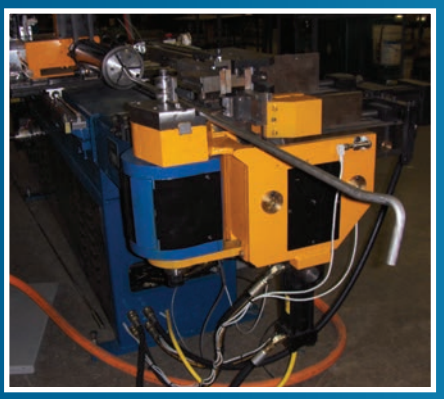
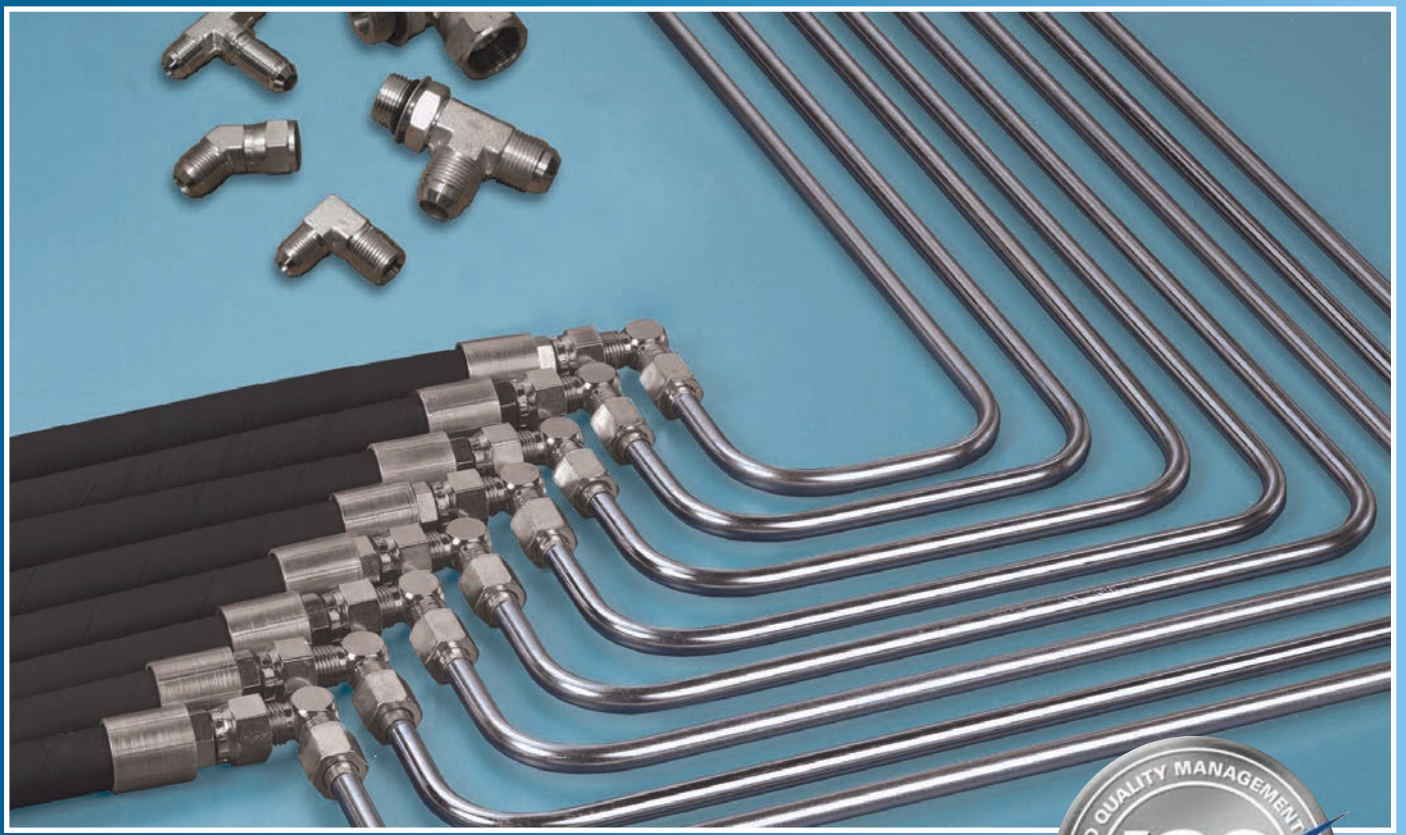
# Mid-State

"FLUID TRANSFER PRODUCTS"



