PROFESSIONAL BENDER WITH DIES HPB40

ASSEMBLY & OPERATING INSTRUCTIONS

Diagrams within this manual may not be drawn proportionally.

Due to continuing improvements, actual product may differ slightly from the product described herein.

Read this material before using this product.
Failure to do so can result in serious injury.
SAVE THIS MANUAL.

SPECIFICATIONS

Max Round Pipe O.D.(mm//in)	50.8//2
Max. Bending Angle	180°

SAVE THIS MANUAL

You will need the manual for the safety warnings and precautions, assembly instructions, operating and maintenance procedures, parts list and diagram. Keep your invoice with this manual. Write the invoice number on the inside of the front cover. Keep the manual and invoice in a safe and dry place for future reference.

SAFETY WARNINGS AND PRECAUTIONS

WARNING: When using tool, basic safety precautions should always be followed to reduce the risk of personal injury and damage.
Read all instructions before using this tool!

1. **Keep work area clean.** Cluttered areas invite injuries.
2. **Observe work area conditions.** Do not use machines or power tools in damp or wet locations. Don't expose to rain. Keep work area well lighted. Do not use electrically powered tools in the presence of flammable gases or liquids.
3. **Keep children away.** Children must never be allowed in the work area. Do not let them handle machines, tools, or extension cords.
4. **Store idle equipment.** When not in use, tools must be stored in a dry location to inhibit rust. Always lock up tools and keep out of reach of children.
5. **Do not force tool.** It will do the job better and more safely at the rate for which it was intended. Do not use inappropriate attachments in an attempt to exceed the tool capacity.
6. **Use the right tool for the job.** Do not attempt to force a small tool or attachment to do the work of a larger industrial tool. Do not modify this tool and do not use this tool for a purpose for which it was not intended.
7. **Dress properly.** Do not wear loose clothing or jewelry as they can be caught in moving parts. Protective, electrically non-conductive clothes and non-skid footwear are recommended when working. Wear restrictive hair covering to contain long hair.
8. **Use eye and ear protection.** Always wear ANSI approved impact safety goggles. Wear a full face shield if you are producing metal filings or wood chips. Wear an ANSI approved dust mask or respirator when working around metal, wood, and chemical dusts and mists.
9. **Do not overreach.** Keep proper footing and balance at all times. Do not reach over or across running machines. Keep hands and fingers clear of the Roll Dies when operating.

10. **Maintain tools with care.** Keep tools sharp and clean for better and safer performance. Follow instructions for lubricating and changing accessories. Inspect tool cords periodically and, if damaged, have them repaired by an authorized technician. The handle must be kept clean, dry, and free from oil and grease at all times.
11. **Remove adjusting keys and wrenches.** Check that keys and adjusting wrenches are removed from the tool or machine work surface before plugging it in.
12. **Stay alert.** Watch what you are doing, use common sense. Do not operate any tool when you are tired.
13. **Check for damaged parts.** Before using any tool, any part that appears damaged should be carefully checked to determine that it will operate properly and perform its intended function. Check for alignment and binding of moving parts; any broken parts or mounting fixtures; and any other condition that may affect proper operation. Any part that is damaged should be properly repaired or replaced by a qualified technician. Do not use the tool if any switch does not turn on and off properly.
14. **Guard against electric shock.** Prevent body contact with grounded surfaces such as pipes, radiators, ranges and refrigerator enclosures.
15. **Replacement parts and accessories.** When servicing, use only identical replacement parts. Use of any other parts will void the warranty. Only use accessories intended for use with this tool.
16. **Do not operate tool if under the influence of alcohol or drugs.** Read warning labels if taking prescription medicine to determine if your judgment or reflexes are impaired while taking drugs. If there is any doubt, do not operate the tool.
17. **Maintenance.** For your safety, service and maintenance should be performed regularly by a qualified technician.
18. **Workpiece may be sharp.** After bending or cutting workpieces use caution. Be aware of sharp edges or sharp shreds of metal that may be created. Use heavy duty gloves when handling the workpiece.

WARNING: The warnings, cautions, and instructions discussed in this instruction manual cannot cover all possible conditions and situations that may occur. It must be understood by the operator that common sense and caution are factors which cannot be built into this product, but must be supplied by the operator.

