



VALVES, FITTINGS & TUBING PRESSURE VESSELS & REACTORS



High Pressure Equipment
A GRACO Company



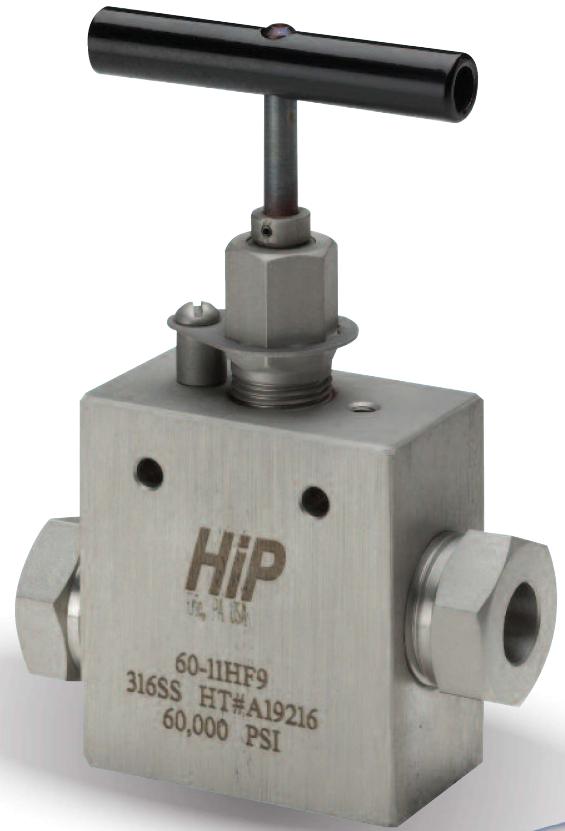
HiP... Our Name is High Pressure

High pressure valves, fittings and tubing manufactured to the highest quality standards, delivered with the shortest lead times, and priced to make you money... it's been the focus at HiP throughout our more than 65 year history. We offer a broad product portfolio capable of handling pressures up to 150,000 psi and carry an extensive inventory allowing us to offer same day shipping of many items. In addition to our high pressure valves, we offer a complete line of reactors and pressure vessels and an expanded family of pumping systems and instrument valves.

In addition to our standard products, we offer a complete line of valves and fittings for oil and gas industry use with sour gas (H₂S). For applications involving specialty gases, corrosive liquids, and extreme temperatures/conditions, we'll make our products using exotic alloys and temperature extensions, as well as design and build a solution to meet your exact requirements, such as our popular custom manifolds. This dedication to satisfying our loyal customers is the driving force behind our continued growth, including our passing the 4 million high pressure valves and fittings shipped milestone.

Committment to Quality

As a company that exclusively deals in elevated pressure applications, we understand that our customers depend on our products to provide safe and reliable operation at pressures as high as 150,000 psi. Throughout our history we have been dedicated to continuous improvement in all aspects of our manufacturing operation and customer service. This commitment has only increased over time, including our joining the Graco family of companies and implementing their world class quality systems.



Markets

Our high standards for quality, service and value have enabled us to achieve preferred supplier status with a wide variety of market leaders in many different industries.

- **Waterjet Cutting and Blasting**
- **Oil and Gas**
- **Chemical and Petrochemical**
- **Research and Development**
- **Universities and Government**
- **General Industry**

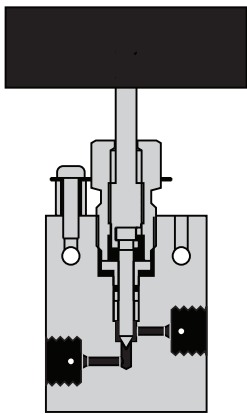
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Valve Design

