2,900	5,500	5,900
1/4	-4-ST	1 27/32	27/32	1	9/32	11/16	3,000	5,600	6,000
3/8	-6-ST	2 1/8	1	1 1/8	3/8	13/16	2,400	4,500	4,800
1/2	-8-ST	2 15/32	1 1/8	1 11/32	15/32	1	2,100	4,100	4,300
3/4	-12-ST	2 15/16	1 7/16	1 1/2	5/8	1 1/4	1,600	3,000	3,200
1	-16-ST	3 1/2	1 5/8	1 7/8	7/8	1 11/16	2,000	3,700	4,000

All dimensions in inches. Dimensions for reference only—subject to change.

See page 8 for ordering instructions.

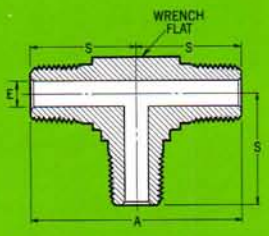
BRANCH TEE (BT)



Used to make a three-way connection to Male-to-Male-to-Female NPT threaded components.

Pipe Size	Catalog Number	A	L	S	E Min. Opening	Wrench Flat	Working Pressure (PSIG) (B) Brass	(SS) 316	(S) Carbon Steel
1/16	-1-BT	1 1/2	3/4	3/4	1/8	7/16	3,000	5,700	6,100
1/8	-2-BT	1 11/16	27/32	27/32	3/16	11/16	2,900	5,500	5,900
1/4	-4-BT	1 11/16	27/32	1	9/32	11/16	3,000	5,600	6,000
3/8	-6-BT	2	1	1 1/8	3/8	13/16	2,400	4,500	4,800
1/2	-8-BT	2 1/4	1 1/8	1 11/32	15/32	1	2,100	4,100	4,300
3/4	-12-BT	2 7/8	1 7/16	1 1/2	5/8	1 1/4	1,600	3,000	3,200
1	-16-BT	3 1/4	1 5/8	1 7/8	7/8	1 11/16	2,000	3,700	4,000

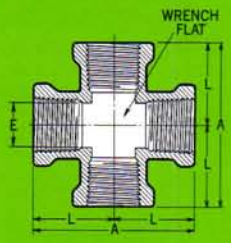
MALE TEE (MT)



Male NPT all ports. Used to make a three-way connection of female threaded components. Also provides space-saver joining of three female components.

Male Pipe Size	Catalog Number	A	S	E	Wrench Flat	Working Pressure (PSIG) (B) Brass	(SS) 316	(S) Carbon Steel
1/16	-1-MT	1 1/2	3/4	1/8	7/16	5,200	9,800	10,400
1/8	-2-MT	1 1/2	3/4	3/16	7/16	4,800	9,000	9,600
1/4	-4-MT	2	1	9/32	11/16	3,700	7,000	7,500
3/8	-6-MT	2	1	3/8	11/16	3,600	6,900	7,300
1/2	-8-MT	2 17/32	1 17/64	15/32	1	3,000	5,700	6,100
3/4	-12-MT	3	1 1/2	5/8	1 1/4	3,400	6,400	6,800
1	-16-MT	3 3/4	1 7/8	7/8	1 11/16	2,400	4,600	4,900

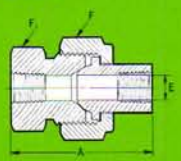
CROSS (CS)



Used to provide a four-way connection of Male NPT pipe or Male threaded components.

Female Pipe Size	Catalog Number	A	L	E Min. Opening	Wrench Flat	Working Pressure (PSIG) (B) Brass	(SS) 316	(S) Carbon Steel
1/16	-1-CS	1 1/2	3/4	1/4	7/16	3,000	5,700	6,100
1/8	-2-CS	1 11/16	27/32	11/32	11/16	2,900	5,500	5,900
1/4	-4-CS	1 11/16	27/32	7/16	11/16	3,000	5,600	6,000
3/8	-6-CS	2	1	37/64	13/16	2,400	4,500	4,800
1/2	-8-CS	2 1/4	1 1/8	23/32	1	2,100	4,100	4,300
3/4	-12-CS	2 7/8	1 7/16	59/64	1 1/4	1,600	3,000	3,200
1	-16-CS	3 1/4	1 5/8	1 5/32	1 3/4	2,000	3,700	4,000

UNION BALL JOINT (UBJ)



Used to provide a make and break joint between NPT pipe or threaded components. Required between two male components when one or both are fixed. First tighten the UBJ ends to fixed male threaded components, then tighten union nut. Exclusive torque ring reduces make-up problems and enhances life of fitting.

Female Pipe Size	Catalog Number	A	E	F Hex	F_1 Hex	Working Pressure (PSIG) (B) Brass	(SS) 316	(S) Carbon Steel
1/8	-2-UBJ	1 13/16	11/32	1 1/8	15/16	2,900	5,500	5,900
1/4	-4-UBJ	2 11/32	7/16	1 3/8	1 3/16	3,000	5,600	6,000
3/8	-6-UBJ	2 1/2	9/16	1 1/2	1 5/16	2,400	4,500	4,800
1/2	-8-UBJ	2 11/16	45/64	1 3/4	1 5/8	2,100	4,100	4,300
3/4	-12-UBJ	3 1/8	29/32	2	1 7/8	1,600	3,000	3,200
1	-16-UBJ	3 9/16	1 1/8	2 1/2	2 3/8	2,000	3,700	4,000

All dimensions in inches. Dimensions for reference only—subject to change.
See page 8 for ordering instructions.

CAJON®

PRECISION PIPE FITTINGS

FEATURES

- Machined from barstock or forging materials which meet applicable A.S.T.M. specifications.
- Threads exceed requirements of ASA B2.1 (1968) for tapered pipe threads (N.P.T.).
- Full thread engagement assures reliable makeup of pipe connections.
- Available in many combinations of sizes, multi-step reductions, unusual shapes, and a wide range of materials to reduce the number of fittings needed in a system.
- Attractive finishes meet quality appearance requirements for sophisticated scientific equipment.
- Fittings are properly packaged, with exposed threads protected, to insure delivery undamaged.
- All working pressures in fitting tables are calculated in accordance with Power Piping Code ASA B31.1 and Refinery Piping Code ASA B31.3.

	Min. Ultimate Tensile Strength	Safety Factor
Brass	40,000 PSI	4:1
Steel	60,000 PSI	3:1
Stainless Steel	75,000 PSI	4:1

- NPT to ISO Adapters and Hex Nipples available from stock.

ORDERING INSTRUCTIONS

- The numbering system for CAJON Pipe Fittings is designed so that all part numbers are prefixed by a MATERIAL DESIGNATOR, followed by a dash.
  Examples: B—(brass), S—(steel), SS—(316 stainless steel).
  For other materials see reverse side of FITTINGS tab in Master Catalog Binder.
- The SIZE DESIGNATOR following the first dash indicates pipe size in sixteenths of an inch.
- The letter combination following the SIZE DESIGNATOR identifies the TYPE OF PIPE FITTING:

CN = Close Nipple
HN = Hex Nipple
HLN = Hex Long Nipple
HRN = Hex Reducing Nipple
A = Adapter
RA = Reducing Adapter
RB = Reducing Bushing
HCG = Hex Coupling
HRCG = Hex Reducing Coupling
CP = Pipe Cap
P = Pipe Plug

E = Elbow
SE = Street Elbow
RSE = Reducing Street Elbow
ME = Male Elbow
T = Tee
ST = Street Tee
BT = Branch Tee
MT = Male Tee
CS = Cross
UBJ = Union Ball Joint

- The number following the TYPE OF FITTING designates the reduced pipe size or type in sixteenths of an inch (if applicable). ISO ends are identified by the letter R preceding the fractional designation. The tapered style (R7) is differentiated from the straight style (R228) by adding the letter T to the fractional designation.

TYPICAL PART NUMBERS

MATERIAL DESIGNATOR		PIPE THREAD SIZE IN 1/16"		TYPE OF FITTING		REDUCED SIZE OR TYPE OF OTHER END	See Catalog Page No.
SS	–	2	–	HRN	–	1	
316 Stainless Steel		1/8"		Hex Reducing Nipple		1/16"	2
B	–	8	–	CP			
Brass		1/2"		Pipe Cap			5
B	–	4	–	A	–	R¼T	
Brass		1/4"		Adapter		ISO Thread Size	3

STRIP TEEZE® is recommended as a pipe thread sealant. See Lubricants/Sealants subsection of Master Catalog Binder. For PIPE to WELD CONNECTORS, see Weld Fittings subsection of Master Catalog Binder. †SNUBBERS (GAUGE PROTECTORS)—For SNUBBER ADAPTERS and REDUCING ADAPTERS, see Filter subsection of Master Catalog Binder.

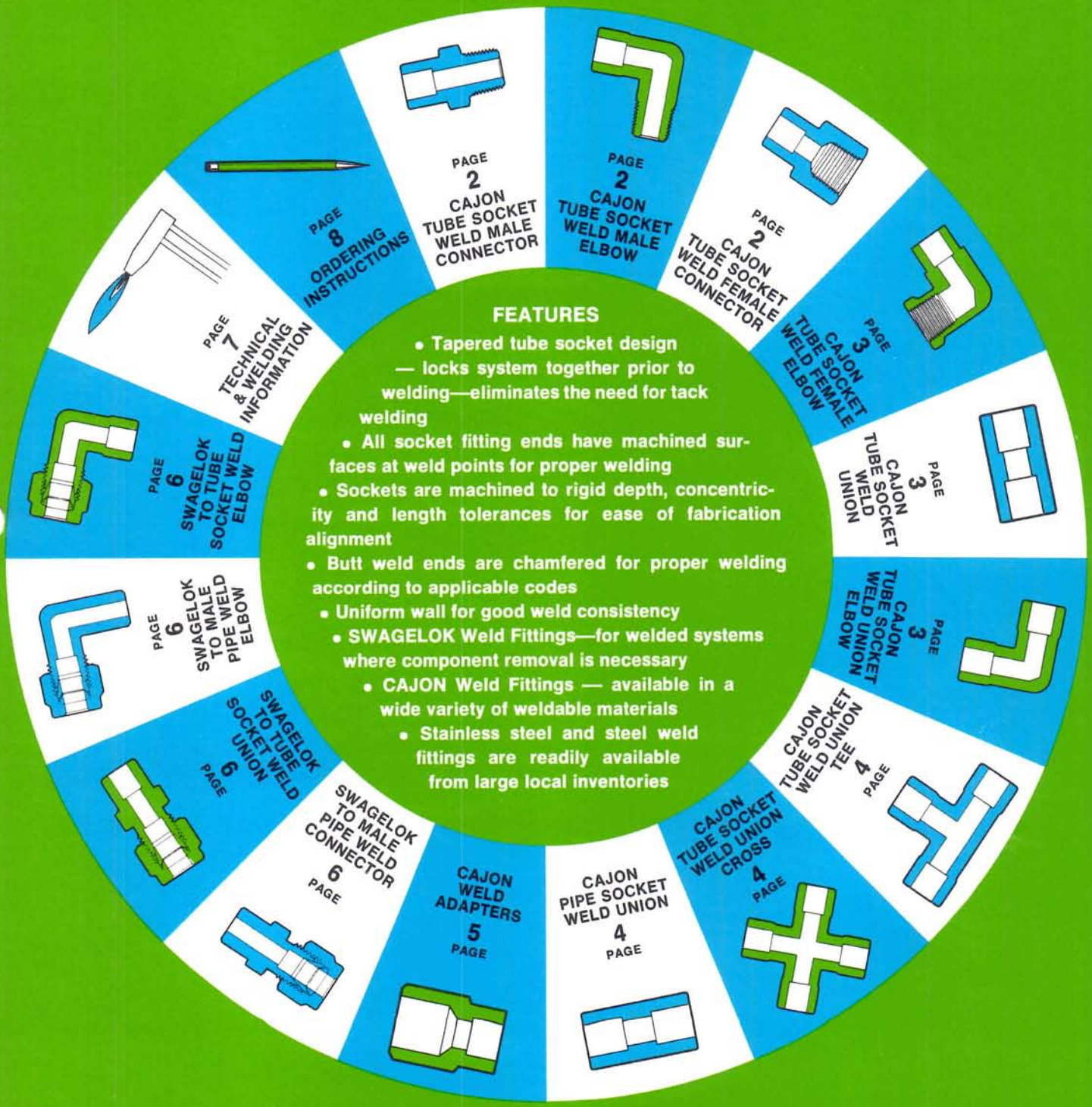
YOUR LOCAL SALES & SERVICE REPRESENTATIVE:

1-75-125M-250M-8L

PRINTED IN U.S.A.

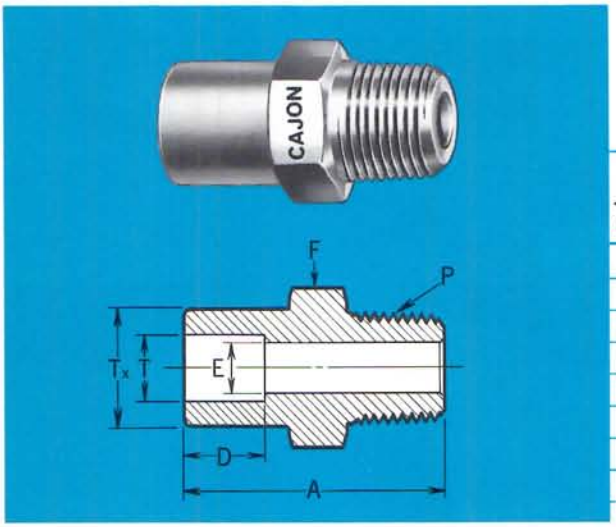
For a complete adaptation to imported straight and tapered pipe threads, consult your local distributor for "ISO - NPT" fittings.

WELD FITTINGS



PURPOSE: CAJON Weld Fittings are designed for use where permanent welded connections are required, to avoid the problems inherent in applications involving corrosive fluids, shock from pressure surges, temperature cycling and system vibration.

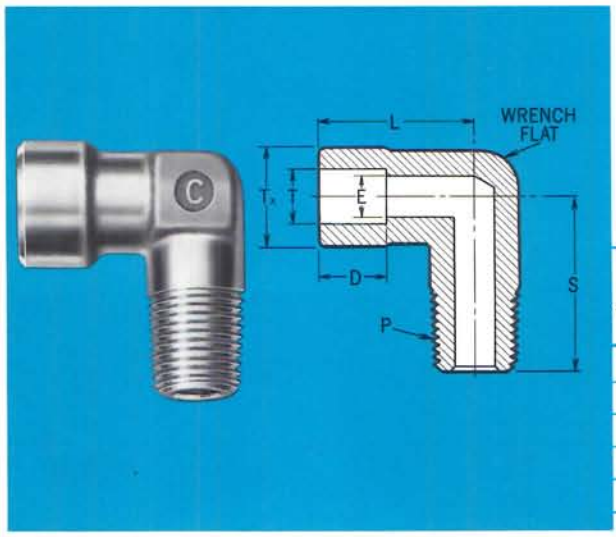
SWAGELOK Weld Fittings are used to provide disassembly in an otherwise permanently welded tubing system.



TUBE SOCKET WELD MALE CONNECTOR

Used to install welded tube connection to a female threaded pipe port.

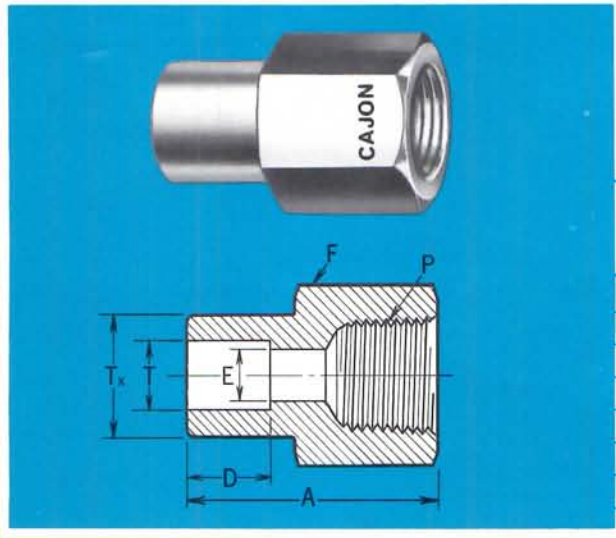
T TUBE O.D.	P MALE PIPE SIZE	CATALOG NUMBER*	A	D	E MIN. OPENING	F HEX FLAT	Tx	WORKING PRESSURE PSIG 304L 316	WORKING PRESSURE PSIG C-1018
1/8	1/8	-2-TSW-1-2	13/16	7/32	3/32	7/16	5/16	9,000	9,600
1/4	1/8	-4-TSW-1-2	29/32	9/32	3/16	1/2	1/2	9,000	9,600
1/4	1/4	-4-TSW-1-4	1 1/8	9/32	3/16	9/16	1/2	7,000	7,500
3/8	1/4	-6-TSW-1-4	1 3/16	5/16	9/32	5/8	5/8	7,000	7,500
3/8	3/8	-6-TSW-1-6	1 7/32	5/16	9/32	11/16	5/8	6,900	7,300
3/8	1/2	-6-TSW-1-8	1 13/32	5/16	9/32	7/8	5/8	5,700	6,100
1/2	3/8	-8-TSW-1-6	1 9/32	3/8	3/8	3/4	3/4	6,900	7,300
1/2	1/2	-8-TSW-1-8	1 15/32	3/8	13/32	7/8	3/4	5,700	6,100
5/8	1/2	-10-TSW-1-8	1 1/2	13/32	1/2	15/16	15/16	5,700	6,100



TUBE SOCKET WELD MALE ELBOW

Used to install welded tube connection to a female threaded pipe port at a 90° angle.