FEATURES

1. Bends round pipe and square pipe.
2. Easy operation.
3. All CNC machined surfaces.
4. Large 50.8mm//2” capacity.

UNPACKING

When unpacking, check to make sure that the item is intact and undamaged. If any parts are missing or broken, please contact the seller.

ASSEMBLY

1) Assemble the bender's frame assembly as shown below.

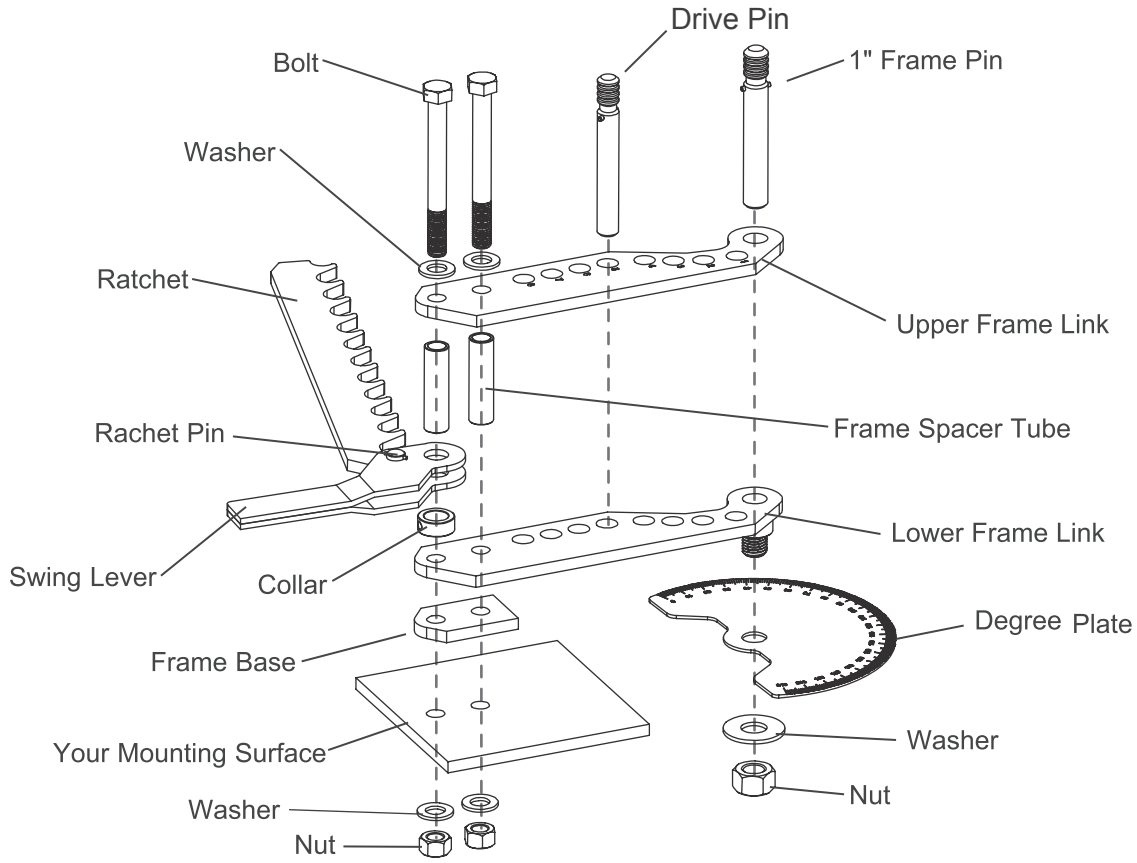


Figure 1 - Exploded view of the Frame Assembly with Degree Plate

A) Place the Frame Base（6#）on your Stand (11#) aligned with two holes of the Stand (11#).

B) Place the Lower Frame Link(2#) with the notched side to the left on top of the Frame Base(6#) aligned with the two holes.

C) Assemble the Ratchet(5#) and Swing Lever(3#) exactly as shown in **figures 1,2** using the pin and two spring pins. The Swing Lever(3#) must rotate almost a full 180 degrees . If the Swing Lever(3#) is installed upside down you will be unable to engage the next ratchet tooth during bending.