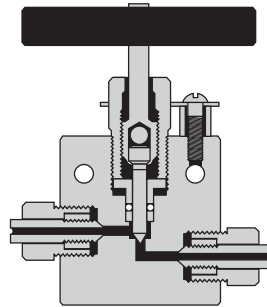
General

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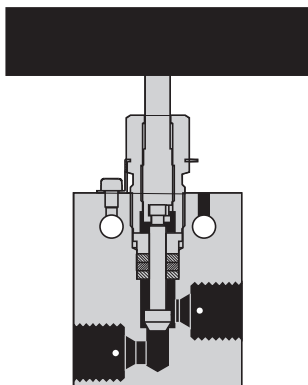
- Valve bodies through 100,000 psi are high tensile Type 316 stainless steel, 150,000 psi valve bodies are 17-4 PH stainless steel.
- Stem assemblies have non-rotating tips to prevent galling with valve seats.
- Packing is located below the stem threads to prevent contact with media (liquid or gas).
- Packing glands are equipped with locking devices or lock nuts.
- Six valve patterns (see chart on page 7).
- Tubing connections are: $\frac{1}{16}$ " , $\frac{1}{8}$ " , $\frac{1}{4}$ " , $\frac{3}{8}$ " , $\frac{9}{16}$ " , $\frac{3}{4}$ " , 1" and $1\frac{1}{2}$ ".
Pipe connections include: $\frac{1}{8}$ " , $\frac{1}{4}$ " , $\frac{3}{8}$ " , $\frac{1}{2}$ " , $\frac{3}{4}$ " , and 1" NPT.
- Remote control air operators are available for most valves.



Slotted Stem



Rolled Style Stem



Pinned Stem

Slotted Stem: Non-rotating slotted stems are standard on AF4, AF6, LF4, LF6, LF9, HF6, HF4, and HF9 (30,000 psi) HF2, HF4, HF6, HF9 (60,000 psi) for on-off service and ensure long life on valve seats. Regulating tip stems are available for all valves at no additional cost, add -REG to part number.

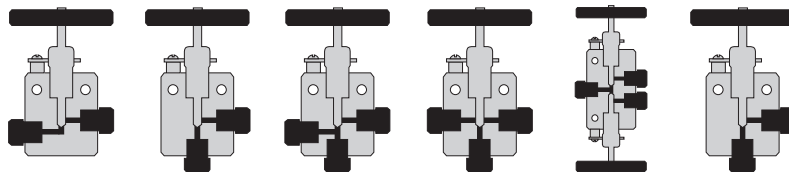
Rolled Style Stem: This simple two-piece design is also non-rotating and is ideal for smaller valves and for valves made from exotic materials. The standard lower section stem is manufactured from hardened 17-4 PH stainless steel. It is affixed to a one-piece upper stem requiring no periodic adjustment. The two stem components are free to rotate independently of each other, thereby minimizing rotation of the lower stem against the valve seat.

The Rolled Style Stem is standard for all AF1, AF2, NFA, NFB, LF4, LF6 valves, 30,000 psi HF2, XF4, and XF6 valves, as well as most valves requiring stems made from exotic materials. It is optional for any valve normally supplied with a Positive Guide Stem.

Pinned Stem Design: This variation on the Rolled Style Stem is a three-piece design in which the lower stem is pinned into a freely-rotating stem guide. It has all of the advantages of the rolled style stem, with the additional benefit of a replaceable lower section stem.

The Pinned Stem Design is standard for all NFC, NFD, NFF, NFH, LF9, LF12, LF16, and HF16 valves.