# *Tube Assemblies Catalog*

*Catalog TAW215b*
*Dated December 2014*
*Supersedes all previous catalogs*



CERTIFIED QUALITY MANAGEMENT SYSTEM
ISO 9001:2008

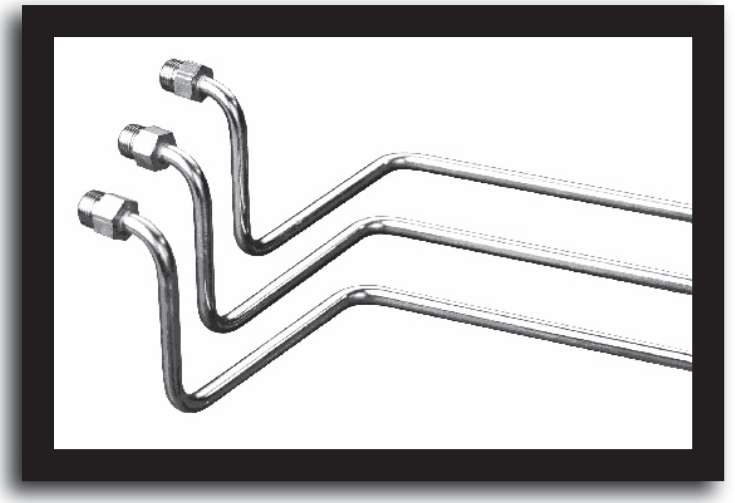
(800) 421-7051
www.midstate-sales.com

Inside Sales & Service
(800) 421-7051

Mid-State
"FLUID TRANSFER PRODUCTS"

# Tube Assemblies

## Introduction



Industry leading OEM's (Original Equipment Manufacturers) have chosen Mid-State because we provide a wide range of tube processing services including engineering support, stocking a large inventory of bulk tubing, and prototype to production runs.

We manufacture hydraulic tube assemblies for a variety of applications and industries using standard SAE hydraulic tubing to create made to order assemblies.

Our tube assemblies are used in hydraulic, fuel, oil, lubrication, fleet, automotive and military applications. In fact, Mid-State production standards are qualified to **iso 9001:2008** by the Defense Contract Management Agency, which provides contract management services to the U.S. Department of Defense, other federal agencies and foreign governments.

We can simplify your engineering, specification, and purchasing duties by taking single source responsibility for all of the flow control systems on your machinery from prototype to production.

Below is a chart that outlines our capabilities and manufacturing

| Tube Assembly specifications | Processes |
|---|---|
| Type — Hydraulic, fuel line, oil lines, lubrication, fleet and automotive<br>Size — ⅛" O.D. to 1 ½" O.D.<br>Materials — Steel, stainless steel, copper, bundy<br>Ends — Flared, double flared, pipe, O-Ring, flat face O-Ring, specials<br>Quantities — 1 piece to 50,000 pieces | • Bending<br>• Flaring<br>• Double Flaring<br>• Beading<br>• Brazing<br>• Welding (TIG)<br>• Machining |

## Processing services

One of our primary goals is to maximize our ability to provide the highest quality products and services that meet or exceed industry standards. Mid-State comes highly recommended not only because our tube processing services are supported by skilled professionals; but also because we are responsive, innovative, reliable and committed to providing exceptional service.

**services** – Standard Tube Product – beading, bending, brazing, flaring, double flaring, machining and welding (TIG and Orbital).

For orders and information, call your Mid-State representative at **800-421-7051.**

As your hydraulic tubing expert, Mid-State provides all the essential production processing services. By the time our two teams have finished collaborating, your project will be completed to the most exacting specifications. For more information on processing services, see the chart below. Whatever your hydraulic tubing needs, Mid-State delivers on time, every time.

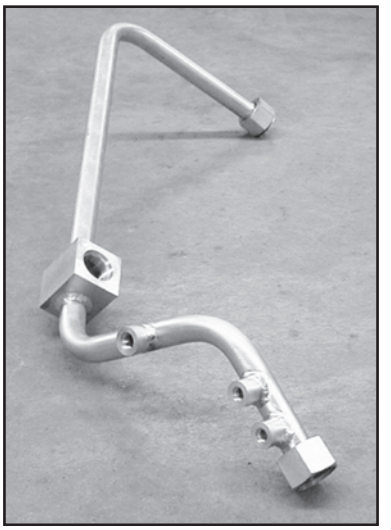
## Tube Processing ChArT

| service/Process | metal | Thickness/diameter | specifications |
|---|---|---|---|
| Beading | CS, SS, Cu, Al | ⅜" - 1 ½" O.D. / 0.065 max | SAE J1231 |
| Bending | CS, SS, Cu, Al | ⅛" - 1 ½" O.D. | To Print |
| Brazing | CS, SS, Al, Br | All | AWS |
| Flaring | CS, SS, Cu, AL | ⅜" - 1 ½" O.D. / 0.120 max | SAE J533 |
| Machining | CS, SS, Al, Br | Up to 4" O.D. | SAE |
| Welding | CS, SS, Al | All | AWS / ASME |

*CS - Carbon Steel, SS - Stainless Steel, Cu - Copper, Al - Aluminum, Br - Brass.*

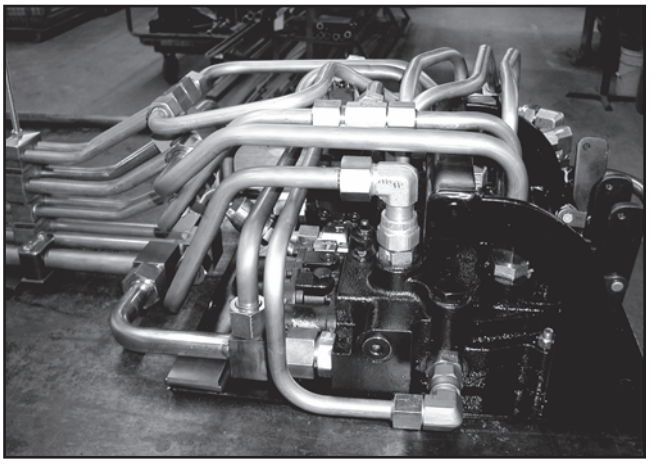
*Beading, Bending & Flaring can be done up to 4" with tooling upon request.*