T TUBE O.D.	P MALE PIPE SIZE	CATALOG NUMBER*	D	E MIN. OPEN-ING	L	S	WRENCH FLAT	Tx	WORKING PRESSURE PSIG 304L 316	WORKING PRESSURE PSIG C-1018
1/4	1/4	-4-TSW-2-4	9/32	3/16	27/32	15/16	1/2	1/2	7,000	7,500
3/8	1/4	-6-TSW-2-4	5/16	9/32	13/16	15/16	1/2	19/32	7,000	7,500
3/8	3/8	-6-TSW-2-6	5/16	9/32	1	1	11/16	5/8	6,900	7,300
3/8	1/2	-6-TSW-2-8	5/16	9/32	1 1/32	1 3/8	13/16	5/8	5,700	6,100
1/2	1/2	-8-TSW-2-8	3/8	13/32	1 3/32	1 3/8	13/16	3/4	5,700	6,100
3/4	3/4	-12-TSW-2-12	7/16	5/8	1 7/32	1 7/16	1	1 1/8	6,000	6,400



TUBE SOCKET WELD FEMALE CONNECTOR

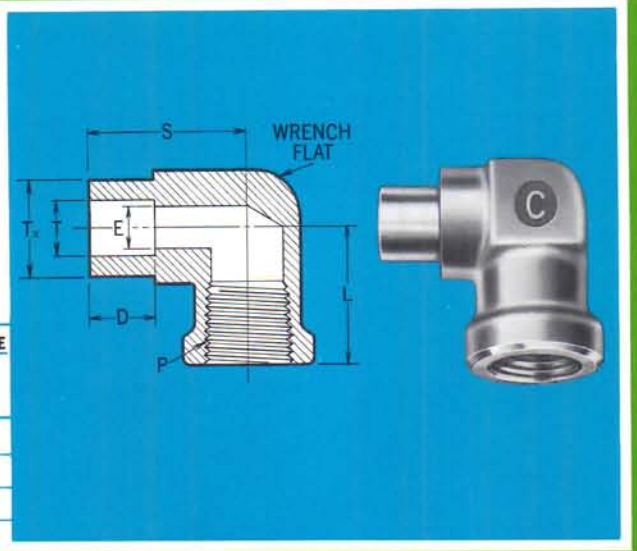
Used to install welded tube connection to a male pipe thread.

T TUBE O.D.	P FEMALE PIPE SIZE	CATALOG NUMBER*	A	D	E MIN. OPENING	F HEX FLAT	Tx	WORKING PRESSURE PSIG 304L 316	WORKING PRESSURE PSIG C-1018
1/8	1/8	-2-TSW-7-2	15/16	7/32	3/32	9/16	5/16	5,400	5,800
1/4	1/8	-4-TSW-7-2	1	9/32	3/16	9/16	1/2	5,400	5,800
1/4	1/4	-4-TSW-7-4	1 3/16	9/32	3/16	3/4	1/2	5,100	5,400
3/8	1/4	-6-TSW-7-4	1 3/16	5/16	9/32	3/4	5/8	5,100	5,400
3/8	3/8	-6-TSW-7-6	1 5/16	5/16	9/32	7/8	5/8	4,500	4,800
1/2	3/8	-8-TSW-7-6	1 3/8	3/8	13/32	7/8	3/4	4,500	4,800
1/2	1/2	-8-TSW-7-8	1 11/16	3/8	13/32	1 1/16	3/4	5,200	5,600
5/8	1/2	-10-TSW-7-8	1 11/16	13/32	1/2	1 1/16	15/16	5,200	5,600

*See PAGE 8 for material designator prefix and ordering instructions. Other sizes, both larger and smaller, are available on request. *Dimensions for reference only . . . subject to change.*

TUBE SOCKET WELD FEMALE ELBOW

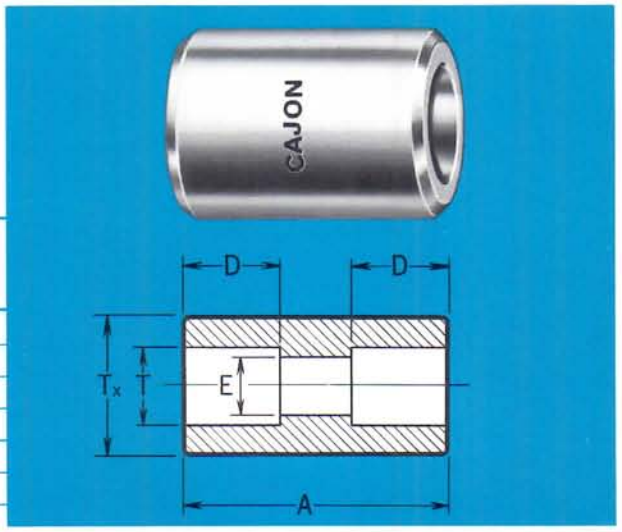
Used to install welded tube connection to a male pipe thread at a 90° angle.



T TUBE O.D.	P FEMALE PIPE SIZE	CATALOG NUMBER*	D	E MIN. OPEN-ING	L	S	Tx	WRENCH FLAT	WORKING PRESSURE PSIG 304L 316	WORKING PRESSURE PSIG C-1018
1/4	1/4	-4-TSW-8-4	9/32	3/16	27/32	3/4	1/2	11/16	5,100	5,400
3/8	1/4	-6-TSW-8-4	5/16	9/32	27/32	27/32	5/8	11/16	5,100	5,400
3/8	1/2	-6-TSW-8-8	5/16	9/32	1 1/8	1 1/16	5/8	1	5,200	5,600
1/2	1/2	-8-TSW-8-8	3/8	13/32	1 1/8	1 1/8	3/4	1	4,100	4,300

TUBE SOCKET WELD UNION

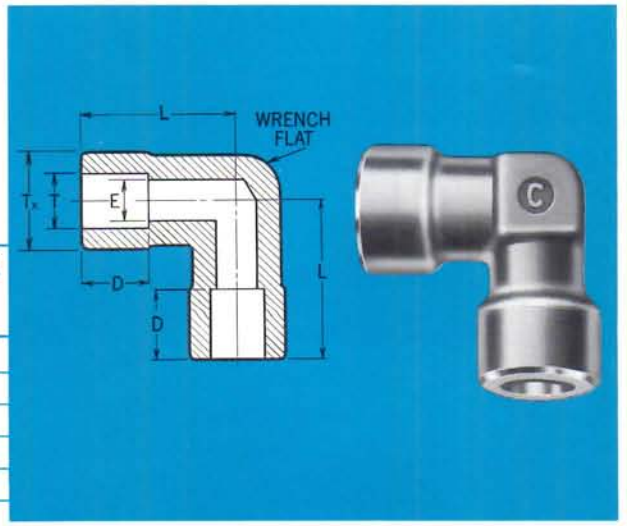
Used to install two welded tube connections in a straight line.



T TUBE O.D.	CATALOG NUMBER*	A	D	E MIN. OPENING	Tx	WORKING PRESSURE PSIG 304L 316	WORKING PRESSURE PSIG C-1018
1/8	-2-TSW-6	9/16	7/32	3/32	5/16	12,600	13,500
1/4	-4-TSW-6	11/16	9/32	3/16	1/2	10,800	11,500
3/8	-6-TSW-6	7/8	5/16	9/32	5/8	7,500	8,000
1/2	-8-TSW-6	1 1/16	3/8	13/32	3/4	6,900	7,400
5/8	-10-TSW-6	1 3/16	13/32	1/2	15/16	6,400	6,900
3/4	-12-TSW-6	1 5/16	7/16	5/8	1 1/16	6,000	6,400
1	-16-TSW-6	1 7/16	5/8	7/8	1 3/8	4,900	5,300

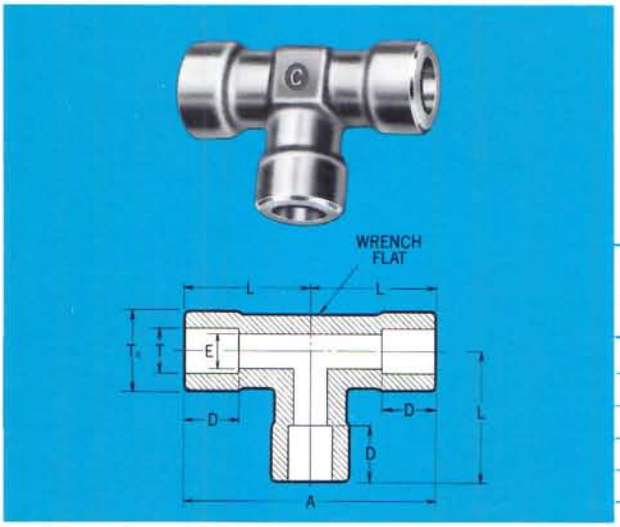
TUBE SOCKET WELD UNION ELBOW

Used to install two welded tube connections at a 90° angle.



T TUBE O.D.	CATALOG NUMBER*	D	E	L	WRENCH FLAT	Tx	WORKING PRESSURE PSIG 304L 316	WORKING PRESSURE PSIG C-1018
1/4	-4-TSW-9	9/32	3/16	23/32	7/16	1/2	10,800	11,500
3/8	-6-TSW-9	5/16	9/32	13/16	1/2	19/32	7,500	8,000
1/2	-8-TSW-9	3/8	13/32	1	11/16	13/16	6,900	7,400
5/8	-10-TSW-9	13/32	1/2	1 3/32	13/16	15/16	6,400	6,900
3/4	-12-TSW-9	7/16	5/8	1 7/32	1	1 1/8	6,000	6,400
1	-16-TSW-9	5/8	7/8	1 15/32	1 1/4	1 7/16	4,900	5,300

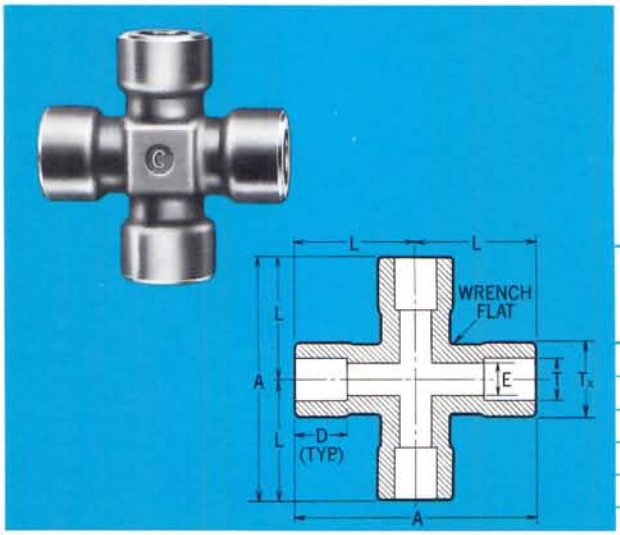
*See PAGE 8 for material designator prefix and ordering instructions. Other sizes, both larger and smaller, are available on request. *Dimensions for reference only . . . subject to change.*



TUBE SOCKET WELD UNION TEE

Used for tee-shaped installation of three welded tube connections.

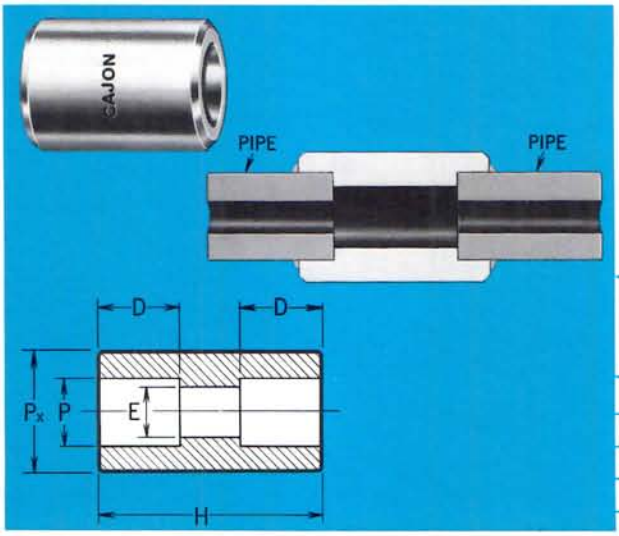
T TUBE O.D.	CATALOG NUMBER*	A	D	E MIN. OPEN-ING	L	WRENCH FLAT	Tx	WORKING PRESSURE PSIG 304L 316	WORKING PRESSURE PSIG C-1018
1/8	-2-TSW-3	1 7/16	7/32	3/32	23/32	7/16	5/16	12,600	13,500
1/4	-4-TSW-3	1 7/16	9/32	3/16	23/32	7/16	1/2	10,800	11,500
3/8	-6-TSW-3	1 5/8	5/16	9/32	13/16	1/2	19/32	7,500	8,000
1/2	-8-TSW-3	2	3/8	13/32	1	11/16	13/16	6,900	7,400
3/4	-12-TSW-3	2 7/16	7/16	5/8	1 7/32	1	1 1/8	6,000	6,400
1	-16-TSW-3	2 15/16	5/8	7/8	1 15/32	1 1/4	1 7/16	4,900	5,300



TUBE SOCKET WELD UNION CROSS

Used for cross-shaped installation of four welded tube connections.

T TUBE O.D.	CATALOG NUMBER*	A	D	E MIN. OPEN-ING	L	WRENCH FLAT	Tx	WORKING PRESSURE PSIG 304L 316	WORKING PRESSURE PSIG C-1018
1/8	-2-TSW-4	1 7/16	7/32	3/32	23/32	7/16	5/16	12,600	13,500
1/4	-4-TSW-4	1 7/16	9/32	3/16	23/32	7/16	1/2	10,800	11,500
3/8	-6-TSW-4	1 5/8	5/16	9/32	13/16	1/2	19/32	7,500	8,000
1/2	-8-TSW-4	2	3/8	13/32	1	11/16	13/16	6,900	7,400
3/4	-12-TSW-4	2 7/16	7/16	5/8	1 7/32	1	1 1/8	6,000	6,400
1	-16-TSW-4	2 15/16	5/8	7/8	1 15/32	1 1/4	1 7/16	4,900	5,300



PIPE SOCKET WELD UNION

Used for straight-line installation of two welded pipe connections.

P PIPE SIZE	CATALOG NUMBER*	D	E MIN. OPENING	Px	H	WORKING PRESSURE PSIG 304L 316	WORKING PRESSURE PSIG C-1018
1/4	-4-PSW-6	3/8	13/32	1	1 1/16	8,900	9,500
3/8	-6-PSW-6	7/16	1/2	1 1/8	1 1/8	8,100	8,700
1/2	-8-PSW-6	1/2	47/64	1 3/8	1 3/8	7,500	8,100
3/4	-12-PSW-6	5/8	15/16	1 1/2	1 3/4	5,300	5,700
1	-16-PSW-6	5/8	1 1/16	1 7/8	1 3/4	5,500	5,800

See PAGE 8 for material designator prefix and ordering instructions. Other sizes, both larger and smaller, are available on request. *Dimensions for reference only . . . subject to change.

WELD ADAPTERS

Versatility of CAJON Weld Adapters allows many different weld end combinations.

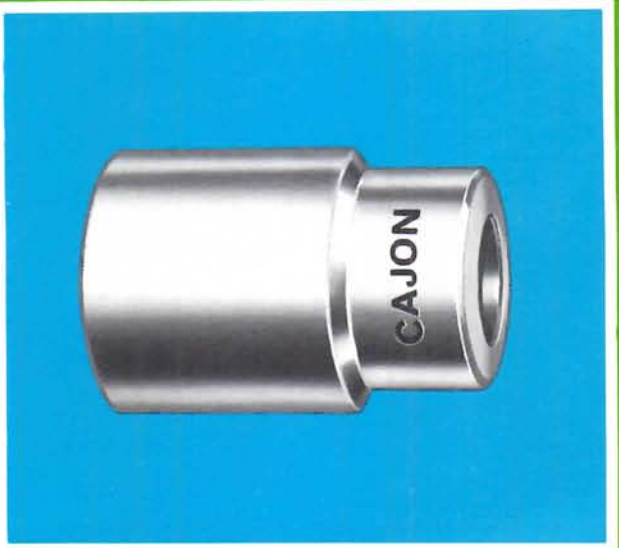
MPW=Male Pipe Weld—Also called Pipe Butt Weld

MTW=Male Tube Weld—Also called Tube Butt Weld

PSW=Pipe Socket Weld

TSW=Tube Socket Weld

A typical use would be to weld an MPW adapter into a pipe socket end of a valve. Substantial labor and material savings can be realized by converting to tubing downstream of the valve.

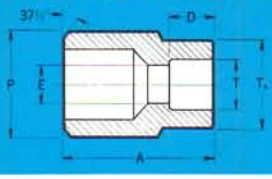


PIPE TO TUBE WELD ADAPTER

P PIPE SIZE	T TUBE SOCKET SIZE	CATALOG NUMBER*	A	D	E MIN. OPENING	Tx	WORKING PRESSURE PSIG 304L 316	WORKING PRESSURE PSIG C-1018
¼	¼	-4-MPW-A-4TSW	⅞	9/32	3/16	½	9,800	10,400
¼	⅜	-4-MPW-A-6TSW	29/32	5/16	9/32	⅝	7,500	8,000
⅜	⅜	-6-MPW-A-6TSW	1⅛	5/16	9/32	.675	7,500	8,000
⅜	½	-6-MPW-A-8TSW	1 1/16	⅜	13/32	¾	6,900	7,400
½	¼	-8-MPW-A-4TSW	1⅛	9/32	3/16	½	7,500	8,100
½	⅜	-8-MPW-A-6TSW	1⅛	5/16	9/32	⅝	7,500	8,000
½	½	-8-MPW-A-8TSW	1 3/16	⅜	13/32	¾	6,900	7,400
¾	⅜	-12-MPW-A-6TSW	1½	5/16	9/32	⅝	6,200	6,600
¾	½	-12-MPW-A-8TSW	1½	⅜	13/32	¾	6,200	6,600
1	⅜	-16-MPW-A-6TSW	1⅜	5/16	9/32	⅝	5,700	6,100
1	½	-16-MPW-A-8TSW	1 9/16	⅜	13/32	¾	5,700	6,100

Used to reduce from a pipe socket to a smaller tube size.

Used to reduce from a pipe butt weld to a smaller tube size.