Quick Selector Guide to Standard Valves



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Taper Seal Valves

	Tubing Size		Two Way Straight	Two Way Angle	Three Way Two Press	Three Way One Press	Three Way Two Stem	Replaceable Seat
	O.D.	I.D.						
10,000 psi	1/4"	1/8"	10-11AF4	10-12AF4	10-13AF4	10-14AF4	10-15AF4	10-12AF4-R
	3/8"	1/4"	10-11AF6	10-12AF6	10-13AF6	10-14AF6	10-15AF6	10-12AF6-R
15,000 psi	1/16"	.030"	15-11AF1	15-12AF1	15-13AF1	15-14AF1	15-15AF1	NA
	1/8"	1/16"	15-11AF2	15-12AF2	15-13AF2	15-14AF2	15-15AF2	NA
10,000 psi	1/8"		10-11NFA	10-12NFA	10-13NFA	10-14NFA	10-15NFA	10-12NFA-R
	1/4"		10-11NFB	10-12NFB	10-13NFB	10-14NFB	10-15NFB	10-12NFB-R
	3/8"		10-11NFC	10-12NFC	10-13NFC	10-14NFC	10-15NFC	10-12NFC-R
	1/2"		10-11NFD	10-12NFD	10-13NFD	10-14NFD	10-15NFD	10-12NFD-R
	3/4"		10F-11NFF	10F-12NFF	10F-13NFF	10F-14NFF	10F-15NFF	10F-12NFF-R
	1"		10F-11NFH	10F-12NFH	10F-13NFH	10F-14NFH	10F-15NFH	10F-12NFH-R
15,000 psi	1/8"		15F-11NFA	15F-12NFA	15F-13NFA	15F-14NFA	15F-15NFA	15F-12NFA-R
	1/4"		15F-11NFB	15F-12NFB	15F-13NFB	15F-14NFB	15F-15NFB	15F-12NFB-R
	3/8"		15F-11NFC	15F-12NFC	15F-13NFC	15F-14NFC	15F-15NFC	15F-12NFC-R
	1/2"		15F-11NFD	15F-12NFD	15F-13NFD	15F-14NFD	15F-15NFD	15F-12NFD-R
10,000 psi	3/4"	33/64"	10-11LF12	10-12LF12	10-13LF12	10-14LF12	10-15LF12	10-12LF12-R
	1"	11/16"	10-11LF16	10-12LF16	10-13LF16	10-14LF16	10-15LF16	10-12LF16-R
15,000 psi	1 1/2"	15/16"	15-11LF24	15-12LF24	15-13LF24	15-14LF24	15-15LF24	15-12LF24-R
20,000 psi	1/4"	7/64"	20-11LF4	20-12LF4	20-13LF4	20-14LF4	20-15LF4	20-12LF4R
	3/8"	13/64"	20-11LF6	20-12LF6	20-13LF6	20-14LF6	20-15LF6	20-12LF6R
	9/16"	5/16"	20-11LF9	20-12LF9	20-13LF9	20-14LF9	20-15LF9	20-12LF9R
	3/4"	33/64"	20-11LF12	20-12LF12	20-13LF12	20-14LF12	20-15LF12	20-12LF12R
	1"	11/16"	20-11LF16	20-12LF16	20-13LF16	20-14LF16	20-15LF16	20-12LF16R
30,000 psi	1/8"	.040"	30-11HF2	30-12HF2	30-13HF2	30-14HF2	30-15HF2	30-12HF2R
	1/4"	.083"	30-11HF4	30-12HF4	30-13HF4	30-14HF4	30-15HF4	30-12HF4R
	3/8"	1/8"	30-11HF6	30-12HF6	30-13HF6	30-14HF6	30-15HF6	30-12HF6R
	9/16"	3/16"	30-11HF9	30-12HF9	30-13HF9	30-14HF9	30-15HF9	30-12HF9R
	1"	.437"	30-11HF16	30-12HF16	30-13HF16	30-14HF16	30-15HF16	30-12HF16R
60,000 psi	1/8"	.020"	60-11HF2	60-12HF2	60-13HF2	60-14HF2	60-15HF2	60-12HF2R
	1/4"	1/16"	60-11HF4	60-12HF4	60-13HF4	60-14HF4	60-15HF4	60-12HF4R
	3/8"	1/8"	60-11HF6	60-12HF6	60-13HF6	60-14HF6	60-15HF6	60-12HF6R
	9/16"	3/16"	60-11HF9	60-12HF9	60-13HF9	60-14HF9	60-15HF9	60-12HF9R
100,000 psi	1/4"	1/16"	100-11XF4	100-12XF4	100-13XF4	100-14XF4	NA	100-12XF4R
150,000 psi	3/8"	1/16"	150-11XF6	150-12XF6	150-13XF6	150-14XF6	NA	150-12XF6R

NPT Valves

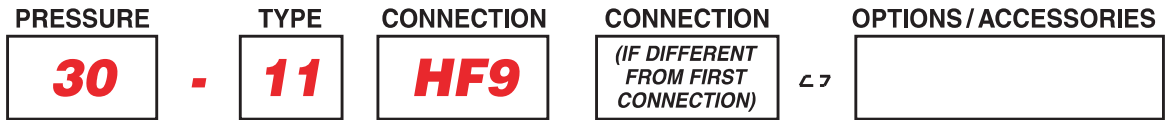
Medium Pressure Valves

High Pressure Valves

Ultra High Pressure Valves

Catalog Numbering System

1



Pressure Series

- 10 = 10,000 psi
- 15 = 15,000 psi
- 20 = 20,000 psi
- 30 = 30,000 psi
- 40 = 40,000 psi
- 60 = 60,000 psi
- 100 = 100,000 psi
- 150 = 150,000 psi

Catalog part numbers for some components (NPT fittings, special alloy parts) have been maintained for historical consideration.