***SPECIAL NOTES:** Our welders are certified to AWS D.1-90 and ASME Section IX.*



## suPPor T And AssisTAnce

Mid-State works carefully to ensure that every order is delivered to the customer's specification; that's why each of our processing services is managed to ISO 9001:2008 standards. Additionally, Mid-State offers customers an array of value-added services including engineering assistance, technical counseling, field expertise and special packaging, just pick up the phone and call us at **800-421-7051**.



**engineering support** - Our CAD capabilities allow us to work from finished engineering drawings, samples, or even rough sketches. Combined with our product knowledge of hydraulic tube and fitting processes, we are able to conduct a value analysis and recommend the best installation and routing methods for your application. Have a question? We have the answer. Our staff provides expert product recommendations on appropriate sizes and grades, machining, and fabrication. We can counsel you and your engineers over the phone, or at your plant.

**Field Application Assistance** – Our Field Application Specialists are specially trained to provide accurate, in-depth evaluations of your current hydraulic systems. Our tried and tested methods of hydraulic tube routing and installation prove that the earlier we get involved with your product engineering team, the more effective we are.

Our Step-by-Step process to proper tube routing and installation include:

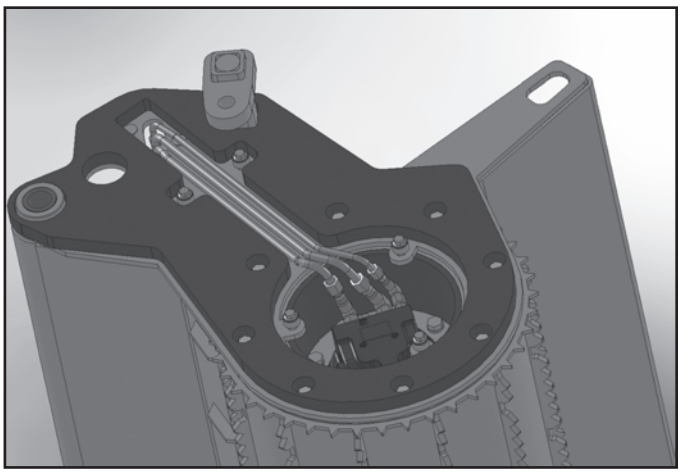
1. Meeting with your engineering team to identify the problem, issue, challenge or obstacle.
2. Gather all available engineering data.
3. Analyze the engineering data.
4. Make an initial recommendation.
5. Test the recommendation.
6. Evaluate the test.
7. Provide a final solution.

During the testing phase, we like to physically route an ideal port-to-port hydraulic system. Our goal is to assist your team to design a finished product to test and evaluate before production begins. We want to help you design the most efficient fluid power product for your customers.

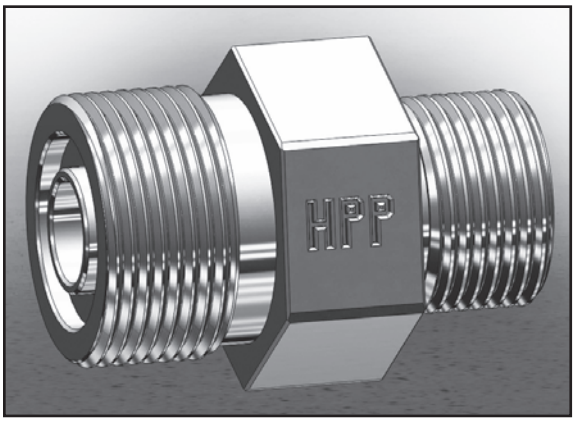
**customer service** - We understand the difficulties in the quoting and ordering process; therefore, we simplify the buying process by providing kitting and quotation services. An example of kitting would be individually packaging a group of tube assemblies into separate boxes so that the assembly line only has to pick up one box for each manufactured unit.

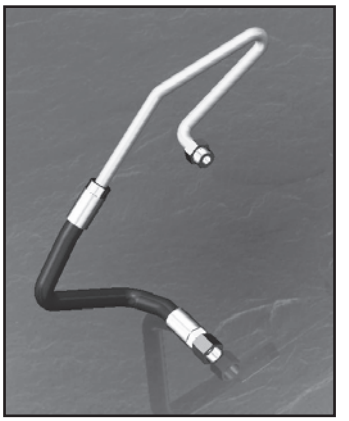
For more information, call your Mid-State representative at **800-421-7051.**