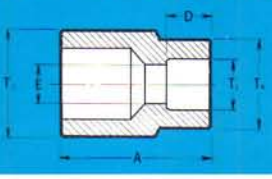


TUBE TO TUBE WELD ADAPTER

T2 TUBE FITTING O.D.	T TUBE SOCKET SIZE	CATALOG NUMBER*	A	D	E	Tx	WORKING PRESSURE PSIG 304L 316	WORKING PRESSURE PSIG C-1018
¼	⅛	-4-MTW-A-2TSW	11/16	7/32	3/32	5/16	11,700	12,500
⅜	⅛	-6-MTW-A-2TSW	¾	7/32	3/32	5/16	7,500	8,000
⅜	¼	-6-MTW-A-4TSW	¾	9/32	3/16	½	7,500	8,000
½	¼	-8-MTW-A-4TSW	⅞	9/32	3/16	½	7,100	7,600
½	⅜	-8-MTW-A-6TSW	⅞	5/16	9/32	⅝	7,100	7,600
¾	⅜	-12-MTW-A-6TSW	1⅛	5/16	9/32	⅝	6,100	6,500
¾	½	-12-MTW-A-8TSW	1⅛	⅜	13/32	¾	6,100	6,500
1	½	-16-MTW-A-8TSW	1⅜	⅜	13/32	¾	4,900	5,300

Used to reduce from a tube socket to a smaller tube size.

Used to reduce from a tube butt weld to a smaller tube size.

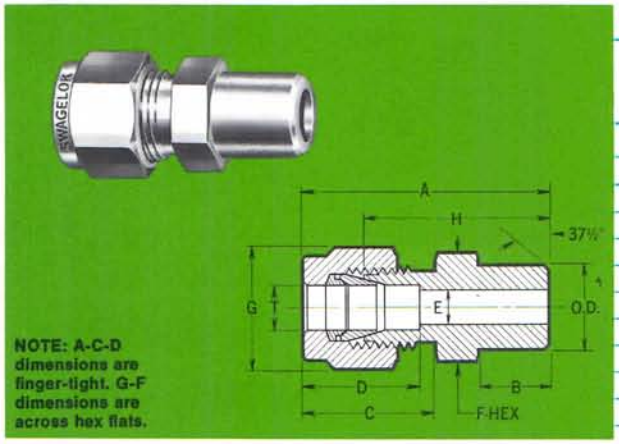


*See PAGE 8 for material designator prefix and ordering instructions. Other sizes, both larger and smaller, are available on request. *Dimensions for reference only . . . subject to change.*

Swagelok

TO WELD FITTINGS

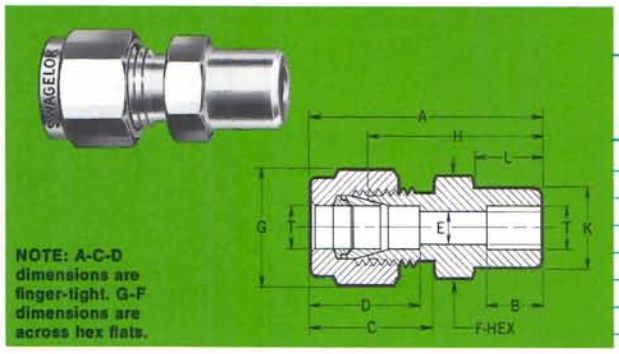
SWAGELOK TO MALE PIPE WELD CONNECTOR



NOTE: A-C-D dimensions are finger-tight. G-F dimensions are across hex flats.

T TUBE O.D.	MALE PIPE WELD SIZE	CATALOG NUMBER	PIPE WELD O.D.	A	B	C	D	E MIN. OPEN-ING	F	G	H
1/8	1/8	-200-1-2MPW	.405	1 3/16	3/8	5/8	17/32	3/32	7/16	7/16	29/32
3/16	1/8	-300-1-2MPW	.405	1 15/64	3/8	21/32	9/16	1/8	7/16	1/2	61/64
1/4	1/8	-400-1-2MPW	.405	1 5/16	3/8	23/32	5/8	3/16	1/2	9/16	1
1/4	1/4	-400-1-4MPW	.540	1 1/2	9/16	23/32	5/8	3/16	9/16	9/16	1 3/16
3/8	1/4	-600-1-4MPW	.540	1 19/32	9/16	25/32	11/16	9/32	5/8	11/16	1 9/32
3/8	3/8	-600-1-6MPW	.675	1 19/32	9/16	25/32	11/16	9/32	11/16	11/16	1 9/32
3/8	1/2	-600-1-8MPW	.840	1 13/16	3/4	25/32	11/16	9/32	7/8	11/16	1 1/2
1/2	3/8	-810-1-6MPW	.675	1 23/32	9/16	7/8	29/32	13/32	13/16	7/8	1 5/16
1/2	1/2	-810-1-8MPW	.840	1 29/32	3/4	7/8	29/32	13/32	7/8	7/8	1 1/2
5/8	1/2	-1010-1-8MPW	.840	1 15/16	3/4	7/8	31/32	1/2	15/16	1	1 17/32
3/4	3/4	-1210-1-12MPW	1.050	2	3/4	7/8	31/32	5/8	1 1/16	1 1/8	1 19/32
1	1	-1610-1-16MPW	1.315	2 1/16	15/16	1 1/32	1 7/32	7/8	1 3/8	1 1/2	1 31/32

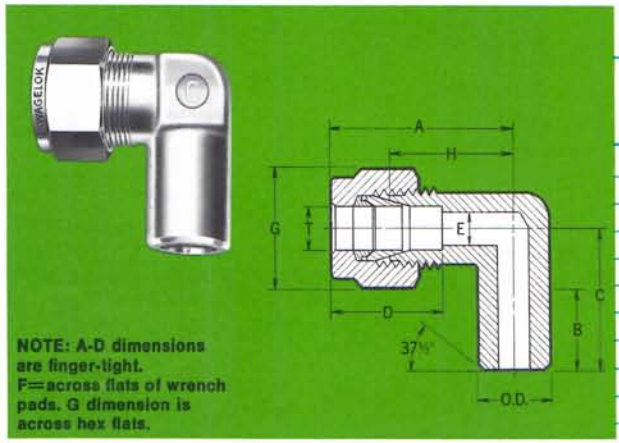
SWAGELOK TO TUBE SOCKET WELD UNION



NOTE: A-C-D dimensions are finger-tight. G-F dimensions are across hex flats.

T TUBE O.D.	CATALOG NUMBER	A	B	C	D	E MIN. OPEN-ING	F	G	H	K	L
1/8	-200-6-2TSW	1 5/32	1/4	5/8	17/32	3/32	7/16	7/16	7/8	5/16	11/32
3/16	-300-6-3TSW	1 15/64	9/32	21/32	9/16	1/8	7/16	1/2	61/64	3/8	3/8
1/4	-400-6-4TSW	1 11/32	5/16	23/32	5/8	3/16	1/2	9/16	1 1/32	7/16	13/32
3/8	-600-6-6TSW	1 1/2	3/8	25/32	11/16	9/32	5/8	11/16	1 3/16	5/8	15/32
1/2	-810-6-8TSW	1 5/8	1/2	7/8	29/32	13/32	13/16	7/8	1 7/32	3/4	15/32
5/8	-1010-6-10TSW	1 21/32	9/16	7/8	31/32	1/2	15/16	1	1 1/4	7/8	15/32
3/4	-1210-6-12TSW	1 23/32	9/16	7/8	31/32	5/8	1 1/16	1 1/8	1 5/16	1 1/16	15/32
1	-1610-6-16TSW	2 1/16	3/4	1 1/32	1 7/32	7/8	1 3/8	1 1/2	1 19/32	1 5/16	9/16

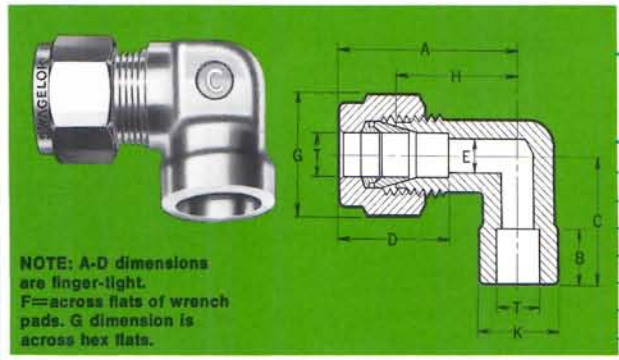
SWAGELOK TO MALE PIPE WELD ELBOW



NOTE: A-D dimensions are finger-tight. F=across flats of wrench pads. G dimension is across hex flats.

T TUBE O.D.	MALE PIPE WELD SIZE	CATALOG NUMBER	PIPE WELD O.D.	A	B	C	D	E MIN. OPEN-ING	F	G	H
1/8	1/8	-200-2-2MPW	.405	15/16	3/8	23/32	17/32	3/32	7/16	7/16	21/32
3/16	1/8	-300-2-2MPW	.405	31/32	3/8	3/4	9/16	1/8	7/16	1/2	11/16
1/4	1/8	-400-2-2MPW	.405	1 1/32	3/8	25/32	5/8	3/16	7/16	9/16	23/32
1/4	1/4	-400-2-4MPW	.540	1 3/32	9/16	15/16	5/8	3/16	1/2	9/16	25/32
3/8	1/4	-600-2-4MPW	.540	1 5/32	9/16	1	11/16	9/32	1/2	11/16	27/32
1/2	3/8	-810-2-6MPW	.675	1 3/8	9/16	1 1/8	29/32	13/32	11/16	7/8	31/32
1/2	1/2	-810-2-8MPW	.840	1 7/16	3/4	1 5/16	29/32	13/32	13/16	7/8	1 1/32
5/8	1/2	-1010-2-8MPW	.840	1 7/16	3/4	1 3/8	31/32	1/2	13/16	1	1 1/32
3/4	3/4	-1210-2-12MPW	1.050	1 9/16	3/4	1 1/2	31/32	5/8	1	1 1/8	1 5/32
1	3/4	-1610-2-12MPW	1.050	1 25/32	15/16	1 21/32	1 7/32	7/8	1 1/4	1 1/2	1 5/16
1	1	-1610-2-16MPW	1.315	1 25/32	15/16	1 21/32	1 7/32	7/8	1 1/4	1 1/2	1 5/16

SWAGELOK TO TUBE SOCKET WELD ELBOW



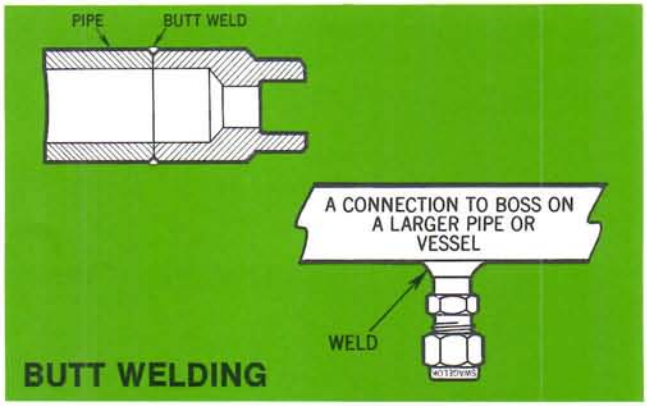
NOTE: A-D dimensions are finger-tight. F=across flats of wrench pads. G dimension is across hex flats.

T TUBE O.D.	CATALOG NUMBER	A	B	C	D	E MIN. OPEN-ING	F	G	H	K
1/8	-200-9-2TSW	15/16	1/4	21/32	17/32	3/32	7/16	7/16	21/32	1/2
3/16	-300-9-3TSW	31/32	9/32	11/16	9/16	1/8	7/16	1/2	11/16	1/2
1/4	-400-9-4TSW	1 1/32	5/16	23/32	5/8	3/16	7/16	9/16	23/32	1/2
3/8	-600-9-6TSW	1 5/32	3/8	27/32	11/16	9/32	1/2	11/16	27/32	19/32
1/2	-810-9-8TSW	1 3/8	1/2	31/32	29/32	13/32	11/16	7/8	31/32	13/16
5/8	-1010-9-10TSW	1 7/16	9/16	1 1/32	31/32	1/2	13/16	1	1 1/32	15/16
3/4	-1210-9-12TSW	1 9/16	9/16	1 5/32	31/32	5/8	1	1 1/8	1 5/32	1 1/8
1	-1610-9-16TSW	1 25/32	3/4	1 5/16	1 7/32	7/8	1 1/4	1 1/2	1 5/16	1 7/16

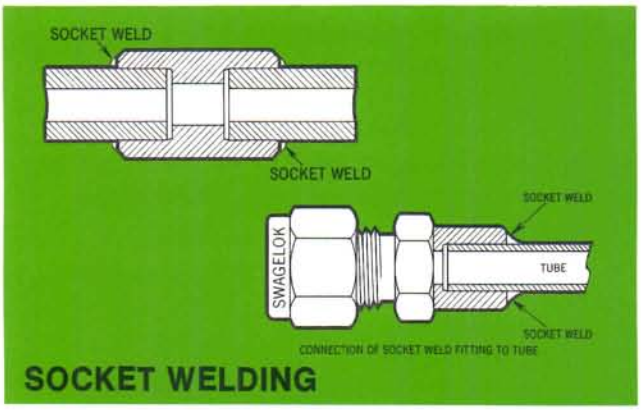
NOTE: Weld ends conform with code for pressure piping ASA-B31.1. and all pipe ends shown have Schedule 80 wall thickness or greater.
For complete technical and installation information on other SWAGELOK Tube Fittings, see subsection on Tube Fittings (1" & under) in Master Catalog Binder.
Dimensions for reference only . . . subject to change.

Technical & Welding INFORMATION

CAJON and SWAGELOK Weld Fittings are precision machined to meet applicable ASME specifications and ASA pressure piping codes. Pressure ratings listed for each fitting are calculated in accordance with Power Piping Code ASA B31.1 and Refinery Piping Code ASA B31.3. All working pressures listed are at 3:1 safety factor for carbon steel and 4:1 safety factor for stainless steel.



A Butt Weld Fitting, normally welded to a pipe or boss, is butted against the face of the component to which it is to be welded. A circumferential fillet weld is then made at the butt joint.



A Socket Weld Fitting has a provision for inserting a tube or pipe into its socket. The fillet weld is then made around the tube or pipe O.D. on the face of the fitting.

SWAGELOK TO WELD FITTINGS

SWAGELOK to weld connections allow easy disassembly of otherwise all welded systems, and provide a transition from welded to non-welded tubing systems.

Installation

When proper methods and precautions are used, SWAGELOK to Weld Fittings will give the usual high quality performance of all other SWAGELOK Tube Fittings.

Completely assembled fittings should not be welded (either pulled up or finger-tight as received) because distortion of the assembly often occurs and lubricants are removed from the nut, making subsequent pull-up or disassembly difficult. The first step in installing a weld fitting is to remove the nuts and ferrules and provide a protecting cap on the tube fitting end as discussed below.

Handling Precautions When Welding

When welding any fitting, regardless of material, care must always be taken so as not to damage the SWAGELOK end or port. If this end is left unprotected, weld spatter during welding can cause damage to threads, machined surfaces, and/or sealing surfaces. This can be eliminated by using a nut or standard fitting plug to cover the thread and seat areas.

The nut or plug needs only to be snugged up by hand to insure protection. This method will allow you to continue using the same nut or plug many times as a protective device while welding.

Material

The choice of fitting material and material being welded is very critical. The same materials will insure the same coefficients of expansion and thus eliminate possibilities of faulty weld, out-of-roundness, dimensional changes, etc., that could be detrimental to a good weld connection.

Welding Procedure

Tack welding at four positions 90° apart will hold the fitting in place while completing the weld. Alignment and concentricity of components are insured by this technique. Refer to Page 8 for further alignment information.

Lubricating Precautions After Welding

When welding carbon steel parts, the protective oil coating is often removed by heat. If a SWAGELOK to Weld Fitting is tightened after the oil is removed or has flashed off, there is a chance of galling if no other lubricant such as "Goop" is used. Improper pull-up or tightening, which causes a poor connection, could result from poorly lubricated threads.

WELD FITTING MATERIALS

CAJON	SWAGELOK
S—Steel (C-1018)	A—Aluminum (6061 T6)
SS—Stainless Steel (316)	B—Brass (Free Cutting)
304L—Stainless Steel (304L)	S—Steel (C-1018)
	SS—Stainless Steel (316)

See complete list of fitting materials and designator codes at beginning of FITTINGS section of Master Catalog Binder.

NOTE: For connecting high pressure fittings to welded systems see High Pressure Fittings Subsection of Master Catalog Binder.

Ordering Instructions

The numbering system for CAJON Weld Fittings is designed so that all part numbers are prefixed by a MATERIAL DESIGNATOR code followed by a dash. Examples: B— (brass), S— (steel), SS— (316 stainless steel), 304L— (304L stainless steel).

The SIZE DESIGNATOR following the dash indicates tube or pipe size in sixteenths of an inch.

The letter combination following the SIZE DESIGNATOR identifies the TYPE OF WELD CONNECTION:

MPW=Male Pipe Weld
MTW=Male Tube Weld
PSW=Pipe Socket Weld
TSW=Tube Socket Weld

The letter or number following the TYPE OF WELD CONNECTION identifies the TYPE OF FITTING:

1—Weld to Male Pipe Connector
2—Weld to Male Pipe Elbow
3—Weld Union Tee
4—Weld Union Cross
6—Weld Union
7—Weld to Female Pipe Connector
8—Weld to Female Pipe Elbow
9—Weld Union Elbow
A—Adapter

The number or number and letters following the TYPE OF FITTING designates the REDUCED SIZE AND TYPE OF END CONNECTION (if applicable).

TYPICAL CAJON PART NUMBERS

MATERIAL	DESIGNATOR		SIZE DESIGNATOR		TYPE OF WELD CONNECTION		TYPE OF FITTING		REDUCED SIZE CONNECTION (IF APPLICABLE)	SEE CATALOG PAGE NO.
316	SS	–	4	–	TSW	–	1	–	4	2
316	SS	–	8	–	PSW	–	6			4
304L	304L	–	6	–	MTW	–	A	–	4TSW	5
Steel	S	–	12	–	MPW	–	A	–	8TSW	5

TYPICAL SWAGELOK PART NUMBERS

MATERIAL	DESIGNATOR		SWAGELOK SIZE DESIGNATOR		TYPE OF FITTING		WELD END SIZE AND TYPE	SEE CATALOG PAGE NO.
Steel	S	–	400	–	1	–	4MPW	6
Brass	B	–	400	–	9	–	4TSW	6
316	SS	–	600	–	2	–	4MPW	6
Steel	S	–	810	–	6	–	8TSW	6

See complete list of fitting materials and designator codes at beginning of FITTING section of Master Catalog Binder.