The referred pressure series may not reflect the actual pressure rating. Please refer to applicable catalog page for pressure rating, or consult the factory.

Type of Components

- 2 = Gland, Collar or Sleeve
- 3 = Anti-Vibration Assembly
- 7 = Plug
- 11 = 2-Way Straight Valve
- 12 = 2-Way Angle Valve
- 13 = 3-Way Valve with Two Pressure Connections
- 14 = 3-Way Valve with One Pressure Connections
- 15 = 3-Way, 2-Stem Valve
- 16 = Ball Valve (Floating)
- 21 = Coupling or Adapter
- 22 = Elbow
- 23 = Tee
- 24 = Cross
- 41 = Check Valve
- 51 = Line Filter
- 61 = Safety Head (Straight)
- 63 = Safety Head (Tee Type)
- 71 = 2-Way Ball Valve *
- 72 = 3-Way Ball Valve 180° *
- 73 = 3-Way Ball Valve Diverter *
- 74 = 2-Way Ball Valve *
- 75 = 3-Way Ball Valve 180° *
- 76 = 3-Way Ball Valve Diverter *
- 77 = 3-Way Mini Ball Valve 1/4" NPT
- 80 = 2-Way Ball Valve *
- 81 = 3-Way Ball Valve 180° *
- 82 = 3-Way Ball Valve Diverter *

* (Trunion)

Connection(s) Size and Type

Female	Male	
AF1	AM1	1/16" Taper Seal
AF2	AM2	1/8" Taper Seal
AF4	AM4	1/4" Taper Seal
AF6	AM6	3/8" Taper Seal
LF4	LM4	1/4" Medium Pressure
LF6	LM6	3/8" Medium Pressure
LF9	LM9	9/16" Medium Pressure
LF12	LM12	3/4" Medium Pressure
LF16	LM16	1" Medium Pressure
LF24	LM24	1 1/2" Medium Pressure
HF2	HM2	1/8" High Pressure
HF4	HM4	1/4" High Pressure
HF6	HM6	3/8" High Pressure
HF9	HM9	9/16" High Pressure
HF16	HM16	1" High Pressure
XF4	XM4	1/4" Ultra High Pressure
XF6	XM6	3/8" Ultra High Pressure
NFA	NMA	1/8" NPT Pipe
NFB	NMB	1/4" NPT Pipe
NFC	NMC	3/8" NPT Pipe
NFD	NMD	1/2" NPT Pipe
NFF	NMF	3/4" NPT Pipe
NFH	NMH	1" NPT Pipe
—	HA9	9/16" Hose
—	HA12	3/4" Hose
—	HA16	1" Hose
—	HA21	1 5/16" Hose

Options

- V = Micro Control Metering Assembly
- HT = High Temperature Stem Extension (Up to 1,000° F)
- SGS = Sour Gas (H₂S) Service
- N/O = Normally Open
- N/C = Normally Closed
- K = With Antivibration Collars and Glands
- REG = Regulating Tip
- TSR8 = Ball Valve Actuator
- TDA8 = Ball Valve Actuator Double Acting
- W/O = Without Collars and Glands
- LT = Low Temperature Stem Extension (to -320°F)
- MPO-NO = Medium Duty Piston Operator Normally Open
- MPO-NC = Medium Duty Piston Operator Normally Closed
- HPO-NO = Heavy Duty Piston Operator Normally Open
- HPO-NC = Heavy Duty Piston Operator Normally Closed
- EHPO-NO = Extra Heavy Piston Operator Normally Open
- EHPO-NC = Extra Heavy Piston Operator Normally Closed
- OC = Oxygen Cleaning
- HL = Handle Lock (Ball Valve Only)
- MHNO = Mini Hippo Normally Open
- MHNC = Mini Hippo Normally Closed
- LS = Limit Switch

How to Order Valves and Fittings

Simply indicate catalog number and specify option or special requirement.