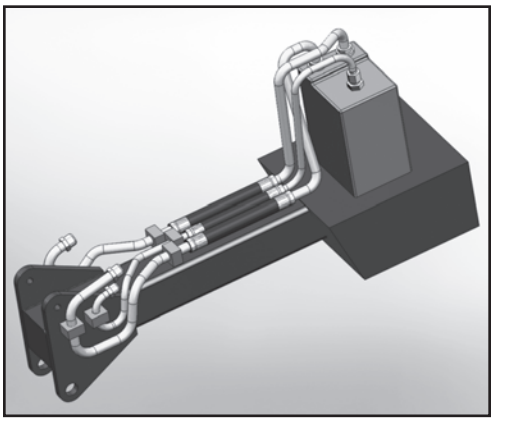
## solidWorks



Mid-State utilizes SolidWorks engineering software. We are capable of assisting our customers in the design and routing of hydraulic tubes, hoses and fittings. We can help develop a complete hydraulic system while still in the concept design phase. All too many times, the hose and fittings are left as the final step in the product design with little thought of where it will fit or how much it will cost. Tube assemblies ar usually completely overlooked and once in production are never considered. We can detect clearance issues by providing a 3D image of the "complete" hydraulic system. We can import other 3D formats and save the results in an "IGES" format for easy interaction. We can also guide our customers towards cost saving solutions before it's too late! Contact our engineering department and ask how 3D imaging can help in your hydraulic system design.





# Tube Assembly cleAning & PrOTecTion Policy

## mission

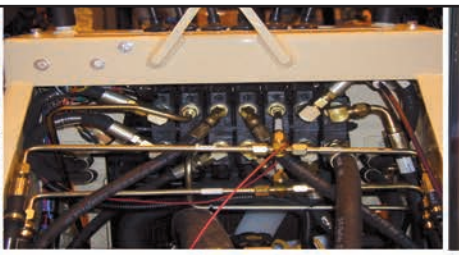
Mid-State will strive to deliver tube assemblies that are cleaned and protected to our customer's requirements. All tubes will be free of any loose debris or corrosion at the time of shipment. Each tube will be capped & packaged to ensure that the integrity of the tube O.D. and I.D. are not compromised. We will warranty any tube up to 30 days after shipment. Additional protection can be achieved with the application of our petroleum rust inhibitor and/or VCI bag or tube sleeve to seal the assembly prior to shipment. Our standard tube cleaning process should achieve ISO 20/17/14 cleanliness (minimum) for all assemblies at the time of shipment. Particle counts are regularly conducted using our MP-FILTRI testing equipment on all cleaning or protective fluids as well as final assemblies to validate our claims.

## STAndArd Tube CleAning Process

1) All tubing received at Mid-State in bulk will be inspected for the presence of O.D. and I.D. rust or damage to shape and rejected if necessary
2) Every tube that is cut for production will be flushed immediately using an emulsion cleaning fluid (NC-3098 / Ford Motor Company Spec - M5B198A). This water soluble solution with RP additive (light brown in color) is delivered under pressure with an elevated temperature to ensure the effectiveness of the process.
3) Tubes are visually inspected in the straight form as a precaution to identify any obstructions such as caps, metal chips or I.D. rust that may have not been detected in the longer factory length.
4) All welded assemblies such as tube to tube or tube to fitting will be purged during the GTAW process with pure Argon as a deterrent to weld slag.
5) All silver brazed assemblies are to be pre-fluxed and post-braze cleaned in addition to another NC-3098 flush.
6) All tubes assemblies requiring a trim, drilled hole or mitre cut will be deburred and flushed immediately with the NC-3098 solution during the manufacturing process.

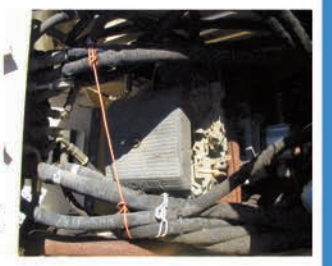
## AddiTionAl PrOTecTion

1) **Corrosion Preventative Treatment** - Tube assemblies are submerged and flushed with CASTROL DWX30 and racked to drain excess fluid before packaging.
2) **VCI packaging** - Individual or multiple tubes are sealed in our ZERUST bags or sleeving prior to shipment.



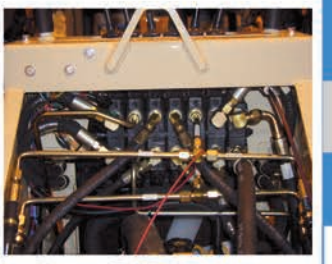

## Tube & Weld

## Case Study # 43



**Problem: A manufacturer of quality equipment and additives for the erosion control and landscaping industries needed to turn a sharp corner with a radiator hose that had a large bend radius. This prevented them from building the desired compact, finished product.**

**Solution: After receiving digital pictures of their machine, we exchanged a few important dimensions and discussed several design possibilities. We designed, built and tested two separate prototype assemblies, finally recommending a 1-1/4 x .065 beaded tube bent in way to avoid certain critical areas yet kept sections of hose for flexibility.**



**Result: At a cost of $8.00 versus the $18.00 for the often-replaced radiator hose, our tube assemblies helped streamline their equipment and was very economical. In addition, our tube assemblies removed a leak point because of previous welding and eliminated 20 minutes of labor. In the end, the customer saved both time & money as well as resolved an engineering problem.**

- Beading
- Bending
- Brazing
- Double Flaring
- Flaring
- Machining
- Welding (TIG)

**Engineering support**

**Hydraulic tube assemblies provide:**

- ✓ Higher working pressures
- ✓ Simplified assembly
- ✓ Lower labor costs
- ✓ Reduced leak points