PRE-ASSEMBLY BEFORE WELDING

All CAJON Socket Weld Fittings incorporate a tapered socket which facilitates system assembly. The taper holds the tubing in place during welding, allowing pre-assembly of several tubing runs before welding. In addition, the tapered socket design improves alignment, and virtually eliminates high stresses in the weld area because the tube end does not bottom out in the fitting socket.

WELD END VALVES

PATENTED

WHITEY Severe Service Ball Tip Shut-off Valves are available with butt weld and socket weld ends in pressure ratings to 6000 psi. *See Regulating and Shut-off Valve Subsection of Master Catalog Binder for complete information.*

NUPRO Bellows Valves with butt weld and socket weld ends can be used to handle the most difficult fluid containment problems. Pressures range from vacuum to 2500 psi and temperatures from cryogenic to 1500°F. *See Bellows Valve Subsection of Master Catalog Binder for complete information.*

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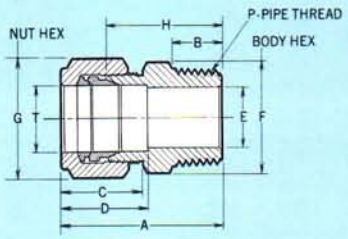
Other weld fittings may be found in the Vacuum Products subsection.

Swagelok®

1¼", 1½" & 2" TUBE FITTINGS

Manufactured to exact tolerances for all industrial applications, SWAGELOK 1¼", 1½" & 2" steel and 316 stainless steel tube fittings provide leak-proof, trouble-free service.

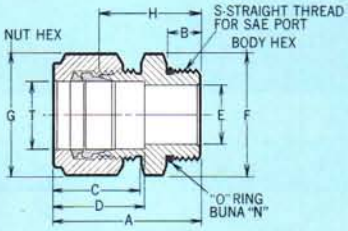
Patent Pending



Swagelok® Male Connector

CATALOG NUMBER*	T Tube O.D.	P Male Pipe Size	A	B	C	D	E Min. Opening	F	G	H
-2000-1-20	1¼	1¼	3 1/32	15/16	1 17/32	1⅝	1 3/32	1¾	1⅞	2 11/64
-2400-1-24	1½	1½	3½	1 1/32	1 25/32	1 31/32	1 11/32	2⅛	2¼	2 7/16
-3200-1-32	2	2	4 31/64	1 1/16	2 31/64	2 43/64	1 13/16	2¾	3	3

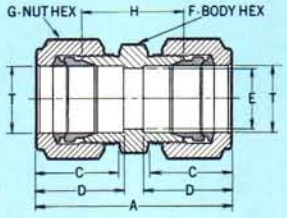
NOTE — A-C-D dimensions are finger-tight/G-F dimensions are across hex flats.



Swagelok® Connector for Straight Thread Boss**

CATALOG NUMBER*	T Tube O.D.	S Thr'd Size	A	B	C	D	E Min. Opening	F	G	H	O-Ring Uniform Size No.
-2000-1-20ST	1¼	1⅝-12	2 11/16	19/32	1 17/32	1⅝	1 3/32	1⅞	1⅞	1 53/64	920
-2400-1-24ST	1½	1⅞-12	3 1/16	19/32	1 25/32	1 31/32	1 11/32	2⅛	2¼	2	924
-3200-1-32ST	2	2½-12	4 1/64	19/32	2 31/64	2 43/64	1 13/16	2¾	3	2 17/32	932

NOTE — A-C-D dimensions are finger-tight/G-F dimensions are across hex flats.
**Adapts to MS-33649; AND 10049; AND 10050; JIC and SAE Ports.



Swagelok® Union

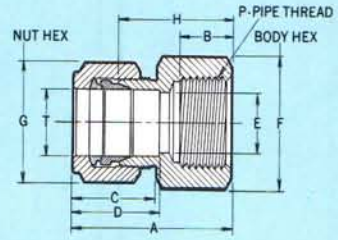
CATALOG NUMBER*	T Tube O.D.	A	C	D	E Min. Opening	F	G	H
-2000-6	1¼	3⅝	1 17/32	1⅝	1 3/32	1¾	1⅞	1 57/64
-2400-6	1½	4¼	1 25/32	1 31/32	1 11/32	2⅛	2¼	2 7/64
-3200-6	2	5 29/32	2 31/64	2 43/64	1 13/16	2¾	3	2 15/16

NOTE — A-C-D dimensions are finger-tight/G-F dimensions are across hex flats.

Component parts of SWAGELOK Tube Fittings are all made of the same material. Dimensions for reference only . . . subject to change.

All dimensions are in inches
*Tube Fittings are available in carbon steel and type 316 stainless steel. Use S- as a prefix for carbon steel and SS- as a prefix for stainless steel.

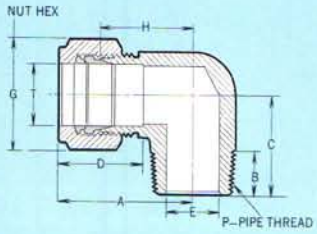
CRAWFORD FITTING COMPANY
29500 SOLON ROAD • CLEVELAND, OHIO 44139
Crawford Fittings (Canada), Ltd. • Niagara Falls, Ontario



Swagelok® Female Connector

CATALOG NUMBER*	T Tube O.D.	P Female Pipe Size	A	B	C	D	E Min. Open-ing	F	G	H
-2000-7-20	1¼	1¼	2 15/16	1	1 17/32	1⅝	1 3/32	2⅛	1⅞	2 5/64
-2400-7-24	1½	1½	3 9/32	1 3/32	1 25/32	1 31/32	1 11/32	2⅜	2¼	2 7/32
-3200-7-32	2	2	4 1/64	1⅛	2 31/64	2 43/64	1 13/16	2⅞	3	2 17/32

NOTE — A-C-D dimensions are finger-tight/G-F dimensions are across hex flats.

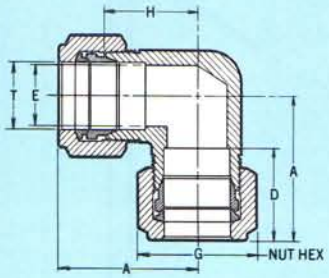


Swagelok® Male Elbow

CATALOG NUMBER*	T Tube O.D.	P Male Pipe Size	A	B	C	D	E Min. Open-ing	F	G	H
-2000-2-20	1¼	1¼	2⅝	15/16	1⅞	1⅝	1 3/32	1 11/16	1⅞	1¾
-2400-2-24	1½	1½	3 1/16	1 1/16	2⅜	1 31/32	1 11/32	2	2¼	2
-3200-2-32	2	2	4 15/64	1 3/32	2⅞	2 43/64	1 13/16	2¾	3	2¾

NOTE—A-D dimensions are finger-tight/F=across flats of wrench pads/G dimension is across hex flats.

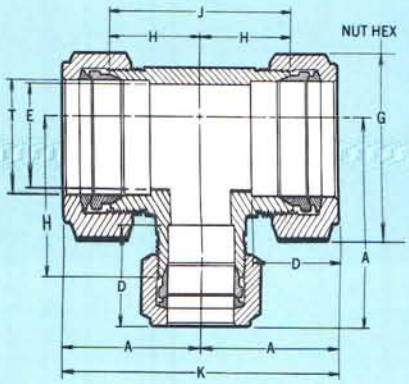
Component parts of SWAGELOK Tube Fittings are all made of the same material. Dimensions for reference only . . . subject to change.



Swagelok® Union Elbow

CATALOG NUMBER*	T Tube O.D.	A	D	E Min. Open-ing	F	G	H
-2000-9	1¼	2⅝	1⅝	1 3/32	1 11/16	1⅞	1¾
-2400-9	1½	3 5/64	1 31/32	1 11/32	2	2¼	2
-3200-9	2	4 15/64	2 43/64	1 13/16	2¾	3	2¾

NOTE—A-D dimensions are finger-tight/both ports are identical/F=across flats of wrench pads/G dimension is across hex flats.



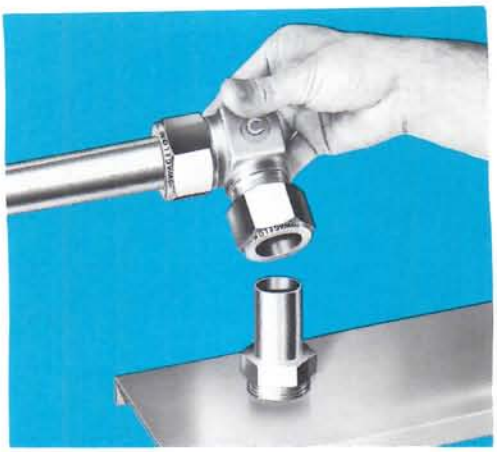
Swagelok® Union Tee

CATALOG NUMBER*	T Tube O.D.	A	D	E Min. Open-ing	F	G	H	J	K
-2000-3	1¼	2⅝	1⅝	1 3/32	1 11/16	1⅞	1¾	3½	5¼
-2400-3	1½	3 5/64	1 31/32	1 11/32	2	2¼	2	4	6 5/32
-3200-3	2	4 7/32	2 43/64	1 13/16	2¾	3	2 47/64	5 15/32	8 7/16

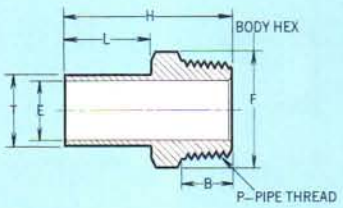
NOTE—A-D-K dimensions are finger-tight/all ports are identical/F=across flats of wrench pads/G dimension is across hex flats.

All dimensions are in inches

*Tube Fittings are available in carbon steel and type 316 stainless steel.
Use S- as a prefix for carbon steel and SS- as a prefix for stainless steel.



For Male and Female Elbows, use Union Elbow with Male or Female Adapter as shown. Adapters can also be used to make Male Run, Male Branch, Female Run and Female Branch Tees when used in conjunction with Union Tees.

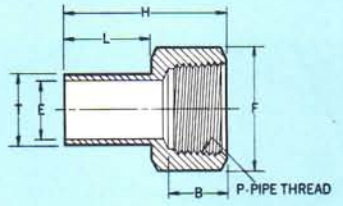


Swagelok® Male Adapter Tube to Pipe

CATALOG NUMBER*	T Tube O.D.	P Male Pipe Size	B	E Min. Opening	F	H	L
-2001-A-20	1¼	1¼	15/16	1 3/32	1¾	3 5/32	1 21/32
-2401-A-24	1½	1½	1 1/32	1 5/16	2⅛	3 23/32	2
-3201-A-32	2	2	1 1/16	1¾	2¾	4 45/64	2 45/64

NOTE — F dimension is across hex flats.

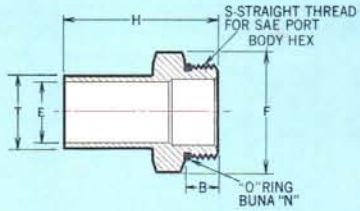
Component parts of SWAGELOK Tube Fittings are all made of the same material. Dimensions for reference only . . . subject to change.



Swagelok® Female Adapter Tube to Pipe

CATALOG NUMBER*	T Tube O.D.	P Female Pipe Size	B	E Min. Opening	F	H	L
-2001-A-20F	1¼	1¼	1	1 3/32	2⅛	3 1/16	1 21/32
-2401-A-24F	1½	1½	1 3/32	1 5/16	2⅜	3½	2
-3201-A-32F	2	2	1⅛	1¾	2⅞	4 15/64	2 45/64

NOTE — F dimension is across hex flats.



Swagelok® Adapter for Straight Thread Boss**

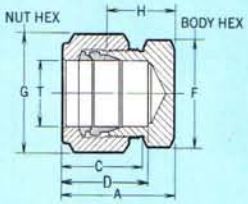
CATALOG NUMBER*	T Tube O.D.	S Thread Size	B	F	H	E Min. Opening	O-Ring Uniform Size No.
-2001-A-20ST	1¼	1⅝-12	19/32	1⅞	2 13/16	1 3/32	920
-2401-A-24ST	1½	1⅞-12	19/32	2⅛	3 9/32	1 5/16	924
-3201-A-32ST	2	2½-12	19/32	2¾	4 15/64	1¾	932

NOTE — F dimension is across hex flats.

**Adapts to MS-33649; AND 10049; AND 10050; JIC and SAE Ports.

All dimensions are in inches

*Tube Fittings are available in carbon steel and type 316 stainless steel. Use S- as a prefix for carbon steel and SS- as a prefix for stainless steel.

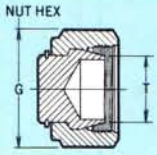


Swagelok® Cap (For capping end of tube)

CATALOG NUMBER*	T Tube O.D.	A	C	D	F	G	H
-2000-C	1¼	2 3/32	1 17/32	1 5/8	1¾	1⅞	1 15/64
-2400-C	1½	2 17/32	1 25/32	1 31/32	2⅛	2¼	1 15/32
-3200-C	2	3 27/64	2 31/64	2 43/64	2¾	3	1 15/16

NOTE — A-C-D dimensions are finger-tight/F-G dimensions are across hex flats.

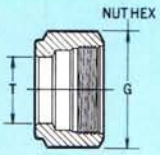
Swagelok® Plug (For plugging unused port of fitting)



CATALOG NUMBER*	T Tube O.D.	G
-2000-P	1¼	1⅞
-2400-P	1½	2¼
-3200-P	2	3

NOTE — G dimension is across hex flats.
NOTE: To tighten plug properly from finger-tight position, snug up nut with wrench only ¼ turn.

Swagelok® Nut



CATALOG NUMBER*	T Tube O.D.	G
-2002-1	1¼	1⅞
-2402-1	1½	2¼
-3202-1	2	3

NOTE — G dimension is across hex flats.

Swagelok® Front Ferrule

CATALOG NUMBER*	T Tube O.D.
-2003-1	1¼
-2403-1	1½
-3203-1	2

Swagelok® Back Ferrule

CATALOG NUMBER*	T Tube O.D.
-2004-1	1¼
-2404-1	1½
-3204-1	2

All dimensions are in inches

*Tube Fittings are available in carbon steel and type 316 stainless steel. Use S- as a prefix for carbon steel and SS- as a prefix for stainless steel.

Component parts of SWAGELOK Tube Fittings are all made of the same material. Dimensions for reference only . . . subject to change.

Swagelok® Hydraulic Swaging Unit

The SWAGELOK Hydraulic Swaging Unit is designed to make a safe and reliable torque-free, leak-proof seal on large tubing sizes.

The Hydraulic Swaging Unit consists of a Swaging Tool and an Accessory Case. The Accessory Case contains a Hydraulic Pump, Hose and Service Equipment.

Part Number	For
HSU-2000	1¼" SWAGELOK Fittings
HSU-2400	1½" SWAGELOK Fittings
HSU-3200	2" SWAGELOK Fittings

NOTE: SWAGELOK Carbon Steel Fittings are designed for use with high quality Soft Annealed Carbon Steel Tubing ASTM A-179 or equivalent; SWAGELOK Stainless Steel Fittings are designed for use with high quality Soft Annealed Stainless Steel Tubing ASTM A-269 or equivalent.

	RECOMMENDED WALL THICKNESS		
Tubing O.D. (")	Material	Min. Wall	Max. Wall
1¼	Carbon Steel	.065	.180
1¼	Stainless Steel	.065	.156
1½	Carbon Steel	.083	.220
1½	Stainless Steel	.083	.188
2	Carbon Steel	.095	.220
2	Stainless Steel	.095	.188

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Swagelok®
WHITEY®
CAJON®
'Sno-Trik®
NUPRO®

MATERIAL DESIGNATOR GUIDE

The following list shows materials and material designators for various standard and special fittings in this section of the binder. However, not all fittings are available in all materials and some fittings are available in materials not shown below. Consult your local distributor for current information on material availability.

All materials are designated as a PREFIX to the part number followed by a dash (—). For example: B - 400 - 2 - 4; SS - 400 - 2 - 4, etc.

MATERIALS - (Metal)	MATERIAL DESIGNATOR
A286 Alloy Steel	A286—
Aluminum Alloys	A—
Brass	B—
CMF22 Chrome Moly Steel	CMF22—
Gold/24 Carat	GOLD—
Hastelloy/Alloy B*	HB—
Hastelloy/Alloy C-276*	HC—
Hastelloy/Alloy X*	HX—
Haynes #25*	HY25—
Inconel 600†	INC—
Inconel X†	INCX—
Lead	LEAD—
Magnesium Alloys	MG21A—
Molybdenum	MO—
Monel†	M—
Nickel	NI—
Carpenter 20 Cb3 Stainless Steel‡	C20—
Carpenter 455 Stainless Steel‡	455—
17-4PH Stainless Steel	174PH—
302 Stainless Steel	302—
303 Stainless Steel	303—
304 Stainless Steel	304—
304L Stainless Steel	304L—
310 Stainless Steel	310—
316 Stainless Steel	SS—
316L Stainless Steel	316L—
321 Stainless Steel	321—
347 Stainless Steel	347—
416 Stainless Steel	416—
22-13-5 Stainless Steel§	SX—
Steel (Carbon)	S—
Tantalum	TA—
Titanium	TI—
Zirconium	ZR—
Zirconium Alloys	ZIRC—

MATERIALS - (Plastic)	MATERIAL DESIGNATOR
Acetal	DEL—
Nylon	NY—
PCTFE Fluorocarbon	KF—
Polyethylene	P—
Polypropylene	PP—
Polyvinyl Chloride	PVC—
TFE Fluorocarbon	T—

*—Cabot Corporation—Stellite Div.
†—International Nickel Co.
‡—Carpenter Technology Corp.
§—Armco Steel Corp.

STANDARD PARTS LIST No. 2

Effective December 1, 1974

CRAWFORD FITTING COMPANY

Swagelok®
TUBE FITTINGS

WHITEY®
MATCHLESS VALVES FOR EXACTING SERVICE

NUPRO®
PRECISION VALVES AND FILTERS

CAJON®
INDUSTRIAL AND VACUUM PRODUCTS

'Sno-Trik®
TUBE FITTINGS AND VALVES FOR HIGH PRESSURE

- The items indicated as standard (Std.) in this list are available from authorized distributors of the Crawford Fitting Company.
- All items not listed as standard (Std.) may be quoted by factories on request. This list applies to orders received on or after December 1, 1974.
- This list is subject to change without notice.