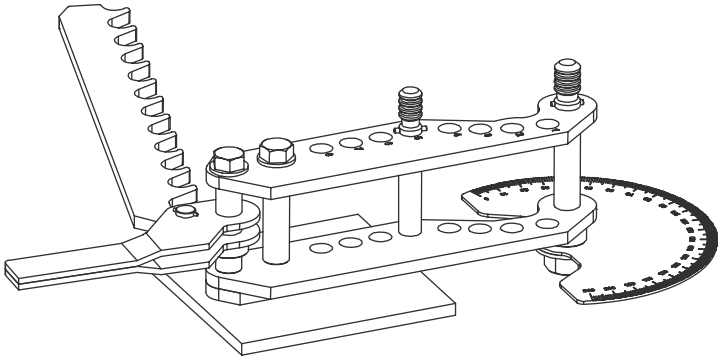


Figure 2 - Completed Frame Assembly with Degree Plate

D) Place the Swing Lever (3#) and the Collar (8#) on one of the two Frame Spacer Tubes (15#). Do not tighten Collar(8#).

E) Install the Upper Frame Link(1#), Ratchet(5#) assembly and Frame Spacer Tubes(15#) as shown above. Hand tighten the bolts(17#).

F) Insert the 1” Frame Pin(14#) into the Frame Link hole. Slide the Drive Pin (12#) into hole #5.Tighten the Nuts(19#) as tightly as possible, while insuring the two pins are perfectly vertical and slide easily through their respective holes.

G) Raise the Swing Lever(3#) to the middle of the Frame Spacer Tube(15#) and lock into position with the Collar(8#).

H) Install Degree Plate(9#) as shown. Use only your hand to snug down the Nut (19#). This Nut (19#) is never wrench tightened. This allows you to easily adjust the Degree Plate (9#) while bending.

3) The two Drive Links(7#) are assembled next. Using the two Drive Link Spacer Tubes(16#),two Bolts(20#),for Washers(21#) and two Nuts(22#), assemble the two Drive Links(7#) as shown in **figure 3**. The word 'TOP' must be face up on both links. This is very important because three of the four drive holes are offset to the right. Hand tighten only. Insert the two pins into their respective holes to help alignment. Lay the assembly on its side to further help alignment and wrench tighten securely.