Examples:

30-11HF4 = 30,000 psi Straight Valve for 1/4" O.D. tubing

60-23HF4 = 60,000 psi Tee for 1/4" O.D. tubing

15-21AF2 = 15,000 psi Straight Coupling for 1/8" O.D. tubing, Taper Seal connections

15-21AF2NMB = 15,000 psi Adapter with one end 1/8" O.D. Female Taper Seal and opposite end Male 1/4" NPT Pipe

30-11HF6-HT = 30,000 psi Straight Valve for 3/8" O.D. tubing with High Temperature Extension

"HIPCO" 10-12NFB (N/C) = 10,000 psi Angle Valve for 1/4" NPT Pipe with "Hipco" Air Operator, Normally Closed

"HIPPO" 15-11A4F (N/C) = 10,000 psi Angle Valve for 1/4" Taper Seal with "Hippo" Piston Operator, Normally Closed

60-21HF4 (Hastelloy C-276) = 60,000 psi Straight Coupling for 1/4" O.D. tubing, made from Hastelloy C-276 material



High Pressure Equipment

Tooling

To ensure safe and leak-free operation of your pressure system, High Pressure Equipment Company provides complete installation instructions for the make-up of a coned and threaded connection. In addition to outlining the correct procedures, we offer coning and threading tools and female tubing connection tools.



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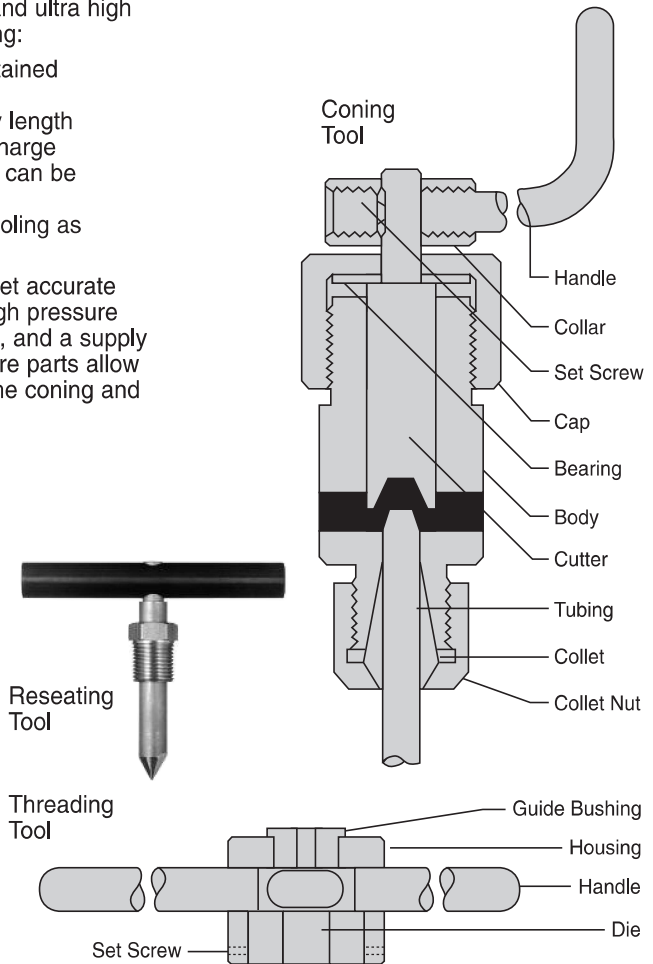
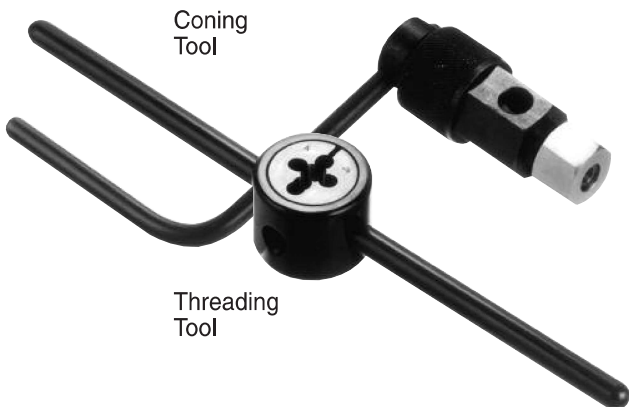
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Tooling

The coned and threaded tubing ends for the medium, high and ultra high pressure connections may be supplied by any of the following:

1. Standard length tubing nipples with ends prepared. Maintained in stock—ready for shipment.
2. Special length tubing nipples with ends prepared. Specify length required (up to 22 feet long). Add coning and threading charge to tubing price. (While not in stock, special length nipples can be furnished quickly for prompt delivery).
3. Preparation of tubing ends at your own facility by hand tooling as described in this section.