Swagelok® TUBE FITTINGS

1/16" O.D. TUBE

PART NUMBER	STD. PKG.	BRASS (B)	ALUMI-NUM (A)	STEEL (S)	316 STAINLESS (SS)	MONEL (M)	NYLON (NY)	TFE (T)
-100-1-1		Std.		Std.	Std.			
-100-1-OR					Std.			
-100-1-2	50	Std.		Std.	Std.			
-100-1-2BT					Std.			
-100-2-2	25	Std.			Std.			
-100-3		Std.			Std.			
-100-6		Std.		Std.	Std.			
-100-6-2AN		Std.						
-1FO-6GC					Std.			
-100-C		Std.			Std.			
-100-P		Std.			Std.			
-100-R-2		Std.		Std.	Std.			
-100-R-4		Std.			Std.			
-100-SET	100				Std.			Std.
-102-1	100	Std.		Std.	Std.			
-103-1	100	Std.		Std.	Std.		Std.	Std.
-104-1	100	Std.		Std.	Std.		Std.	Std.
-1F2-1GC					Std.			

1/8" O.D. TUBE (Cont'd)

PART NUMBER	STD. PKG.	BRASS (B)	ALUMI-NUM (A)	STEEL (S)	316 STAINLESS (SS)	MONEL (M)	NYLON (NY)	TFE (T)
-200-71-2		Std.						
-200-A1-2		Std.						
-201-A-2	25	Std.			Std.			
-201-A-2F		Std.			Std.			
-201-A-OR					Std.			
-200-A-2ANF					Std.			
-201-A-4	25	Std.			Std.			
-201-A-4F		Std.			Std.			
-200-C		Std.			Std.			
-200-P		Std.		Std.	Std.			
-201-PC		Std.			Std.			
-200-R-3	25	Std.			Std.			
-200-R-4	25	Std.		Std.	Std.			
-200-R-6		Std.			Std.			
-200-SET	100	Std.		Std.	Std.		Std.	Std.
-202-1	100	Std.	Std.	Std.	Std.			
-202-1K	100	Std.						
-203-1	100	Std.	Std.	Std.	Std.	Std.	Std.	Std.
-204-1	100	Std.	Std.	Std.	Std.	Std.	Std.	Std.

1/8" O.D. TUBE

PART NUMBER	STD. PKG.	BRASS (B)	ALUMI-NUM (A)	STEEL (S)	316 STAINLESS (SS)	MONEL (M)	NYLON (NY)	TFE (T)
-200-1-1		Std.			Std.			
-200-1-OR		Std.			Std.			
-200-1-2	50	Std.	Std.	Std.	Std.			
-200-1-2BT		Std.			Std.			
-200-1-2-OR		Std.			Std.			
-200-1-2MPW					Std.			
-200-1-4		Std.		Std.	Std.			
-200-1-4BT					Std.			
-200-2-2	25	Std.	Std.	Std.	Std.			
-200-2-4	25	Std.			Std.			
-200-3	15	Std.		Std.	Std.			
-200-3TFT		Std.			Std.			
-200-3TMT	15	Std.			Std.			
-200-3TTF	10	Std.			Std.			
-200-3TTM	15	Std.			Std.			
-200-4		Std.			Std.			
-200-6	50	Std.	Std.	Std.	Std.			
-200-6-1		Std.		Std.	Std.			
-200-6-2AN		Std.			Std.			
-200-6-2TSW					Std.			
-200-6-4AN		Std.			Std.			
-200-7-2	25	Std.			Std.			
-200-7-4		Std.			Std.			
-200-8-2	25	Std.			Std.			
-200-8-4					Std.			
-200-9	25	Std.			Std.			
-200-11-2		Std.						
-200-61	20	Std.		Std.	Std.			

3/16" O.D. TUBE

PART NUMBER	STD. PKG.	BRASS (B)	ALUMI-NUM (A)	STEEL (S)	316 STAINLESS (SS)	MONEL (M)	NYLON (NY)	TFE (T)
-300-1-2	50	Std.		Std.	Std.			
-300-1-2BT		Std.		Std.	Std.			
-300-1-OR		Std.			Std.			
-300-1-2MPW					Std.			
-300-1-4		Std.			Std.			
-300-1-4BT					Std.			
-300-2-2	20	Std.		Std.	Std.			
-300-3	20	Std.			Std.			
-300-3TTM	20	Std.						
-300-6	50	Std.		Std.	Std.			
-300-6-2		Std.			Std.			
-300-7-2	25	Std.			Std.			
-300-8-2	25	Std.						
-300-9	20	Std.			Std.			
-300-61	20	Std.			Std.			
-301-A-2	25	Std.			Std.			
-301-A-4	25	Std.						
-300-C		Std.			Std.			
-300-P		Std.			Std.			
-300-R-4	25	Std.			Std.			
-300-SET	100	Std.			Std.		Std.	
-302-1	100	Std.	Std.	Std.	Std.			
-302-1K	100	Std.						
-303-1	100	Std.	Std.	Std.	Std.		Std.	Std.
-304-1	100	Std.	Std.	Std.	Std.		Std.	Std.
-305-2		Std.			Std.			

The above part numbers are shown in fractional sizes.

Swagelok® TUBE FITTINGS

1/4" O.D. TUBE

PART NUMBER	STD. PKG.	BRASS (B)	ALUMI-NUM (A)	STEEL (S)	316 STAINLESS (SS)	MONEL (M)	NYLON (NY)	TFE (T)
-400-1-2	50	Std.	Std.	Std.	Std.		Std.	Std.
-400-1-2BT		Std.			Std.			
-400-1-OR		Std.		Std.	Std.			
-400-1-2-OR		Std.			Std.			
-400-1-2MPW					Std.			
-400-1-4	50	Std.	Std.	Std.	Std.		Std.	Std.
-400-1-4KN		Std.						
-400-1-4BT		Std.		Std.	Std.			
-400-1-4-OR		Std.			Std.			
-400-1-4MPW				Std.	Std.			
-400-1-6	50	Std.	Std.	Std.	Std.			
-400-1-8	25	Std.	Std.	Std.	Std.		Std.	
-400-1-8BT					Std.			
-400-2-2	20	Std.	Std.	Std.	Std.		Std.	
-400-2-2MPW					Std.			
-400-2-4	25	Std.	Std.	Std.	Std.		Std.	
-400-2-4MPW					Std.			
-400-2-6		Std.						
-400-2-8		Std.			Std.			
-400-3	20	Std.	Std.	Std.	Std.		Std.	Std.
-400-3TFT	20	Std.			Std.			
-400-3TMT	20	Std.	Std.	Std.	Std.		Std.	
-400-3TTF	20	Std.		Std.	Std.			
-400-3TTM	20	Std.	Std.	Std.	Std.		Std.	
-400-3-4TFT	20	Std.		Std.	Std.			
-400-3-4TMT		Std.	Std.	Std.	Std.			
-400-3-4TTF	20	Std.		Std.	Std.			
-400-3-4TTM		Std.	Std.	Std.	Std.			
-400-4		Std.		Std.	Std.			
-400-5-2		Std.		Std.				
-400-5-4					Std.			
-400-6	50	Std.	Std.	Std.	Std.		Std.	Std.
-400-6KN		Std.						
-400-6-1		Std.			Std.			
-400-6-2		Std.	Std.	Std.	Std.		Std.	
-400-6-3		Std.			Std.			
-400-6-4AN		Std.	Std.	Std.	Std.			
-400-6-4TSW					Std.			
-400-7-2	25	Std.	Std.	Std.	Std.		Std.	
-400-7-4	25	Std.	Std.	Std.	Std.		Std.	
-400-7-6		Std.						
-400-7-8		Std.			Std.			
-400-8-2	25	Std.		Std.	Std.			
-400-8-4	20	Std.	Std.	Std.	Std.			
-400-9	25	Std.	Std.	Std.	Std.		Std.	
-400-9-4TSW					Std.			
-400-11-2		Std.			Std.			
-400-11-4		Std.		Std.	Std.			
-400-61	20	Std.	Std.	Std.	Std.		Std.	
-400-61-2		Std.						
-400-61-4AN		Std.		Std.	Std.			
-400-71-2		Std.			Std.			
-400-71-4		Std.	Std.	Std.	Std.			
-400-A1-4		Std.	Std.	Std.	Std.			

1/4" O.D. TUBE (Cont'd)

PART NUMBER	STD. PKG.	BRASS (B)	ALUMI-NUM (A)	STEEL (S)	316 STAINLESS (SS)	MONEL (M)	NYLON (NY)	TFE (T)
-401-A-2	25	Std.		Std.	Std.			
-401-A-2F		Std.			Std.			
-401-A-OR		Std.			Std.			
-401-A-2-OR					Std.			
-401-A-4	25	Std.		Std.	Std.			
-401-A-4F		Std.		Std.	Std.			
-400-A-4ANF		Std.		Std.	Std.		Std.	
-401-A-6	20	Std.			Std.			
-401-A-8	25	Std.			Std.			
-401-A-8F		Std.			Std.			
-400-C		Std.	Std.	Std.	Std.		Std.	
-400-P		Std.	Std.	Std.	Std.		Std.	
-401-PC		Std.		Std.	Std.			
-401-PC-2		Std.			Std.			
-400-R-2		Std.			Std.			
-400-R-4					Std.			
-400-R-5	25	Std.			Std.			
-400-R-6	25	Std.	Std.	Std.	Std.		Std.	
-400-R-8	25	Std.	Std.	Std.	Std.			
-400-R-10		Std.			Std.			
-400-SET	100	Std.	Std.	Std.	Std.	Std.	Std.	Std.
-402-1	100	Std.	Std.	Std.	Std.		Std.	
-402-1K	100	Std.			Std.			
-403-1	100	Std.	Std.	Std.	Std.	Std.	Std.	Std.
-404-1	100	Std.	Std.	Std.	Std.	Std.	Std.	Std.
-405-2		Std.	Std.		Std.		Std.	
-405-170		Std.	Std.		Std.		Std.	
-405-3		Std.	Std.		Std.		Std.	

5/16" O.D. TUBE

PART NUMBER	STD. PKG.	BRASS (B)	ALUMI-NUM (A)	STEEL (S)	316 STAINLESS (SS)	MONEL (M)	NYLON (NY)	TFE (T)
-500-1-2	50	Std.		Std.	Std.			
-500-1-OR		Std.			Std.			
-500-1-4	50	Std.	Std.	Std.	Std.			
-500-1-4BT					Std.			
-500-2-2	20	Std.		Std.	Std.			
-500-2-4	20	Std.		Std.	Std.			
-500-3	20	Std.			Std.			
-500-3TMT	20	Std.						
-500-3TTM	20	Std.						
-500-6	50	Std.		Std.	Std.			
-500-6-4		Std.			Std.			
-500-7-2		Std.			Std.			
-500-7-4		Std.			Std.			
-500-8-2	15	Std.						
-500-8-4	20	Std.						
-500-9	20	Std.			Std.			
-500-61	20	Std.						

The above part numbers are shown in fractional sizes.

Swagelok® TUBE FITTINGS

5/16" O.D. TUBE (Cont'd)

PART NUMBER	STD. PKG.	BRASS (B)	ALUMI-NUM (A)	STEEL (S)	316 STAINLESS (SS)	MONEL (M)	NYLON (NY)	TFE (T)
-501-A-2	25	Std.			Std.			
-501-A-OR		Std.						
-501-A-4	25	Std.						
-500-C		Std.			Std.			
-500-P		Std.			Std.			
-500-R-6	25	Std.			Std.			
-500-SET	100	Std.			Std.		Std.	
-502-1	100	Std.	Std.	Std.	Std.			
-502-1K		Std.						
-503-1	100	Std.	Std.	Std.	Std.		Std.	Std.
-504-1	100	Std.	Std.	Std.	Std.		Std.	Std.
-505-3		Std.			Std.			
-505-4		Std.			Std.			

3/8" O.D. TUBE

PART NUMBER	STD. PKG.	BRASS (B)	ALUMI-NUM (A)	STEEL (S)	316 STAINLESS (SS)	MONEL (M)	NYLON (NY)	TFE (T)
-600-1-2	50	Std.	Std.	Std.	Std.			
-600-1-OR		Std.			Std.			
-600-1-4	50	Std.	Std.	Std.	Std.			
-600-1-4KN		Std.						
-600-1-4BT					Std.			
-600-1-4MPW					Std.			
-600-1-6	50	Std.	Std.	Std.	Std.			
-600-1-6BT					Std.			
-600-1-6MPW					Std.			
-600-1-8	25	Std.	Std.	Std.	Std.			
-600-1-8BT					Std.			
-600-1-8MPW				Std.	Std.			
-600-1-12		Std.			Std.			
-600-2-2	20	Std.	Std.	Std.	Std.			
-600-2-4	20	Std.	Std.	Std.	Std.			
-600-2-4MPW					Std.			
-600-2-6	20	Std.	Std.	Std.	Std.			
-600-2-8	20	Std.	Std.	Std.	Std.			
-600-3	20	Std.	Std.	Std.	Std.			
-600-3TFT	10	Std.		Std.	Std.			
-600-3TMT	20	Std.	Std.	Std.	Std.			
-600-3TTF	10	Std.		Std.	Std.			
-600-3TTM	20	Std.	Std.	Std.	Std.			
-600-4		Std.		Std.	Std.			
-600-5-4		Std.		Std.				
-600-6	50	Std.	Std.	Std.	Std.			
-600-6KN		Std.						
-600-6-4		Std.	Std.	Std.	Std.			
-600-6-4AN		Std.						
-600-6-5		Std.						
-600-6-6AN		Std.			Std.			
-600-6-6TSW		Std.		Std.	Std.			
-600-7-2		Std.		Std.	Std.			
-600-7-4	25	Std.	Std.	Std.	Std.			
-600-7-6	25	Std.		Std.	Std.			

3/8" O.D. TUBE (Cont'd)

PART NUMBER	STD. PKG.	BRASS (B)	ALUMI-NUM (A)	STEEL (S)	316 STAINLESS (SS)	MONEL (M)	NYLON (NY)	TFE (T)
-600-7-8		Std.		Std.	Std.			
-600-8-2	15	Std.			Std.			
-600-8-4	20	Std.	Std.	Std.	Std.			
-600-8-6	20	Std.		Std.	Std.			
-600-9	20	Std.	Std.	Std.	Std.			
-600-11-4		Std.						
-600-61	20	Std.	Std.	Std.	Std.			
-600-61-6AN		Std.			Std.			
-600-71-4		Std.		Std.	Std.			
-600-A1-6		Std.			Std.			
-601-A-2	25	Std.			Std.			
-601-A-OR		Std.			Std.			
-601-A-4	25	Std.		Std.	Std.			
-601-A-4F		Std.			Std.			
-601-A-6	20	Std.			Std.			
-601-A-6F		Std.			Std.			
-600-A-6ANF		Std.			Std.			
-601-A-8	25	Std.		Std.	Std.			
-601-A-8F		Std.						
-600-C		Std.	Std.	Std.	Std.			
-600-P		Std.		Std.	Std.			
-601-PC		Std.		Std.	Std.			
-601-PC-4		Std.			Std.			
-600-R-4		Std.						
-600-R-8	25	Std.		Std.	Std.			
-600-R-10		Std.						
-600-R-12		Std.		Std.	Std.			
-600-SET	100	Std.	Std.	Std.	Std.		Std.	Std.
-602-1	100	Std.	Std.	Std.	Std.			
-602-1K	100	Std.						
-603-1	100	Std.	Std.	Std.	Std.	Std.	Std.	Std.
-604-1	100	Std.	Std.	Std.	Std.	Std.	Std.	Std.
-605-3		Std.			Std.			
-605-4		Std.	Std.		Std.			

1/2" O.D. TUBE

PART NUMBER	STD. PKG.	BRASS (B)	ALUMI-NUM (A)	STEEL (S)	316 STAINLESS (SS)	MONEL (M)	NYLON (NY)	TFE (T)
-810-1-4	25	Std.	Std.	Std.	Std.			
-810-1-OR		Std.		Std.	Std.			
-810-1-6	25	Std.	Std.	Std.	Std.			
-810-1-6MPW					Std.			
-810-1-8	25	Std.	Std.	Std.	Std.			
-810-1-8BT		Std.			Std.			
-810-1-8MPW				Std.	Std.			
-810-1-12		Std.		Std.	Std.			
-810-2-4	20	Std.	Std.	Std.	Std.			
-810-2-6	20	Std.	Std.	Std.	Std.			
-810-2-8	20	Std.	Std.	Std.	Std.			
-810-2-12				Std.				

The above part numbers are shown in fractional sizes.

Swagelok® TUBE FITTINGS

1/2" O.D. TUBE (Cont'd)

PART NUMBER	STD. PKG.	BRASS (B)	ALUMI-NUM (A)	STEEL (S)	316 STAINLESS (SS)	MONEL (M)	NYLON (NY)	TFE (T)
-810-3	10	Std.	Std.	Std.	Std.			
-810-3TFT	10	Std.		Std.	Std.			
-810-3TMT	10	Std.		Std.	Std.			
-810-3TTF	10	Std.		Std.	Std.			
-810-3TTM	10	Std.		Std.	Std.			
-810-3-8TMT		Std.		Std.	Std.			
-810-3-8TTM	10	Std.		Std.	Std.			
-810-4		Std.			Std.			
-810-5-6				Std.				
-810-6	25	Std.	Std.	Std.	Std.			
-810-6-4		Std.		Std.	Std.			
-810-6-6		Std.		Std.	Std.			
-810-6-8AN		Std.		Std.	Std.			
-810-6-8TSW				Std.	Std.			
-810-7-4		Std.		Std.	Std.			
-810-7-6		Std.		Std.	Std.			
-810-7-8		Std.	Std.	Std.	Std.			
-810-7-12		Std.						
-810-8-4	10	Std.		Std.	Std.			
-810-8-6	10	Std.		Std.	Std.			
-810-8-8	10	Std.		Std.	Std.			
-810-9	20	Std.	Std.	Std.	Std.			
-810-11-8		Std.						
-810-61	10	Std.		Std.	Std.			
-810-71-6		Std.		Std.				
-810-71-8		Std.						
-810-A1-8					Std.			
-811-A-4	25	Std.			Std.			
-811-A-4F		Std.			Std.			
-811-A-OR		Std.						
-811-A-6	10	Std.			Std.			
-811-A-8	25	Std.		Std.	Std.			
-811-A-8F		Std.			Std.			
-810-A-8ANF		Std.			Std.			
-810-C		Std.		Std.	Std.			
-810-P		Std.		Std.	Std.			
-811-PC		Std.		Std.	Std.			
-811-PC-4					Std.			
-810-R-10		Std.						
-810-R-12	25	Std.			Std.			
-810-R-16		Std.		Std.	Std.			
-810-SET	100	Std.		Std.	Std.		Std.	Std.
-812-1	50	Std.	Std.	Std.	Std.			
-812-1K		Std.						
-813-1		Std.	Std.	Std.	Std.	Std.	Std.	Std.
-814-1		Std.	Std.	Std.	Std.	Std.	Std.	Std.
-815-4		Std.			Std.			
-815-6		Std.			Std.			