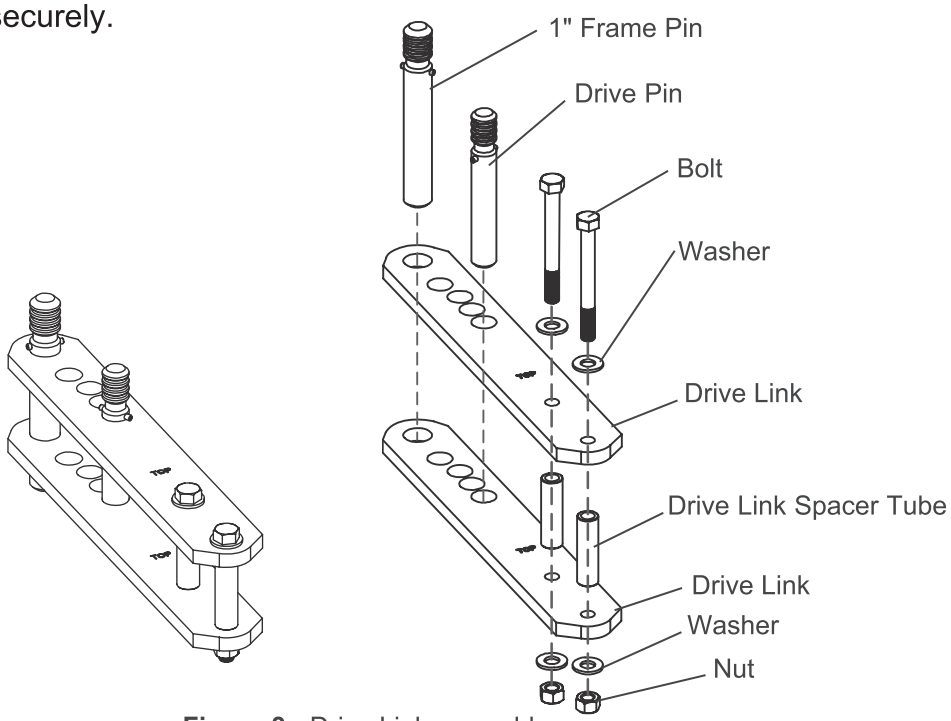


Figure 3 - Drive Link assembly

4) Remove all pins from the Drive Link assembly. With the word 'TOP' facing up, Install the Drive Link assembly into the Frame assembly using the 1" Frame Pin(14#). See **figure 4**. The bender is now assembled and ready for the die set to be installed.

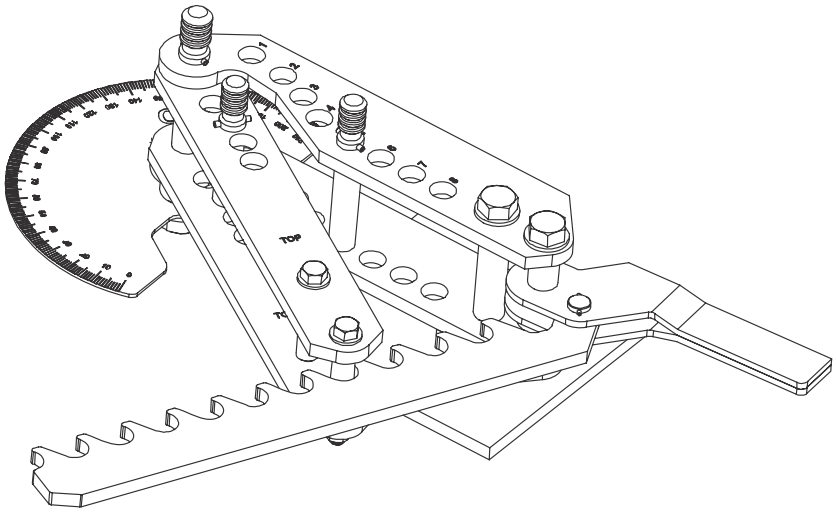


Figure 4 - Completed bender without die set installed

DIE SET COMPONENTS

A Die Set refers to the components that are used in the bender to hold the tubing or pipe during the bending operation. This section does not describe the operation of the bender. This section's purpose is to simply familiarize you with the different components that make up a 'Die Set'. Knowing how the different die set parts interact with each other is essential in operating the bender correctly. The die set must match the size of the tubing or pipe being bent. For example, never bend 1 1/2" tubing in a 1 5/8" die set. This may damage the followbar’s inserts.

First, let's explain the difference between tubing and pipe. Tubing is specified by its outside diameter and a wall thickness. For example, 1 1/2" x .095" tubing has an outside diameter of 1 1/2" and a wall thickness of .095". On the other hand, pipe is specified loosely on its inside diameter. We say loosely because the pipe's size may not actually be its inside diameter. Confused yet? Just remember pipe is commonly used for the purpose of transporting fluids. Fluid flow is only concerned with the inside area of the pipe and the outside makes no difference what so ever. Pipe wall thickness is specified as a schedule number and is obtained from a pipe chart. Another example, 1 1/2" schedule 40 pipe has an outside diameter of 1.900" (larger than 1 7/8") and a wall thickness of .145" and an inside diameter of 1.610" (near 1 5/8"). So, when

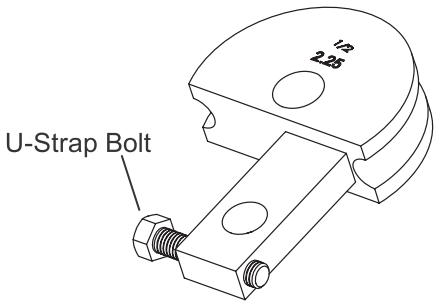
ordering die sets be careful to specify whether it's a tube or pipe size die set.