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# Tube & Weld

# Case Study # 52

Figure 1. Solution

**Problem: A leading manufacturer of high performance stump cutters, forestry and site preparation equipment for the tree care industry designed a new prototype unit but was concerned that three separate hose assemblies connecting the hydraulic attachment(s) to the cab body had too much slack and could become dislodged while the unit was in operation.**

**Solution: After exchanging engineering data including drawings and specifications, it was decided that the best option to streamline the unit would be to design and install a kit assembly that utilized SAE hydraulic tubing for stability and a shortened hose assembly to maintain flexibility.**

**Result: Although the build cost increased, the aftermarket serviceability was greatly improved. In fact, estimates show that a one-time replacement of the hose assembly under the old design would have cost more than the kit assembly under the new design. Therefore, our tube assemblies improved the prototype in three key aspects: lower repair costs, increased safety and better serviceability.**

- Beading
- Bending
- Brazing
- Double Flaring
- Flaring
- Machining
- Welding (TIG)

**Engineering support**

**Hydraulic tube assemblies provide:**

- ✓ Higher working pressures
- ✓ Simplified assembly
- ✓ Lower labor costs
- ✓ Reduced leak points

## hose / Tube combo Assembl ies

If you want to eliminate adapters and potential leak points within your hydraulic system, then a hose-tube combo assembly may be the best answer for your application. By combining our hose assembly and tube assembly processes, Mid-State can now produce an assembly that will reduce your in house cost of manufacturing, eliminate two adapter connections and offer all the advantages of a tube assembly and the flexibility of a hose assembly.

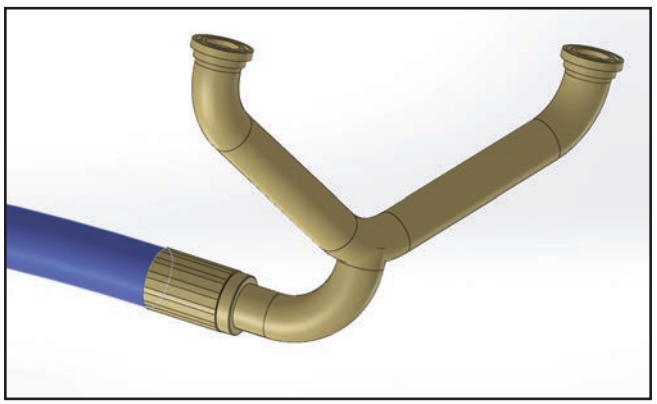
We can take any existing tube assembly design and add a hose assembly or vice versa and add a tube to an existing hose assembly. The applications for this product are wide but it suffices to say that a hose & tube combination assembly can eliminate several problems that a standard hose assembly to adapter to tube assembly may not.

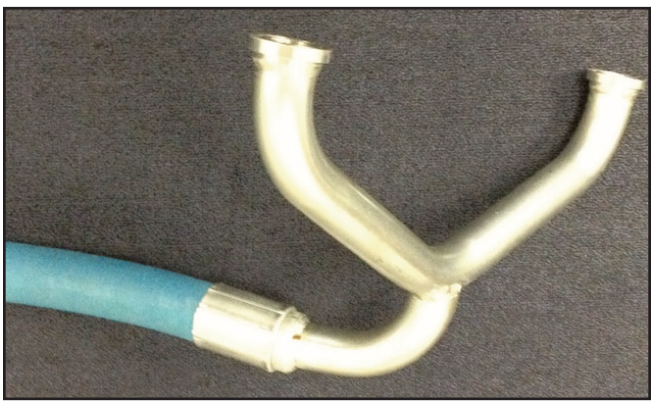
Additionally, our hose assembly capabilities allow us to incorporate your specific tube assembly configuration with a large offering of hydraulic hoses. Any hose in our product offering can be used for a combo assembly. Below is a list of hose specifications that we offer:

| Hose Specification | | |
|---|---|---|
| 100R1T | 100R4 | 100R13/AR |
| 100R2T | 100R4/HT | 100R13/XF |
| 100R2T/AR | 100R4/XF | 100R14 |
| 100R2T/HT | 100R7 | 100R15 |
| 100R17 | 100R7/NC | 100R15/AR |
| 100R17/AR | 100R12 | 4SP/AR |
| 100R16S | 100R12/AR | 4SH/AR |
| 100R16S/AR | 100R12/XF | 30R14 |
| 100R16S/HT | 100R13 | TOC |

*AR = Abrasion Resistant, XF = Extra Flex, HT = High Temp*

## From SolidWorks modeling, To...Finished ProducT





## mATer iAl

Mid-State can be your primary source for hydraulic & structural tubing. We stock every possible size of SAE J525 carbon steel hydraulic tubing from ⅛"- 1 ½" O.D. We also carry SAE J524 (carbon seamless), SAE J527 Bundy weld, 304 SS SAE A269, 304 SS SAE A213, ASTM A- 513 DOM, C4130 (Aircraft quality) and Metric (CS & SS) sizes in that range. Aluminum and Copper are available upon request.

To select tubing for a particular installation, two factors must be determined:

1. **Tubing type** – material and construction and
2. **size** – inside diameter (I.D.) and wall thickness. Information listed below will help with your tubing selection.