5/8" O.D. TUBE

PART NUMBER	STD. PKG.	BRASS (B)	ALUMI-NUM (A)	STEEL (S)	316 STAINLESS (SS)	MONEL (M)	NYLON (NY)	TFE (T)
-1010-1-6	20	Std.		Std.	Std.			
-1010-1-8	20	Std.		Std.	Std.			
-1010-1-8MPW					Std.			
-1010-1-12		Std.						
-1010-2-6	15	Std.		Std.				
-1010-2-8	15	Std.		Std.	Std.			
-1010-3		Std.		Std.	Std.			
-1010-3TTF		Std.						
-1010-3TTM		Std.		Std.				
-1010-6	20	Std.		Std.	Std.			
-1010-6-6		Std.						
-1010-6-8		Std.		Std.	Std.			
-1010-7-6		Std.						
-1010-7-8		Std.		Std.	Std.			
-1010-8-6		Std.						
-1010-8-8	10	Std.		Std.				
-1010-9	10	Std.		Std.	Std.			
-1010-61	10	Std.						
-1011-A-8		Std.			Std.			
-1010-C		Std.			Std.			
-1010-P		Std.			Std.			
-1012-1	50	Std.		Std.	Std.			
-1013-1		Std.		Std.	Std.		Std.	Std.
-1014-1		Std.		Std.	Std.		Std.	Std.
-1015-6		Std.						
-1015-8		Std.						

3/4" O.D. TUBE

PART NUMBER	STD. PKG.	BRASS (B)	ALUMI-NUM (A)	STEEL (S)	316 STAINLESS (SS)	MONEL (M)	NYLON (NY)	TFE (T)
-1210-1-8	15	Std.		Std.	Std.			
-1210-1-OR					Std.			
-1210-1-12	15	Std.		Std.	Std.			
-1210-1-12BT					Std.			
-1210-1-12MPW					Std.			
-1210-2-8	10	Std.		Std.	Std.			
-1210-2-12	10	Std.		Std.	Std.			
-1210-3		Std.		Std.	Std.			
-1210-3TTF		Std.		Std.	Std.			
-1210-6	15	Std.		Std.	Std.			
-1210-6-8		Std.			Std.			
-1210-6-10				Std.				
-1210-7-8		Std.		Std.	Std.			
-1210-7-12		Std.		Std.	Std.			
-1210-8-8		Std.						
-1210-8-12		Std.		Std.				
-1210-9	10	Std.		Std.	Std.			
-1210-61		Std.			Std.			

The above part numbers are shown in fractional sizes.

Swagelok® TUBE FITTINGS

3/4" O.D. TUBE (Cont'd)

PART NUMBER	STD. PKG.	BRASS (B)	ALUMI-NUM (A)	STEEL (S)	316 STAINLESS (SS)	MONEL (M)	NYLON (NY)	TFE (T)
-1211-A-12		Std.		Std.				
-1210-C					Std.			
-1210-P		Std.		Std.	Std.			
-1212-1	25	Std.		Std.	Std.			
-1213-1		Std.		Std.	Std.		Std.	Std.
-1214-1		Std.		Std.	Std.		Std.	Std.
-1215-10		Std.						

7/8" O.D. TUBE

PART NUMBER	STD. PKG.	BRASS (B)	ALUMI-NUM (A)	STEEL (S)	316 STAINLESS (SS)	MONEL (M)	NYLON (NY)	TFE (T)
-1410-1-12		Std.		Std.				
-1410-2-12		Std.						
-1410-6		Std.		Std.				
-1410-7-12		Std.						
-1410-8-12		Std.						
-1410-9		Std.						
-1412-1		Std.		Std.	Std.			
-1413-1		Std.		Std.	Std.		Std.	Std.
-1414-1		Std.		Std.	Std.		Std.	Std.

1" O.D. TUBE

PART NUMBER	STD. PKG.	BRASS (B)	ALUMI-NUM (A)	STEEL (S)	316 STAINLESS (SS)	MONEL (M)	NYLON (NY)	TFE (T)
-1610-1-12		Std.		Std.	Std.			
-1610-1-16		Std.		Std.	Std.			
-1610-2-12				Std.				
-1610-2-16		Std.		Std.	Std.			
-1610-3		Std.		Std.	Std.			
-1610-6		Std.		Std.	Std.			
-1610-7-12				Std.				
-1610-7-16		Std.		Std.	Std.			
-1610-9		Std.		Std.	Std.			
-1610-C					Std.			
-1610-P					Std.			
-1612-1		Std.		Std.	Std.			
-1613-1		Std.		Std.	Std.		Std.	Std.
-1614-1		Std.		Std.	Std.		Std.	Std.
-1615-12					Std.			

The above part numbers are shown in fractional sizes.

QUICK-CONNECTS

PART NUMBER	STD. PKG.	BRASS (B)	ALUMI-NUM (A)	STEEL (S)	316 STAINLESS (SS)	MONEL (M)	NYLON (NY)	TFE (T)
-QC4-B-2PM		Std.			Std.			
-QC4-B-4PM		Std.			Std.			
-QC4-B-400		Std.			Std.			
-QC4-B1-400		Std.			Std.			
-QC4-S-400		Std.			Std.			
-QC4-D-400		Std.			Std.			
-QC6-B-4PM		Std.			Std.			
-QC6-B-600		Std.			Std.			
-QC6-B1-600		Std.			Std.			
-QC6-S-600		Std.			Std.			
-QC6-D-600		Std.			Std.			
-QC8-B-8PM		Std.			Std.			
-QC8-B-810		Std.			Std.			
-QC8-B1-810		Std.			Std.			
-QC8-S-810		Std.			Std.			
-QC8-D-810		Std.			Std.			

Swagelok® TUBE FITTINGS

ACCESSORIES

WRENCHES

PART NUMBER & DESCRIPTION	
MS-RW-46 (RATCHET)9/16"x11/16" For 1/4" & 3/8" Tube Fitting Nuts	Std.
MS-TW-46 (TEE)	Std.

BULKHEAD RETAINERS

PART NUMBER	
S-202-61F	Std.
S-302-61F	Std.
S-402-61F	Std.
S-502-61F	Std.
S-602-61F	Std.
S-812-61F	Std.
S-1012-61F	Std.
S-1212-61F	Std.
S-1612-61F	Std.

THREAD LUBRICANTS

PART NUMBER & DESCRIPTION	
MS-TL-BGT (Blue Goop Tube)	Std.
MS-TL-PGT (High Purity Goop Tube)	Std.
MS-TL-VGT (Vac. Goop Tube)	Std.
MS-TL-BGC (Blue Goop 1# Can)	Std.

STRIP TEEZE®

PART NUMBER & DESCRIPTION	
MS-STR-8 (1/2" x 288" Roll)†	Std.
MS-STR-4 (1/4" x 576" Roll)†	Std.
MS-STCD (CLIPPER DISPENSER)††	Std.

† Each Roll packed in individual plastic container. Ten (10) containers per box.
†† Packed in units of ten (10) per box for use with Strip Teeze container.

INSPECTION GAGES

PART NUMBER	
MS-IG-200	Std.
MS-IG-300	Std.
MS-IG-400	Std.
MS-IG-500	Std.
MS-IG-600	Std.
MS-IG-810	Std.
MS-IG-1010	Std.
MS-IG-1210	Std.
MS-IG-1410	Std.
MS-IG-1610	Std.

SLIDE VALVES

PART NUMBER	
B-2VO-6-2	Std.
SS-2VO-6-2	Std.
B-4VO-6-4	Std.
SS-4VO-6-4	Std.

TUBE FITTERS MANUAL

PART NUMBER	
MS-TFM	Std.

SWAGING TOOLS

PART NUMBER	
MS-ST-200	Std.
MS-ST-300	Std.
MS-ST-400	Std.
MS-ST-500	Std.
MS-ST-600	Std.
MS-ST-810	Std.

FLEXIBLE METAL HOSE

PART NUMBER	
SS-4HO-1-4-S4	Std.
SS-4HO-1-4-L4	Std.
SS-4HO-6-S4	Std.
SS-4HO-6-L4	Std.
SS-6HO-1-6-S6	Std.
SS-6HO-1-6-L6	Std.
SS-6HO-6-S6	Std.
SS-6HO-6-L6	Std.
SS-8HO-1-8-S8	Std.
SS-8HO-1-8-L8	Std.
SS-8HO-6-S8	Std.
SS-8HO-6-L8	Std.

The above part numbers are shown in fractional sizes.

WHITEY® MATCHLESS VALVES FOR EXACTING SERVICE

0 FORGED BODY VALVES

PART NUMBER	BRASS (B)	316 STAINLESS (SS)
-ODKM2-F2		Std.
-ODKM2-S4	Std.	Std.
-OGM2	Std.	Std.
-OGM2-A	Std.	
-OGS2	Std.	Std.
-OGS2-A	Std.	Std.
-OKM2	Std.	Std.
-OKM2-A	Std.	
-OKS2	Std.	Std.
-OKS2-A	Std.	Std.
-ORF2	Std.	Std.
-ORF2-A	Std.	Std.
-ORM2	Std.	Std.
-ORM2-A	Std.	Std.
-ORM2-S2		Std.
-ORM2-S2-A	Std.	Std.
-ORS2	Std.	Std.
-ORS2-A	Std.	Std.
-OVM2	Std.	Std.
-OVM2-A	Std.	
-OVM2-S2		Std.
-OVM2-S2-A		Std.
-OVS2	Std.	Std.
-OVS2-A	Std.	

1 FORGED BODY VALVES

PART NUMBER	BRASS (B)	316 STAINLESS (SS)	MONEL (M)
-1GF2	Std.	Std.	
-1GF2-A	Std.	Std.	
-1GF4	Std.	Std.	
-1GM4	Std.	Std.	
-1GM4-A	Std.		
-1GM4-S4	Std.	Std.	
-1GM4-S4-A	Std.	Std.	
-1GS4	Std.	Std.	
-1GS4-A	Std.	Std.	
-1GS4-X	Std.	Std.	
-1GS6	Std.	Std.	
-1GS8	Std.	Std.	
-1KF2	Std.		
-1KF4	Std.	Std.	
-1KM4	Std.	Std.	
-1KM4-S4	Std.	Std.	
-1KM4-S4-A	Std.	Std.	
-1KM6		Std.	
-1KS4	Std.	Std.	Std.
-1KS4-A	Std.	Std.	
-1KS6	Std.	Std.	
-1KS6-A	Std.	Std.	
-1KS8	Std.	Std.	
-1RF2	Std.	Std.	
-1RF2-A	Std.		
-1RF4	Std.	Std.	
-1RF4-A	Std.	Std.	
-1RM4	Std.	Std.	
-1RM4-A	Std.	Std.	
-1RM4-S4	Std.	Std.	

1 FORGED BODY VALVES (Cont'd)

PART NUMBER	BRASS (B)	ALUMI-NUM (A)	STEEL (S)	316 STAINLESS (SS)	MONEL (M)
-1RM4-S4-A				Std.	
-1RM4-S6				Std.	
-1RM6	Std.			Std.	
-1RS4	Std.		Std.	Std.	Std.
-1RS4-A	Std.			Std.	
-1RS6	Std.			Std.	
-1RS6-A	Std.			Std.	
-1RS8	Std.			Std.	
-1VF2	Std.			Std.	
-1VF4	Std.		Std.	Std.	Std.
-1VF4-A	Std.			Std.	
-1VM4	Std.			Std.	
-1VM4-A	Std.			Std.	
-1VM4-S4	Std.	Std.		Std.	
-1VM4-S4-A	Std.			Std.	
-1VM4-S6	Std.			Std.	
-1VM4-S6-A	Std.			Std.	
-1VM6	Std.			Std.	
-1VS4	Std.	Std.	Std.	Std.	Std.
-1VS4-A	Std.		Std.	Std.	
-1VS6	Std.		Std.	Std.	Std.
-1VS6-A	Std.			Std.	
-1VS8	Std.		Std.	Std.	

2 SCREWED BONNET BARSTOCK VALVES

PART NUMBER	BRASS (B)	316 STAINLESS (SS)
-2RF2		Std.
-2RF4	Std.	Std.
-2RS4	Std.	Std.
-2RS4-A		Std.

3 UNION BONNET BARSTOCK VALVES

PART NUMBER	316 STAINLESS (SS)
SS-3LRF2	Std.
SS-3LRF4	Std.
SS-3LRS4	Std.
SS-3LRS4-A	Std.
SS-3NBF2	Std.
SS-3NBF4	Std.
SS-3NBS4	Std.
SS-3NBS4-A	Std.
SS-3TF4	Std.
SS-3TS4	Std.
SS-3VF4	Std.
SS-3VS4	Std.

The above part numbers are shown in fractional sizes.

WHITEY® MATCHLESS VALVES FOR EXACTING SERVICE

4 5 SCREWED BONNET BARSTOCK VALVES

PART NUMBER	BRASS (B)	316 STAINLESS (SS)
-4PDF4		Std.
-4PDGF4		Std.
-4PDM4-F4		Std.
-4PDM8-F4		Std.
-4RF4	Std.	Std.
-4RS4		Std.
-4RS6	Std.	Std.
-4VF4	Std.	Std.
-4VS6		Std.
-5PDF8		Std.
-5PDM8-F8		Std.

6 UNION BONNET BARSTOCK VALVES

PART NUMBER	316 STAINLESS (SS)
SS-6LRF4	Std.
SS-6LRS6	Std.
SS-6NBF4	Std.
SS-6NBF6	Std.
SS-6NBS6	Std.
SS-6NBS8	Std.
SS-6TS6	Std.
SS-6VF4	Std.
SS-6VS6	Std.

7 SCREWED BONNET BARSTOCK VALVES

PART NUMBER	BRASS (B)	316 STAINLESS (SS)
-7RF6	Std.	
-7RF8	Std.	Std.
-7RS8	Std.	Std.
-7VF8		Std.
-7VS8	Std.	Std.

8 UNION BONNET BARSTOCK VALVES

PART NUMBER	316 STAINLESS (SS)
SS-8RF8	Std.
SS-8RS8	Std.
SS-8VF6	Std.
SS-8VF8	Std.
SS-8VS8	Std.

12 "12NB" UNION BONNET SHUT-OFF VALVES

PART NUMBER	316 STAINLESS (SS)
SS-12NBF8	Std.
SS-12NBS8	Std.
SS-12NBS12	Std.

14 "DK" FORGED BODY SHUT-OFF VALVES

PART NUMBER	BRASS (B)	316 STAINLESS (SS)
-14DKM4	Std.	Std.
-14DKM4-S4	Std.	Std.
-14DKM4-S4-A		Std.
-14DKS4	Std.	Std.

16 "DK" FORGED BODY SHUT-OFF VALVES

PART NUMBER	BRASS (B)	316 STAINLESS (SS)
-16DKM4-F4	Std.	Std.
-16DKM4-F4-RD (1900)		Std.
-16DKM4-F4-A	Std.	Std.
-16DKM4-F4-A-RD (1900)		Std.
-16DKS6	Std.	Std.

18 FORGED BODY VALVES

PART NUMBER	BRASS (B)	STEEL (S)
-18KF8	Std.	
-18KS8	Std.	
-18VF8	Std.	Std.
-18VS8	Std.	Std.

21 MICRO-METERING VALVES

PART NUMBER	BRASS (B)	316 STAINLESS (SS)
-21RF2		Std.
-21RF2-A		Std.
-21RS2		Std.
-21RS4	Std.	Std.
-21RS4-A		Std.

22 MICRO-METERING VALVES

PART NUMBER	BRASS (B)	316 STAINLESS (SS)
-22RS2		Std.
-22RF2	Std.	Std.
-22RS4	Std.	Std.
-22RS4-A		Std.

31 UNION BONNET BARSTOCK VALVES

PART NUMBER	316 STAINLESS (SS)
SS-31RF2	Std.
SS-31RF4	Std.
SS-31RS4	Std.

The above part numbers are shown in fractional sizes.

WHITEY® MATCHLESS VALVES FOR EXACTING SERVICE

41 42 MINIATURE BALL VALVES

PART NUMBER	BRASS (B)	316 STAINLESS (SS)
-41S2	Std.	Std.
-41XS2	Std.	Std.
-42F2	Std.	Std.
-42S4	Std.	Std.
-42VF2	Std.	Std.
-42VS4	Std.	Std.
-42XF2	Std.	Std.
-42XS4	Std.	Std.

43 BALL VALVES

PART NUMBER	BRASS (B)	316 STAINLESS (SS)
-43F2	Std.	Std.
-43F4	Std.	Std.
-43F4-A	Std.	Std.
-43M4-S4	Std.	Std.
-43S4	Std.	Std.
-43S4-A		Std.
-43S6	Std.	Std.
-43VF4		Std.
-43XF4	Std.	Std.
-43XS4	Std.	Std.
-43XS4-S4-M4		Std.
-43YF2	Std.	Std.
-43ZF2	Std.	Std.

44 BALL VALVES

PART NUMBER	BRASS (B)	316 STAINLESS (SS)
-44F4	Std.	Std.
-44F6	Std.	Std.
-44S6	Std.	Std.
-44XF4	Std.	Std.
-44XF6	Std.	
-44XS6	Std.	Std.

45 BALL VALVES

PART NUMBER	BRASS (B)	316 STAINLESS (SS)
-45F8	Std.	Std.
-45S8	Std.	Std.
-45S12	Std.	Std.
-45XF8	Std.	Std.
-45XS8	Std.	Std.
-45XS12	Std.	