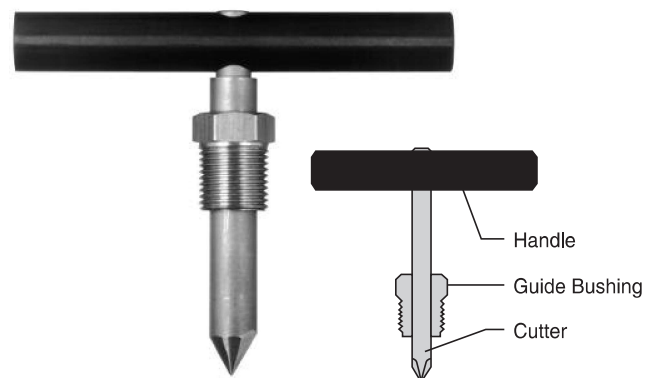
The coning and threading tools are designed for simple yet accurate preparation of tubing ends for the medium, high and ultra high pressure connections. A liberal amount of cutting fluid should be used, and a supply is furnished with each order for tooling. Interchangeable spare parts allow easy change over from one size tubing to another on both the coning and threading tools. Note that the reseating tool is not required for tubing preparation.



Reseating Tools

The reseating tools are available for repairing old or damaged tubing connection seats in valves or fittings. This tool is not required for tubing preparation.

Catalog No.	For Tubing Connection
RTLF4	LF4
RTLF6	LF6
RTLF9	LF9
RTHF2	HF2
RTHF4	HF4
RTHF6	HF6
RTHF9	HF9
RTXF4	XF4
RTXF6	XF6



Coning Tools

The coning tool is designed for preparing a “cone” on the ends of Medium, High and Ultra High Pressure tubing. Included angle of the cone is approximately 57 to 59 degrees. The cutter and collet are interchangeable on all of the assemblies (except 2-HF9 and 2-LF9) to permit changing from one size tubing to another.

Catalog No.	Tubing Size	Spare Cutter	Spare Collet
2-LF4	1/4" O.D. x .109" I.D. (20,000 psi)	2-LF4L	2-LF4P
2-LF6	3/8" O.D. x .203 I.D. (20,000 psi)	2-LF6L	2-LF6P
2-LF9	9/16" O.D. x .312 I.D. (20,000 psi)	2-LF9L*	2-LF9P*
2-HF2	1/8" O.D. x .020 I.D. (60,000 psi) 1/8" O.D. x .040 I.D. (30,000 psi)	2-HF2L	2-HF2P
2-HF4	1/4" O.D. x .083 I.D. (60,000 psi)	2-HF4L	2-HF4P
2-HF6	3/8" O.D. x 1/8" I.D. (60,000 psi)	2-HF6L	2-HF6P
2-HF9	9/16" O.D. x 3/16" I.D. x (60,000 psi)	2-HF9L*	2-HF9P*
2-XF4	1/4" O.D. x 1/16" I.D. (100,000 psi)	2-XF4L	2-XF4P
2-XF6	3/8" O.D. x 1/16" I.D. (150,000 psi)	2-XF6L	2-XF6P

* Not interchangeable



For more information, watch our training video online www.highpressure.com/C-TVide

Threading Tools

The threading tool is designed for preparing a left-hand thread onto Medium, High and Ultra High Pressure tubing ends. The threaded die and guide bushings are interchangeable on all of the assemblies (except 2-MHF2) to permit changing from one size tubing to another. The guide bushing on the 2-MHF2 is built into the die holder.