## Tubing TyPes

Commercial tubing is available in a wide variety of materials, types of construction and quality. Each is best suited for certain specific applications.

**sTeel Tubing** – Seamless SAE 1010 fully annealed and SAE welded types suitable for bending and flaring. This is the only tubing material approved without restrictions by SAE standards.

**sTAinl ess sTeel Tubing** – Both seamless *18-8 fully annealed and welded types suitable for bending and flaring, although seamless tubing is best suited for JIC single flares. Stainless steel tubing is recommended for use with very high pressures and where large diameter tubing is required. It is also suited for many applications where corrosion is a problem. ** (302, 303 and/or 304)*

**Al uminum Tubing** – Seamless annealed is approved by SAE for low-pressure applications.

**coPPer Tubing** – Seamless fully annealed coils and fully annealed or quarter-hard straight lengths can be used for systems that do not use petroleum-based fluids (copper acts as an oil-oxidation catalyst, causing sludge). Copper also tends to work harden when flared or bent and has poor resistance to vibration. Therefore, the use of copper tubing is limited to low-pressure stationary applications and air circuits.

**sPeciAl Al l oy Tubing** – May be required for specific corrosion problems. For more information on these applications, please contact our Tube & Weld Division.

## STAndAr d Size hydr Aul ic Tubing

| Tube o.d. | Tube i.d. | Wall |
|---|---|---|
| ⅛ | .055<br>.069 | .035<br>.028 |
| 3/16 | .117 | .035 |
| ¼ | .120<br>.152<br>.180<br>.194 | .065<br>.049<br>.035<br>.028 |
| 5/16 | .182<br>.214<br>.242<br>.256 | .065<br>.049<br>.035<br>.028 |
| ⅜ | .245<br>.277<br>.305 | .065<br>.049<br>.035 |

| Tube o.d. | Tube i.d. | Wall |
|---|---|---|
| ½ | .310<br>.344<br>.370<br>.402<br>.430 | .095<br>.083<br>.065<br>.049<br>.035 |
| ⅝ | .435<br>.459<br>.495<br>.527<br>.555 | .095<br>.083<br>.065<br>.049<br>.035 |
| ¾ | .510<br>.532<br>.560<br>.584<br>.620<br>.652<br>.680 | .120<br>.109<br>.095<br>.083<br>.065<br>.049<br>.035 |

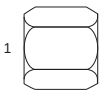
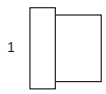
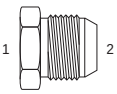
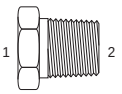
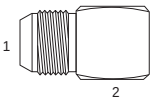
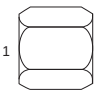
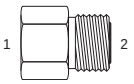
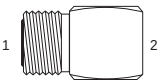
| Tube o.d. | Tube i.d. | Wall |
|---|---|---|
| ⅞ | .657<br>.685<br>.709<br>.745 | .109<br>.095<br>.083<br>.065 |
| 1 | .760<br>.782<br>.810<br>.834<br>.870<br>.902 | .120<br>.109<br>.095<br>.083<br>.065<br>.049 |
| 1 ¼ | .982<br>1.010<br>1.032<br>1.060<br>1.084<br>1.120 | .134<br>.120<br>.109<br>.095<br>.083<br>.065 |
| 1 ½ | 1.232<br>1.260<br>1.282<br>1.310<br>1.334<br>1.370 | .134<br>.120<br>.109<br>.095<br>.083<br>.065 |

Mid-State stocks one of the largest inventories of hydraulic fittings in the U.S. Our huge inventory enables us to build almost any type of prototype or standard assembly for your specific application quickly. We stock the standard SAE brazed, welded, flared and compression fittings for tube from ⅛" to 1 ½" O.D.

In addition, we pride ourselves on our unique ability to modify standard fittings to create "special" connections as well as incorporate the finished component into your production assembly.

We have coined this process "P2P" Performance (port-to-port) and we are unmatched by our competition. Our P2P process gives you, the customer, an unlimited variety of styles to choose from when in the design phase.

## Tube Assembly End Connections

| | | | | | | |
|---|---|---|---|---|---|---|
|  318 - Nut (1) Tube O.D. |  319 - Sleeve (1) Tube O.D. |  403 (1) Tube O.D. (2) Male 37° Flare |  404 (1) Tube O.D. (2) Male Pipe |  500 (1) Male 37° Flare (2) Tube O.D. |  FF318 - Nut (1) ORFS Tube Nut |  FF319 - Sleeve (1) ORFS Braize On Sleeve |
|  FF403 (1) Tube O.D. (2) Male ORFS |  FF500 (1) Male ORFS (2) Tube O.D. | | | | | |