53 56 58 LIFT CHECK VALVES

PART NUMBER	316 STAINLESS (SS)
SS-53F4	Std.
SS-53S4	Std.
SS-56F4	Std.
SS-56S6	Std.
SS-58F8	Std.
SS-58S8	Std.

63 SWING-OUT BALL VALVE

PART NUMBER	BRASS (B)	316 STAINLESS (SS)
-63F8	Std.	Std.

92 93 AIR OPERATED FORGED BODY VALVES

PART NUMBER	BRASS (B)	316 STAINLESS (SS)
-92S4	Std.	Std.
-93S4	Std.	Std.

MISCELLANEOUS WHITEY PRODUCTS

SAMPLE CYLINDERS

PART NUMBER	
304-HDF2-40	Std.
304-HDF4-75	Std.
304-HDF4-150	Std.
304-HDF4-300	Std.
304-HDF4-500	Std.
304-HDF4-1000	Std.

SAFETY CLAMPS

DESCRIPTION	
MS-40"-Clamp	Std.
MS-72"-Clamp	Std.

UNIVERSAL MOUNTING BRACKETS

PART NUMBER	
MS-1-6	Std.

The above part numbers are shown in fractional sizes.

NUPRO® PRECISION VALVES AND FILTERS

B BELLOWS VALVES

PART NUMBER	BRASS (B)	316 STAINLESS (SS)	MONEL (M)
-4BG		Std.	
-4BG-TSW		Std.	
-4BK	Std.	Std.	Std.
-4BK-NC	Std.	Std.	
-4BK-NO		Std.	
-4BK-TSW		Std.	
-4BKT	Std.	Std.	
-4BMG	Std.	Std.	
-4BMW		Std.	
-4BMW-TSW		Std.	
-4BW		Std.	
-4BW-TSW		Std.	
-6BG		Std.	
-6BG-TSW		Std.	
-6BK	Std.	Std.	
-6BK-TSW		Std.	
-6BW		Std.	
-6BW-TSW		Std.	
-8BG-TSW		Std.	
-8BK	Std.	Std.	
-8BK-TSW		Std.	
-8BW		Std.	
-8BW-TSW		Std.	

C CA CHECK VALVES

PART NUMBER	BRASS (B)	316 STAINLESS (SS)	MONEL (M)
-2C-1/3		Std.	
-2C-1	Std.	Std.	
-2C-10		Std.	
-2C-25		Std.	
-2C2-1/3	Std.	Std.	
-2C2-1	Std.	Std.	
-2C2-10	Std.	Std.	
-2C2-25		Std.	
-2C4-1/3	Std.	Std.	
-2C4-1	Std.	Std.	
-2C4-25	Std.		
-4C-1/3	Std.	Std.	
-4C-1	Std.	Std.	Std.
-4C-10	Std.	Std.	
-4C-25	Std.	Std.	
-4C1-1/3		Std.	
-4C1-1	Std.		
-4C2-1/3	Std.	Std.	
-4C2-1	Std.	Std.	
-4C2-10	Std.	Std.	
-4C2-25	Std.	Std.	
-4C4-1/3	Std.	Std.	
-4C4-1	Std.	Std.	
-4C4-10	Std.	Std.	
-4C4-25		Std.	

C CA CHECK VALVES (Cont'd)

PART NUMBER	BRASS (B)	316 STAINLESS (SS)
-4CA-3	Std.	Std.
-4CA-50	Std.	Std.
-6C-1/3	Std.	Std.
-6C-1	Std.	Std.
-6C-10	Std.	Std.
-6C-25		Std.
-6C2-1		Std.
-6C4-1	Std.	Std.
-8C-1/3	Std.	Std.
-8C-1	Std.	Std.
-8C-10		Std.
-8C-25		Std.
-8C2-1	Std.	Std.
-8C2-10	Std.	
-8C4-1	Std.	Std.
-8C4-10		Std.
-8C4-25		Std.
-12C-1		Std.
-16C4-1	Std.	Std.

CP CPA CHECK VALVES

PART NUMBER	BRASS (B)	316 STAINLESS (SS)
-4CP2-1	Std.	Std.
-4CP5-1	Std.	Std.
-4CPA2-3	Std.	Std.
-4CPA2-50	Std.	Std.
-8CP2-1	Std.	Std.
-8CP5-1	Std.	Std.
-8CPA2-3	Std.	Std.
-8CPA2-50	Std.	Std.
MS-PG-4CP4 Deflector Cap		Std.
MS-PG-8CP4 Deflector Cap		Std.

CS CYLINDERS

PART NUMBER	316 STAINLESS (SS)
SS-4CS-TSW-10	Std.
SS-4CS-TSW-25	Std.
SS-4CS-TSW-50	Std.

F FILTERS

PART NUMBER	BRASS (B)	316 STAINLESS (SS)
-2F-7	Std.	Std.
-2F-15	Std.	Std.
-2F-60	Std.	Std.
-2F4-7	Std.	

The above part numbers are shown in fractional sizes.

NUPRO® PRECISION VALVES AND FILTERS

F FILTERS (Cont'd)

PART NUMBER	BRASS (B)	316 STAINLESS (SS)
-2FT7-7	Std.	Std.
-4F-7	Std.	Std.
-4F-15	Std.	Std.
-4F-60	Std.	Std.
-4F2-7		Std.
-4F4-7	Std.	Std.
-4F4-60		Std.
-4FR-7	Std.	Std.
-4FR-15	Std.	Std.
-4FR-60	Std.	Std.
-4FT7-7	Std.	Std.
-6F-7		Std.
-6F-15	Std.	Std.
-6F-60	Std.	Std.
-8F-7		Std.
-8F-60	Std.	Std.

FE FILTER ELEMENTS

ELEMENT PART NO.	FOR FILTER PART NO.	316 STAINLESS (SS)
-2-7;-2-15;-2-60	-2F-,-2FT7-	Std.
-4-7;-4-15;-4-60	-4F-,-4FT7-	Std.
-8-7;-8-15;-8-60	-4FR-,-6F-,-8F-	Std.

H BELLOWS VALVES

PART NUMBER	BRASS (B)	316 STAINLESS (SS)
-2H	Std.	Std.
-2H2	Std.	Std.
-2H4	Std.	
-4H	Std.	Std.
-4H2	Std.	Std.
-4H4	Std.	Std.
-4H-TSW		Std.
-4H-TSW (1/4x.049x3" EXT.)		Std.

J FORGED BODY SHUT-OFF VALVES

PART NUMBER	BRASS (B)
B-2J2	Std.
B-2JA2	Std.
B-4J	Std.
B-4J-PM	Std.
B-4J1	Std.

J FORGED BODY SHUT-OFF VALVES (Cont'd)

PART NUMBER	BRASS (B)
B-4J2	Std.
B-4J4	Std.
B-4JA	Std.
B-4JA-PM	Std.
B-4JA1	Std.
B-4JR	Std.
B-6J	Std.
B-24JA1	Std.

JB FORGED BODY SHUT-OFF VALVES

PART NUMBER	316 STAINLESS (SS)
SS-4JB	Std.
SS-4JB1	Std.
SS-4JB2	Std.
SS-4JBA	Std.

L METERING VALVES ①

PART NUMBER	BRASS (B)	316 STAINLESS (SS)
-4L	Std.	Std.
-4L2	Std.	Std.
-4LA	Std.	Std.

M FINE METERING VALVES ①

PART NUMBER	BRASS (B)	316 STAINLESS (SS)	MONEL (M)
-2MA	Std.	Std.	
-2MA1		Std.	
-2MA2	Std.	Std.	
-2MA4	Std.		
-2MG	Std.	Std.	
-2MG2	Std.	Std.	
-2MG4	Std.	Std.	
-4MA	Std.	Std.	
-4MA2		Std.	
-4MG	Std.	Std.	Std.
-4MG2	Std.	Std.	
-4MGD	Std.	Std.	
-4MX	Std.	Std.	

① Micrometer Handle for "M" & "L" Series Valves are regional standards.

The above part numbers are shown in fractional sizes.

NUPRO® PRECISION VALVES AND FILTERS

P PURGE VALVES

PART NUMBER	BRASS (B)	STEEL (S)	316 STAINLESS (SS)
-4P-2M	Std.		Std.
-4P-4			Std.
-4P-4M	Std.	Std.	Std.
-4P-6M	Std.		

R SAFETY RELIEF VALVES

PART NUMBER	BRASS (B)	316 STAINLESS (SS)
-6R-4M-10	Std.	Std.
-6R-4M-50	Std.	Std.
-6R-4M-100	Std.	Std.

S VERY FINE METERING VALVES

PART NUMBER	BRASS (B)	316 STAINLESS (SS)
-1SA	Std.	Std.
-1SG		Std.
-2SA	Std.	Std.
-2SG	Std.	Std.
-2SGD	Std.	Std.
-2SX	Std.	Std.

Vernier Handle for "S" Series Valves is a regional standard.

SNOOP®

QUANTITY	SNOOP (8 OZ. BOTTLE)	REAL COOL SNOOP (8 OZ. BOTTLE)	STD. PKG.
1-11	Std.	Std.	
12-143	Std.	Std.	12
144 and up	Std.	Std.	72

T BELLOWS VALVES

PART NUMBER	316 STAINLESS (SS)
SS-4TW	Std.
SS-4TW-TSW	Std.
SS-8TW-TSW	Std.

The above part numbers are shown in fractional sizes.

TP TUBE PLUGS

PART NUMBER	BRASS (B)	STEEL (S)	316 STAINLESS (SS)	MONEL (M)	FIBRE (F)
-TP-5/8-(11-14)	Std.		Std.		
-TP-5/8-(15-20)	Std.	Std.	Std.		
-TP-3/4-(11-14)	Std.	Std.	Std.	Std.	
-TP-3/4-(12-17)	Std.	Std.			
-TP-3/4-(15-20)	Std.	Std.	Std.	Std.	Std.
-TP-7/8-(15-20)	Std.	Std.	Std.		Std.
-TP-1-(11-14)		Std.	Std.	Std.	
-TP-1-(15-20)	Std.	Std.	Std.	Std.	Std.
-TP-1-1/4-(11-14)		Std.			
-TP-1-1/2-(11-14)		Std.			

U BELLOWS VALVES

PART NUMBER	316 STAINLESS (SS)
SS-4UW	Std.
SS-4UW-TSW	Std.
SS-6UW	Std.
SS-8UW-TSW	Std.

V PLASTIC VALVES

PART NUMBER	NYLON (NY)	TFE (T)	POLYVINYL CHLORIDE (PVC)
-4V	Std.	Std.	Std.
-4VD		Std.	

VF BUTTERFLY VACUUM VALVES

PART NUMBER	304 STAINLESS (304)
304-24VFO	Std.

CAJON® INDUSTRIAL PRODUCTS

1/16"

CATALOG NUMBER	BRASS (B)	ALUMI-NUM (A)	STEEL (S)	316 STAINLESS (SS)	MONEL (M)	NYLON (NY)	304L STAINLESS (304L)
-1-HN				Std.			
-1-P	Std.						

1/8"

CATALOG NUMBER	BRASS (B)	ALUMI-NUM (A)	STEEL (S)	316 STAINLESS (SS)	MONEL (M)	NYLON (NY)	304L STAINLESS (304L)
-2-A	Std.			Std.			
-2-BT	Std.						
-2-CN	Std.			Std.			
-2-CP				Std.			
-2-E	Std.			Std.			
-2-FHC-4S	Std.						
-2-FHC-4T	Std.						
-2-HC-1-2	Std.			Std.			
-2-HC-1-4	Std.			Std.			
-2-HCG	Std.			Std.			
-2-HLN-1.50				Std.			
-2-HLN-2.50				Std.			
-2-HN	Std.			Std.			
-2-L-4		Std.					
-2-ME	Std.			Std.			
-2-MHC-2S	Std.			Std.			
-2-MHC-3S	Std.						
-2-MHC-4S	Std.			Std.			
-2-MHC-4T	Std.			Std.			
-2-MT	Std.			Std.			
-2-P	Std.			Std.			
-2-RA-1	Std.		Std.	Std.			
-2-SE	Std.			Std.			
-2-ST	Std.			Std.			
-2-T	Std.			Std.			

1/4"

CATALOG NUMBER	BRASS (B)	ALUMI-NUM (A)	STEEL (S)	316 STAINLESS (SS)	MONEL (M)	NYLON (NY)	304L STAINLESS (304L)
-4-A	Std.			Std.			
-4-BT	Std.			Std.			
-4-CN	Std.			Std.			
-4-CP	Std.			Std.			
-4-CS	Std.			Std.			
-4-E	Std.		Std.	Std.			
-4-FHC-4S	Std.						
-4-FHC-4T	Std.						
-4-FHC-6S	Std.						
-4-HC-1-2	Std.			Std.			
-4-HC-1-4	Std.			Std.			

1/4" (Cont'd)

CATALOG NUMBER	BRASS (B)	ALUMI-NUM (A)	STEEL (S)	316 STAINLESS (SS)	MONEL (M)	NYLON (NY)	304L STAINLESS (304L)
-4-HC-A-401	Std.			Std.			
-4-HC-A-601	Std.						
-4-HCG	Std.		Std.	Std.			
-4-HLN-1.50				Std.			
-4-HLN-2.00	Std.			Std.			
-4-HLN-2.50	Std.			Std.			
-4-HLN-3.00	Std.			Std.			
-4-HLN-4.00				Std.			
-4-HN	Std.		Std.	Std.			
-4-HRCG-2	Std.			Std.			
-4-HRN-2	Std.			Std.			
-4-L-6		Std.					
-4-ME	Std.			Std.			
-4-MHC-3S	Std.						
-4-MHC-4S	Std.			Std.			
-4-MHC-4T	Std.			Std.			
-4-MHC-6S	Std.			Std.			
-4-MHC-8S	Std.						
-4-MT	Std.			Std.			
-4-P	Std.			Std.			
-4-RA-2	Std.		Std.	Std.			
-4-RB-2	Std.			Std.			
-4-RSE-2	Std.			Std.			
-4-SE	Std.			Std.			
-4-ST	Std.			Std.			
-4-T	Std.			Std.			
-4-TSW-1-4				Std.			
-4-TSW-3				Std.			
-4-TSW-6				Std.			
-4-TSW-7-4				Std.			
-4-TSW-9				Std.			Std.
-4-UBJ				Std.			

3/8"

CATALOG NUMBER	BRASS (B)	ALUMI-NUM (A)	STEEL (S)	316 STAINLESS (SS)	MONEL (M)	NYLON (NY)	304L STAINLESS (304L)
-6-CN	Std.			Std.			
-6-E	Std.			Std.			
-6-HC-1-4	Std.			Std.			
-6-HC-1-6	Std.						
-6-HCG	Std.			Std.			
-6-HN	Std.			Std.			
-6-HRCG-4	Std.						
-6-HRN-4	Std.			Std.			
-6-L-8		Std.					
-6-ME	Std.						
-6-MHC-6S	Std.			Std.			

The above part numbers are shown in fractional sizes.

CAJON® INDUSTRIAL PRODUCTS

3/8" (Cont'd)

CATALOG NUMBER	BRASS (B)	ALUMI-NUM (A)	STEEL (S)	316 STAINLESS (SS)	MONEL (M)	NYLON (NY)	304L STAINLESS (304L)
-6-MHC-8S	Std.						
-6-MT	Std.						
-6-MTW-A-4TSW				Std.			
-6-P	Std.			Std.			
-6-RA-2	Std.						
-6-RA-4	Std.		Std.	Std.			
-6-RB-2	Std.			Std.			
-6-RB-4	Std.		Std.	Std.			
-6-SE	Std.			Std.			
-6-ST	Std.						
-6-T	Std.			Std.			
-6-TSW-1-4				Std.			
-6-TSW-1-8				Std.			
-6-TSW-3				Std.			Std.
-6-TSW-6				Std.			Std.
-6-TSW-9				Std.			

1/2"

CATALOG NUMBER	BRASS (B)	ALUMI-NUM (A)	STEEL (S)	316 STAINLESS (SS)	MONEL (M)	NYLON (NY)	304L STAINLESS (304L)
-8-A				Std.			
-8-BT	Std.						
-8-CN	Std.			Std.			
-8-CP				Std.			
-8-E	Std.			Std.			
-8-HC-1-8	Std.						
-8-HCG	Std.		Std.	Std.			
-8-HLN-2.00				Std.			
-8-HLN-3.00	Std.			Std.			
-8-HN	Std.		Std.	Std.			
-8-HRCG-4	Std.		Std.	Std.			
-8-HRCG-6	Std.			Std.			
-8-HRN-4	Std.		Std.	Std.			
-8-HRN-6	Std.			Std.			
-8-ME	Std.			Std.			
-8-MHC-6S	Std.			Std.			
-8-MHC-8S	Std.			Std.			
-8-MPW-A-4TSW				Std.			
-8-MPW-A-6TSW				Std.			
-8-MPW-A-8TSW				Std.			
-8-MT	Std.			Std.			
-8-P	Std.		Std.	Std.			
-8-RA-2				Std.			
-8-RA-4	Std.		Std.	Std.			
-8-RA-6	Std.			Std.			
-8-RB-2	Std.			Std.			
-8-RB-4	Std.		Std.	Std.			
-8-RB-6	Std.		Std.	Std.			

1/2" (Cont'd)

CATALOG NUMBER	BRASS (B)	ALUMI-NUM (A)	STEEL (S)	316 STAINLESS (SS)	MONEL (M)	NYLON (NY)	304L STAINLESS (304L)
-8-RSE-4				Std.			
-8-SE	Std.			Std.			
-8-ST				Std.			
-8-T	Std.			Std.			
-8-TSW-1-8				Std.			
-8-TSW-3	Std.			Std.			
-8-TSW-6			Std.	Std.			
-8-TSW-7-6				Std.			
-8-TSW-7-8				Std.			
-8-TSW-9				Std.			
-8-UBJ				Std.			