Catalog No.	Tubing Size	Spare Threading Die	Spare Guide Bushing
2-MLF4	1/4" O.D.	1/4" - 28LH	2-MLF4P
2-MLF6	3/8" O.D.	3/8" - 24LH	2-MLF6P
2-MLF9	9/16" O.D.	9/16" - 18LH	2-MLF9P
2-MHF2	1/8" O.D.	1/8" - 40LH	N/A
2-MHF4	1/4" O.D.	1/4" - 28LH	2-MHF4P
2-MHF6	3/8" O.D.	3/8" - 24LH	2-MHF6P
2-MHF9	9/16" O.D.	9/16" - 18LH	2-MHF9P
2-MXF4	1/4" O.D.	1/4" - 28LH	2-MXF4P
2-MXF6	3/8" O.D.	3/8" - 24LH	2-MXF6P



Tooling

Coning Tubing Ends

The coning tool is designed for preparing a “cone” having an included angle of approximately 57 to 59 degrees on the ends of tubing.

Operation is as follows:

1. Secure coning tool body in suitable vise.
You may wish to angle the tool in the vise in order to facilitate access to the collet nut and knurled cap.
2. Cut off tubing to desired length and deburr ends.
3. Rotate knurled cap clockwise into tool as far as it will go.
4. “Back off” knurled cap by rotating counterclockwise a number of complete rotations as indicated in the chart below. (A mark on the knurled cap may be useful).

Tubing Size	“Back Off Turns”
$\frac{1}{8}$ " O.D.	3 turns
$\frac{1}{4}$ " O.D.	4½ turns
$\frac{3}{8}$ " O.D.	4½ turns
$\frac{9}{16}$ " O.D.	8 turns

5. Insert tubing thru collet nut and collet until tubing stops up against inside cutter.
6. Tighten collet nut to secure tubing into position.
7. Turn knurled cap counterclockwise to remove cap and cutter from tool.
8. Apply a very liberal amount of “Sulflo” (sulphur based cutting compound) to the end of the cutter.
9. Screw cap and cutter back into the body until the cutter contacts the end of the tubing.
10. Rotate handle of cutting tool clockwise fairly rapidly with one hand while slowly rotating the knurled cap clockwise with the other hand in order to continuously feed the cutter into the tubing. Do not overly force the cutter against the tubing as it will bind. (You will quickly develop the proper feel). You will need to rotate the knurled cap a complete number of turns as per the chart below in order to complete the cone on the end of the tubing.

Tubing Size	“Back Off Turns”
$\frac{1}{8}$ " O.D.	2½ turns
$\frac{1}{4}$ " O.D.	3½ turns
$\frac{3}{8}$ " O.D.	4 turns
$\frac{9}{16}$ " O.D.	7½ turns

11. After coning the tubing end, loosen the collet nut and remove tubing from the tool. Remove the knurled cap and cutter from the tool in order to clean off the Sulflo compound and steel chips in preparation for the next tube.

NOTES:

- A. Steps 3 and 4 (on left) are primarily a help in properly positioning the tubing in the tool. As you gain experience with the tool, you will be able to judge the proper position by sight in order to eliminate these steps.
- B. The $\frac{1}{4}$ " O.D. and $\frac{3}{8}$ " O.D. tubing sizes are relatively easy to cone. The $\frac{1}{8}$ " O.D. size is “delicate” (be especially careful not to force the cutter). The $\frac{9}{16}$ " O.D. size requires the most amount of firmness in the cutting.
- C. As with other tools, it is not uncommon for a collet to “stick” even after the collet nut has been released. Should this occur, simply tap the side of the collet nut firmly with the wrench to release the collet.

Threading the Tubing

The threading tool is designed to put a left hand thread onto the end of the tubing. Operation is as follows:

1. The coning tool (with the knurled cap and cutter removed) provides an ideal way to hold the tubing for the threading operation (see photo).
2. After securing the tubing, apply a liberal amount of Sulflo to the end of the tubing.
3. Place the threading tool (guide bushing side first) onto the tubing.
4. Place the palm of your hand firmly against the center of the threading tool and rotate your wrist counterclockwise. This will help “start” the die onto the tube. After you feel the die start onto the tubing, continue to rotate the threading tool using the handles.
5. Remove the threading tool and clean off Sulflo and chips.

NOTE:

The tubing collar should easily screw onto the tubing. If it feels too tight or loose, the die should be adjusted accordingly. Simply remove the die from the holder by loosening the outer set screw. The small adjustment screw located on the side of the die can be turned to precisely set the die.