## Fitting Thread Size Comparison Chart

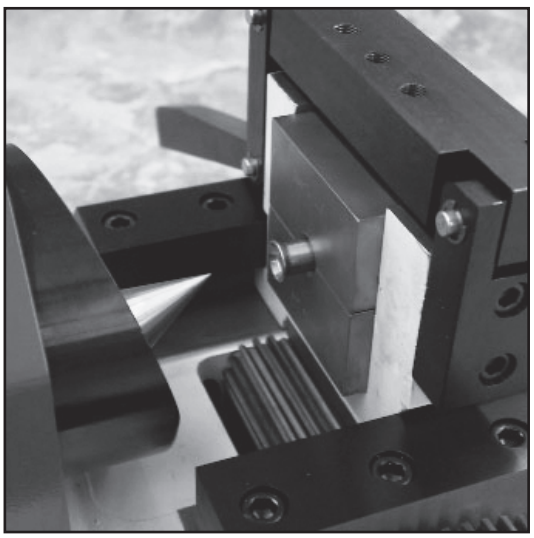
| Tube o.d. | nPT/ nPsm | o-ring Face seal | Jic | sAe o-ring | sAe45° | inverted Flare | compression | bsPT/ bsPP | dash # |
|---|---|---|---|---|---|---|---|---|---|
| ⅛ | ⅛ - 27 | — | 5/16 - 24 | 5/16 - 24 | 5/16 - 24 | 5/16 - 28 | 5/16 - 24 | ⅛ - 28 | 02 |
| 3/16 | — | — | ⅜ - 24 | ⅜ - 24 | ⅜ - 24 | ⅜ - 24 | ⅜ - 24 | — | 03 |
| ¼ | ¼ -18 | 9/16 - 18 | 7/16 - 20 | 7/16 - 20 | 7/16 - 20 | 7/16 - 24 | 7/16 - 24 | ¼ - 19 | 04 |
| 5/16 | — | — | ½ - 20 | ½ - 20 | ½ - 20 | ½ - 20 | ½ - 24 | — | 05 |
| ⅜ | ⅜ -18 | 11/16 - 16 | 9/16 - 18 | 9/16 - 18 | ⅝ - 18 | ⅝ - 18 | 9/16 - 24 | ⅜ - 19 | 06 |
| 7/16 | — | — | — | — | 11/16 - 16 | 11/16 - 18 | ⅝ - 24 | — | 07 |
| ½ | ½ -14 | 13/16 - 16 | ¾ - 16 | ¾ - 16 | ¾ - 16 | ¾ - 18 | 11/16 - 20 | ½ - 14 | 08 |
| ⅝ | — | 1 - 14 | ⅞ - 14 | ⅞ - 14 | ⅞ - 14 | ⅞ - 18 | 13/16 - 18 | — | 10 |
| ¾ | ¾ - 14 | 1 3/16 - 12 | 1 1/16 - 12 | 1 1/16 - 12 | 1 1/16 - 14 | 1 1/16 - 16 | 1 - 18 | ¾ - 14 | 12 |
| ⅞ | — | 1 3/16 - 12 | 1 3/16 - 12 | 1 3/16 - 12 | — | 1 3/16 - 16 | — | — | 16 |
| 1 | 1 - 11 ½ | 1 7/16 - 12 | 1 5/16 - 12 | 1 5/16 - 12 | — | 1 5/16 - 16 | 1 ¼ - 18 | 1 - 11 | 20 |
| 1 ¼ | 1 ¼ - 11 ½ | 1 11/16 - 12 | 1 ⅝ - 12 | 1 ⅝ - 12 | — | — | — | 1 ¼ - 11 | 24 |
| 1 ½ | 1 ½ - 11 ½ | 2 - 12 | 1 ⅞ - 12 | 1 ⅞ - 12 | — | — | — | 1 ½ - 11 | 32 |

## end For mATion And connecTions

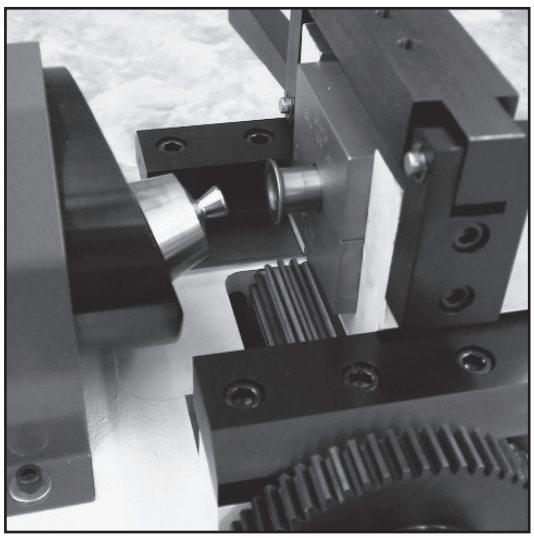
### AuTomATed Fl Ar ing And Fl Anging

Mid-State is committed to providing exceptional service and continually examining new methods of delivering superior products. We are please to announce the implementation of a mistake-proof tube flaring and flanging process known as VERSAtool™. Using the latest technology to improve your product delivery, VERSAtool™ is a Semi-Automatic Tube Flaring and Flanging Machine that provides ultimate versatility in a tube preparation tool. VERSAtool™ is a "three-in-one" operation center. It flares ¼" to 1 ½" (6mm to 38mm) tubing AND flanges ¼" to 1" (6mm to 25mm) tubing. The forming operation automatically burnishes the tube-sealing surface. The machine is tested and approved for use with stainless steel, carbon steel, and copper tubing.

VERSAtool™ flares and flanges various sizes of tubing using a separate Nose-tool and SINGLE Set of Dies that allow VERSAtool™ to form a 37° or 45° Flare, or a SAE J1453 O-Ring Face Seal.