3/4"

CATALOG NUMBER	BRASS (B)	ALUMI-NUM (A)	STEEL (S)	316 STAINLESS (SS)	MONEL (M)	NYLON (NY)	304L STAINLESS (304L)
-12-CN	Std.			Std.			
-12-E				Std.			
-12-HCG				Std.			
-12-HN	Std.		Std.	Std.			
-12-HRCG-4				Std.			
-12-HRCG-8				Std.			
-12-HRN-4				Std.			
-12-HRN-8	Std.			Std.			
-12-MPW-A-6TSW				Std.			
-12-MPW-A-8TSW				Std.			
-12-P				Std.			
-12-RA-8	Std.		Std.	Std.			
-12-RB-4	Std.			Std.			
-12-RB-6	Std.			Std.			
-12-RB-8	Std.		Std.	Std.			
-12-SE	Std.						
-12-TSW-3				Std.			
-12-TSW-9				Std.			

1"

CATALOG NUMBER	BRASS (B)	ALUMI-NUM (A)	STEEL (S)	316 STAINLESS (SS)	MONEL (M)	NYLON (NY)	304L STAINLESS (304L)
-16-E				Std.			
-16-HN	Std.			Std.			
-16-MPW-A-6TSW				Std.			
-16-MPW-A-8TSW				Std.			
-16-P				Std.			
-16-RB-4	Std.			Std.			
-16-RB-8	Std.			Std.			
-16-RB-12	Std.			Std.			

The above part numbers are shown in fractional sizes.

CAJON® VACUUM PRODUCTS

G FLEXIBLE GLASS-END TUBING

PART NUMBER	
G321-4-GXG-2	Std.
G321-4-GX-2	Std.
G321-6-GXG-3	Std.
G321-6-GX-3	Std.
G321-8-GXG-3	Std.
G321-8-GX-3	Std.
G321-12-GXG-3	Std.
G321-12-GX-3	Std.
G321-16-GXG-3	Std.
G321-16-GX-3	Std.

G/M GLASS/METAL TRANSITION TUBES

PART NUMBER	
G304-4-GM-3	Std.
G304-6-GM-3	Std.
G304-8-GM-3	Std.

UT ULTRA-TORR® ASSEMBLIES

CATALOG NUMBER	BRASS (B)	316 STAINLESS (SS)
-2-UT-6		Std.
-2-UT-A-4	Std.	Std.
-4-UT-1-2	Std.	Std.
-4-UT-1-4	Std.	Std.
-4-UT-3	Std.	Std.
-4-UT-6	Std.	Std.
-4-UT-A-4	Std.	Std.
-4-UT-A-6	Std.	Std.
-4-UT-A-6BT	Std.	
-6-UT-1-4	Std.	Std.
-6-UT-6	Std.	Std.
-6-UT-6-4		Std.
-6-UT-A-8	Std.	Std.
-6-UT-A-8BT	Std.	
-8-UT-6	Std.	Std.
-8-UT-A-10	Std.	Std.
-8-UT-A-12		Std.
-8-UT-A-12BT	Std.	
-12-UT-6	Std.	
-12-UT-A-16	Std.	Std.
-12-UT-A-16BT	Std.	
-16-UT-6	Std.	

VCO® O-RING VACUUM COMPONENTS

CATALOG NUMBER	BRASS (B)	316 STAINLESS (SS)
-2-VCO-1	Std.	Std.
-2-VCO-3	Std.	Std.
-4-VCO-1	Std.	Std.
-4-VCO-3	Std.	Std.
-4-VCO-4	Std.	Std.
-6-VCO-1	Std.	Std.
-6-VCO-3	Std.	Std.
-8-VCO-1	Std.	Std.
-8-VCO-3	Std.	Std.
-8-VCO-4	Std.	Std.
-12-VCO-1	Std.	Std.
-12-VCO-3	Std.	Std.
-12-VCO-4	Std.	Std.

VCR® VACUUM COMPONENTS

PART NUMBER	
SS-1-VCR-3	Std.
SS-2-VCR-1	Std.
NI-2-VCR-2	Std.
SS-2-VCR-3	Std.
SS-2-VCR-4	Std.
SS-4-VCR-1	Std.
SS-4-VCR-1-4	Std.
NI-4-VCR-2	Std.
SS-4-VCR-3	Std.
SS-4-VCR-3-4MTW	Std.
SS-4-VCR-3-BL	Std.
SS-4-VCR-4	Std.
SS-4-VCR-7-4	Std.
SS-4-VCR-9	Std.
SS-4-VCR-T	Std.

VCR® VACUUM COMPONENTS

PART NUMBER	
SS-6-VCR-3	Std.
SS-8-VCR-1	Std.
NI-8-VCR-2	Std.
SS-8-VCR-3	Std.
SS-8-VCR-4	Std.

X FLEXIBLE TUBING

PART NUMBER	
321-4-X-2	Std.
321-4-X-4	Std.
321-4-X-6	Std.
321-4-X-12	Std.
321-6-X-1	Std.
321-6-X-3	Std.
321-6-X-6	Std.
321-6-X-12	Std.
321-8-X-1	Std.
321-8-X-3	Std.
321-8-X-6	Std.
321-8-X-12	Std.
321-12-X-1	Std.
321-12-X-3	Std.
321-12-X-6	Std.
321-12-X-12	Std.
321-16-X-1	Std.
321-16-X-3	Std.
321-16-X-6	Std.
321-16-X-12	Std.
321-24-X-1	Std.
321-24-X-3	Std.
321-24-X-6	Std.
321-24-X-12	Std.

The above part numbers are shown in fractional sizes.

CAJON® VACUUM PRODUCTS

XBA BRAZE ADAPTERS

PART NUMBER	
321-4-XBA	Std.
321-6-XBA	Std.
321-8-XBA	Std.
321-12-XBA	Std.
321-16-XBA	Std.

XOA O-RING ADAPTERS

PART NUMBER	
321-4-XOA	Std.
321-6-XOA	Std.
321-8-XOA	Std.
321-12-XOA	Std.
321-16-XOA	Std.

The above part numbers are shown in fractional sizes.

'Sno-Trik® TUBE FITTINGS & VALVES FOR HIGH PRESSURE

FITTING LIST

PART NAME	PART NUMBER		NOTE
MALE CONNECTOR	SS-440-1-44M	Std.	Complete Assembly
	SS-640-1-64M	Std.	
	SS-940-1-94M	Std.	
UNION ELBOW	SS-440-9	Std.	Complete Assembly
	SS-640-9	Std.	
	SS-940-9	Std.	
UNION	SS-440-6	Std.	Complete Assembly
	SS-640-6	Std.	
	SS-940-6	Std.	
UNION TEE	SS-440-3	Std.	Complete Assembly
	SS-640-3	Std.	
	SS-940-3	Std.	
NUT	SS-442-1	Std.	
	SS-642-1	Std.	
	SS-942-1	Std.	
FRONT FERRULE	SS-443-1	Std.	
	SS-643-1	Std.	
	SS-943-1	Std.	
BACK FERRULE	174PH-444-1	Std.	
	174PH-644-1	Std.	
	174PH-944-1	Std.	

EQUIPMENT

ITEM	MODEL NO.	PART NUMBER	SIZE	
Coning Tool *	2	MS-469CT	1/4" - 3/8" - 9/16"	Std.
Cutting Lubricant	CL60	MS-CL60	8 oz. Bottle	Std.

* Universal

The above part numbers are shown in fractional sizes.

Swagelok® METRIC TUBE FITTINGS

3MM O.D. TUBE

PART NUMBER	BRASS (B)	STEEL (S)	316 STAINLESS (SS)
-3MO-1-R1/8	Std.		Std.
-3MO-1-R1/8T	Std.		Std.
-3MO-3	Std.		Std.
-3MO-6	Std.		Std.
-3MO-6-2	Std.		Std.
-3MO-9	Std.		Std.
-3MO-C	Std.		Std.
-3MO-P	Std.		Std.
-3MO-R-2	Std.		Std.
-3MO-R-4	Std.		Std.
-3M1-A-R1/8	Std.		Std.
-3M1-A-R1/8T	Std.		Std.
-3M1-A-R1/8F	Std.		Std.
-3M1-A-R1/8TF	Std.		Std.
-3M2-1	Std.		Std.
-3M3-1	Std.		Std.
-3M4-1	Std.		Std.

4MM O.D. TUBE

PART NUMBER	BRASS (B)	STEEL (S)	316 STAINLESS (SS)
-4MO-1-R1/8		Std.	
-4MO-3		Std.	
-4MO-6		Std.	
-4MO-9		Std.	
-4MO-61		Std.	
-4MO-P		Std.	
-4MO-R-4M		Std.	
-4M1-A-R1/8		Std.	
-4M1-A-R1/8F		Std.	
-4M2-1		Std.	
-4M3-1		Std.	
-4M4-1		Std.	

6MM O.D. TUBE

PART NUMBER	BRASS (B)	STEEL (S)	316 STAINLESS (SS)
-6MO-1-2	Std.	Std.	Std.
-6MO-1-4	Std.	Std.	Std.
-6MO-1-R1/8	Std.	Std.	Std.
-6MO-1-R1/8T	Std.		Std.
-6MO-1-R1/4	Std.	Std.	Std.
-6MO-1-R1/4T	Std.		Std.
-6MO-3	Std.	Std.	Std.
-6MO-6	Std.	Std.	Std.
-6MO-6-4	Std.	Std.	Std.
-6MO-9	Std.	Std.	Std.
-6MO-61	Std.	Std.	Std.
-6MO-C	Std.	Std.	Std.
-6MO-P	Std.	Std.	Std.
-6MO-R-4	Std.	Std.	Std.
-6MO-R-6M		Std.	
-6M1-A-R1/8	Std.	Std.	Std.
-6M1-A-R1/8T	Std.		Std.
-6M1-A-4	Std.	Std.	Std.
-6M1-A-R1/4	Std.		Std.
-6M1-A-R1/8F	Std.	Std.	Std.
-6M1-A-R1/8TF	Std.		Std.
-6M1-A-4F	Std.	Std.	Std.
-6M1-A-R1/4T	Std.		Std.
-6M1-A-R1/4F	Std.		Std.
-6M1-A-R1/4TF	Std.		Std.
-6M1-PC	Std.		Std.
-6M2-1	Std.	Std.	Std.
-6M3-1	Std.	Std.	Std.
-6M4-1	Std.	Std.	Std.
-6M5-4M	Std.		Std.

8MM O.D. TUBE

(USES STANDARD 500 SERIES FITTING)

PART NUMBER	BRASS (B)	STEEL (S)	316 STAINLESS (SS)
-500-1-R1/4		Std.	
-500-3	Std.	Std.	Std.
-500-9	Std.	Std.	Std.
-500-61	Std.	Std.	
-500-P	Std.	Std.	Std.
-500-R-5		Std.	
-501-A-R1/4		Std.	
-501-A-R1/4F		Std.	

The 500 Series fittings are included because of their use on 8MM tubing.

The above part numbers are shown in millimeter sizes.

Swagelok® METRIC TUBE FITTINGS

10MM O.D. TUBE

PART NUMBER	BRASS (B)	STEEL (S)	316 STAINLESS (SS)
-10MO-1-4	Std.	Std.	Std.
-10MO-1-R1/4	Std.	Std.	Std.
-10MO-1-R1/4T	Std.	Std.	Std.
-10MO-1-R3/8		Std.	
-10MO-1-R1/2	Std.		Std.
-10MO-1-R1/2T	Std.		Std.
-10MO-3	Std.	Std.	Std.
-10MO-6	Std.	Std.	Std.
-10MO-6-4	Std.		Std.
-10MO-6-6	Std.	Std.	Std.
-10MO-6-6M	Std.		Std.
-10MO-9	Std.	Std.	Std.
-10MO-61	Std.	Std.	Std.
-10MO-C	Std.	Std.	Std.
-10MO-P	Std.	Std.	Std.
-10MO-R-6	Std.	Std.	Std.
-10MO-R-10M		Std.	
-10M1-A-4	Std.	Std.	Std.
-10M1-A-R1/4	Std.	Std.	Std.
-10M1-A-R1/4T	Std.		Std.
-10M1-A-4F	Std.	Std.	Std.
-10M1-A-R1/4F	Std.	Std.	Std.
-10M1-A-R1/4TF	Std.		Std.
-10M2-1	Std.	Std.	Std.
-10M3-1	Std.	Std.	Std.
-10M4-1	Std.	Std.	Std.

12MM O.D. TUBE

PART NUMBER	BRASS (B)	STEEL (S)	316 STAINLESS (SS)
-12MO-1-R3/8		Std.	
-12MO-1-8	Std.	Std.	Std.
-12MO-1-R1/2	Std.		Std.
-12MO-1-R1/2T	Std.		Std.
-12MO-3	Std.	Std.	Std.
-12MO-6	Std.	Std.	Std.
-12MO-6-8	Std.	Std.	Std.
-12MO-9	Std.	Std.	Std.
-12MO-61		Std.	
-12MO-C	Std.	Std.	Std.
-12MO-P	Std.	Std.	Std.
-12MO-R-8	Std.	Std.	Std.
-12MO-R-12M		Std.	
-12M1-A-R3/8		Std.	
-12M1-A-R3/8F		Std.	
-12M1-A-8	Std.	Std.	Std.
-12M1-A-8F	Std.	Std.	Std.
-12M1-A-R1/2F	Std.		Std.
-12M1-A-R1/2TF	Std.		Std.
-12M2-1	Std.	Std.	Std.
-12M3-1	Std.	Std.	Std.
-12M4-1	Std.	Std.	Std.

The above part numbers are shown in millimeter sizes.

WHITEY® VALVES WITH MILLIMETER (MM) ENDS

1 FORGED BODY VALVES

PART NUMBER	ORIFICE	BRASS (B)	316 STAINLESS (SS)
-1GS6MM	3.17MM	Std.	Std.
-1KS6MM	4.37MM	Std.	Std.
-1RS6MM	4.37MM	Std.	Std.
-1VS6MM	4.37MM	Std.	Std.

2 SCREWED BONNET BARSTOCK VALVES

PART NUMBER	ORIFICE	316 STAINLESS (SS)
-2RS6MM	2.36MM	Std.

3 UNION BONNET BARSTOCK VALVES

PART NUMBER	ORIFICE	316 STAINLESS (SS)
-3LRS6MM	3.96MM	Std.
-3NBS6MM	3.96MM	Std.
-3TS6MM	3.96MM	Std.
-3VS6MM	3.96MM	Std.

42 MINIATURE BALL VALVES

PART NUMBER	ORIFICE	316 STAINLESS (SS)
-42S6MM	3.17MM	Std.

53 LIFT CHECK VALVES

PART NUMBER	ORIFICE	316 STAINLESS (SS)
-53S6MM	3.96MM	Std.

The above part numbers are shown in millimeter sizes.

NUPRO® VALVES WITH MILLIMETER (MM) ENDS

B BELLOWS VALVES

PART NUMBER	ORIFICE	BRASS (B)	316 STAINLESS (SS)
-(6MM)BG	4.37MM		Std.
-(6MM)BK	4.37MM	Std.	Std.
-(6MM)BK-91NC	4.37MM	Std.	Std.
-(6MM)BK-91NO	4.37MM		Std.
-(6MM)BKT	4.37MM	Std.	Std.
-(6MM)BW	4.37MM		Std.
-(10MM)BG	7.92MM		Std.
-(10MM)BK	7.92MM		Std.
-(10MM)BW	7.92MM		Std.
-(12MM)BK	7.92MM		Std.
-(12MM)BW	7.92MM		Std.

C CHECK VALVES

PART NUMBER	ORIFICE	BRASS (B)	316 STAINLESS (SS)
-(6MM)C-1/3	4.75MM		Std.
-(6MM)C-1	4.75MM		Std.
-(6MM)C-10	4.75MM		Std.
-(6MM)C-25	4.75MM		Std.

H BELLOWS VALVES

PART NUMBER	ORIFICE	BRASS (B)	316 STAINLESS (SS)
-(6MM)H	3.96MM	Std.	Std.

J FORGED BODY SHUT-OFF VALVES

PART NUMBER	ORIFICE	BRASS (B)	316 STAINLESS (SS)
-(6MM)J	3.96MM	Std.	
-(6MM)JB	4.37MM		Std.

M FINE METERING VALVES

PART NUMBER	ORIFICE	BRASS (B)	316 STAINLESS (SS)
-(3MM)MG	1.4MM	Std.	
-(3MM)MA	1.4MM	Std.	
-(6MM)MG	1.4MM	Std.	

Stainless Steel Micrometer Handle for "M" Series Valves is a regional standard.

S VERY FINE METERING VALVES

PART NUMBER	ORIFICE	BRASS (B)	316 STAINLESS (SS)
-(3MM)SA	.79MM	Std.	Std.
-(3MM)SG	.79MM	Std.	Std.

Stainless Steel Vernier Handle for "S" Series Valves is a regional standard.

T BELLOWS VALVES

PART NUMBER	ORIFICE	316 STAINLESS (SS)
-(6MM)TW	4.37MM	Std.

U BELLOWS VALVES

PART NUMBER	ORIFICE	316 STAINLESS (SS)
-(6MM)UW	4.37MM	Std.
-(10MM)UW	7.92MM	Std.

The above part numbers are shown in millimeter sizes.

ISO-NPT FITTINGS

CATALOG NUMBER	BRASS (B)	STEEL (S)	316 STAINLESS (SS)
-2-A-R1/8	Std.	Std.	Std.
-2-A-R1/8T	Std.	Std.	Std.
-4-A-R1/4	Std.	Std.	Std.
-4-A-R1/4T	Std.	Std.	Std.
-6-A-R3/8	Std.	Std.	Std.
-6-A-R3/8T	Std.	Std.	Std.
-8-A-R1/2	Std.	Std.	Std.
-8-A-R1/2T	Std.	Std.	Std.
-2-HN-R1/8	Std.	Std.	Std.
-2-HN-R1/8T	Std.	Std.	Std.
-4-HN-R1/4	Std.	Std.	Std.
-4-HN-R1/4T	Std.	Std.	Std.
-6-HN-R3/8	Std.	Std.	Std.
-6-HN-R3/8T	Std.	Std.	Std.
-8-HN-R1/2	Std.	Std.	Std.
-8-HN-R1/2T	Std.	Std.	Std.

ISO STRAIGHT THREAD GASKETS

MALE ISO THREAD	COPPER (CU)
-R1/8-2	Std.
-R1/4-2	Std.
-R3/8-2	Std.
-R1/2-2	Std.

The above part numbers are shown in fractional sizes.

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