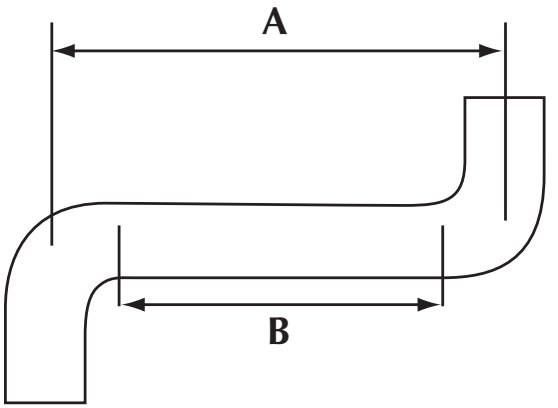


37° or 45° Flare Nose-tool



90° Flange Nose-tool

# Tube Assembly design guide




**A =** overall length

**b =** minimum straight length between bends

This Chart is designed to be used as a guide for obtaining the most economic combination of bend radius, overall length and minimum straight length between two bends. Many other bend radii and design characteristics are available for specific application requirements.

| Tube o.d. | desired bend radius | 'A' minimum | 'b' minimum |
|---|---|---|---|
| 1/4" | .50 | 2.75" | 1.25" |
| 5/16" | .75 | 2.75" | 1.25" |
| 3/8" | .75 | 2.75" | 1.25" |
| 1/2" | .75 | 2.75" | 1.25" |
| 5/8" | 1.12 | 2.75" | 1.25" |
| 3/4" | 1.25 | 2.75" | 1.25" |
| 1" | 1.50 | 2.75" | 1.25" |
| 1 1/4" | 2.50 | 5.50" | 3.00" |
| 1 1/2" | 4.50 | 12.00" | 3.00" |
| 2" | 8.00 | 19.00" | 4.00" |

## bulk Tubing

SAE J525 Electric resistant welded low carbon steel tubing meets ANS B93.4 and NFPA-STD-T3.15.66. Excellent bending and flaring characteristics. Sold in 20 foot random lengths.

| Tubing o.d. | Wall Thickness | gauge | Psi burst Pressure | Part number |
|---|---|---|---|---|
| 3/16 | .035 | 20 | 16,000 | 3-035 HWST |
| 1/4 | .035 | 20 | 12,600 | 4-035 HWST |
| 1/4 | .049 | 18 | 17,640 | 4-049 HWST |
| 1/4 | .065 | 16 | 22,000 | 4-065 HWST |
| 5/16 | .035 | 20 | 10,080 | 5-035 HWST |
| 5/16 | .049 | 18 | 14,112 | 5-049 HWST |
| 3/8 | .035 | 20 | 8,400 | 6-035 HWST |
| 3/8 | .049 | 18 | 11,760 | 6-049 HWST |
| 3/8 | .065 | 16 | 15,600 | 6-065 HWST |
| 1/2 | .035 | 20 | 6,300 | 8-035 HWST |
| 1/2 | .049 | 18 | 8,820 | 8-049 HWST |
| 1/2 | .065 | 16 | 11,700 | 8-065 HWST |
| 1/2 | .083 | 14 | 14,940 | 8-083 HWST |
| 1/4 | .095 | 13 | 17,100 | 8-095 HWST |
| 5/8 | .049 | 18 | 7,055 | 10-049 HWST |
| 5/8 | .065 | 16 | 9,360 | 10-065 HWST |
| 5/8 | .083 | 14 | 11,950 | 10-083 HWST |
| 5/8 | .095 | 13 | 13,680 | 10-095 HWST |
| 3/4 | .035 | 20 | 4,200 | 12-035 HWST |
| 3/4 | .049 | 18 | 5,880 | 12-049 HWST |
| 3/4 | .065 | 16 | 7,800 | 12-065 HWST |
| 3/4 | .083 | 14 | 9,960 | 12-083 HWST |
| 3/4 | .095 | 13 | 11,400 | 12-095 HWST |
| 3/4 | .120 | 11 | 13,080 | 12-120 HWST |
| 7/8 | .065 | 16 | 6,685 | 14-065 HWST |
| 7/8 | .083 | 14 | 8,537 | 14-083 HWST |
| 7/8 | .095 | 13 | 9,771 | 14-095 HWST |
| 1 | .065 | 16 | 5,850 | 16-065 HWST |
| 1 | .083 | 14 | 7,470 | 16-083 HWST |
| 1 | .095 | 13 | 8,550 | 16-095 HWST |
| 1 | .109 | 12 | 9,810 | 16-109 HWST |
| 1 | .120 | 11 | 10,800 | 16-120 HWST |
| 1 1/4 | .065 | 16 | 4,860 | 20-065 HWST |
| 1 1/4 | .095 | 13 | 6,840 | 20-095 HWST |
| 1 1/4 | .120 | 11 | 8,640 | 20-120 HWST |
| 1 1/4 | .134 | 10 | 11,000 | 20-134 HWST |
| 1 1/2 | .095 | 13 | 5,700 | 24-095 HWST |
| 1 1/2 | .120 | 11 | 7,200 | 24-120 HWST |

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