Round Groove Dies:

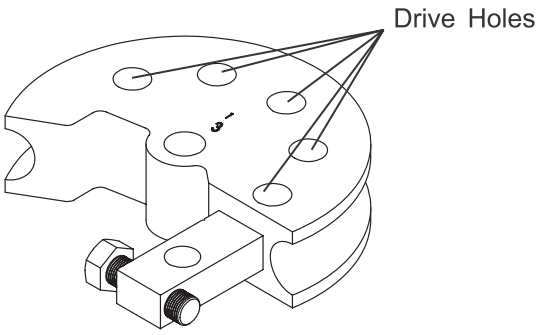
A Round groove die set consists of three main elements:

1) **Forming Die**

This is the part that the tube or pipe actually bends around. It has a circular groove machined around its circumference. Please note that this groove is machined with a specially designed profile to help in reducing flattening of the bend's outside. If you lay a section of tubing into the forming die you will notice that it will NOT completely seat into the die's groove. This is normal for tube size dies and becomes very important as the tube's wall thickness gets thinner. However, forming dies that are machined for 'Pipe' instead of tubing are generally not manufactured with this profile and the pipe may completely seat in the groove. Pipe is much more forgiving when it comes to bending it because of its thicker wall. Stamped into the top is the Outside diameter of



Forming Die without drive holes



Forming Die with drive holes

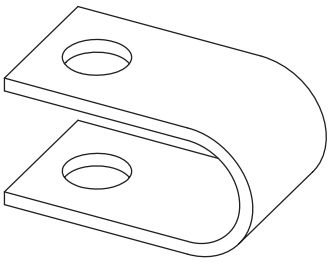
the tube or pipe and the centerline radius (CLR) of the forming die. Above is pictured a 1/2" die with a 2 1/4" CLR and a 1 " die with a 3" CLR.

Drive holes are drilled into most dies with a radius of 3" or larger. When the Drive Pin(12#) is inserted into the Drive Link(7#) , it will pass through these holes. This is how the Drive Link(7#) rotate the forming die. The drive holes are drilled oversize to permit easy insertion of the Drive Pin(12#).

Die sets with a radius smaller than 3" will generally not have drive holes because there is no room to drill them. As explained in the following section on how to operate the bender, the diameter of the tubing or pipe is so small the bender can be operated without the use of the ratchet mechanism.

2) **U-Strap**

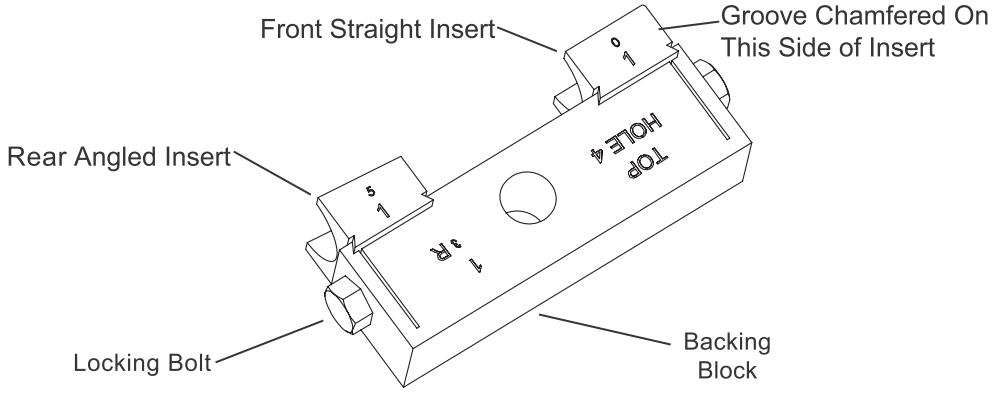
U-Strap is sized to the OD of the pipe or tubing being bent. The size is stamped onto them.



U-Strap for round groove dies

3) **Followbar**

The Followbar is the component that presses the tubing into the forming die to create the bend. Shown in the illustration below, it consists of three main parts: a backing block, an angled rear insert and a straight 0 degree front insert.This multipart design allows the inserts, if damaged or worn out, to be inexpensively replaced without having to purchase a whole followbar assembly. The Inserts are permanent cast from a special bearing grade anti-galling material to protect the tubing from scratching during the bending process and then CNC machined to size.



1 " OD Followbar Assembly

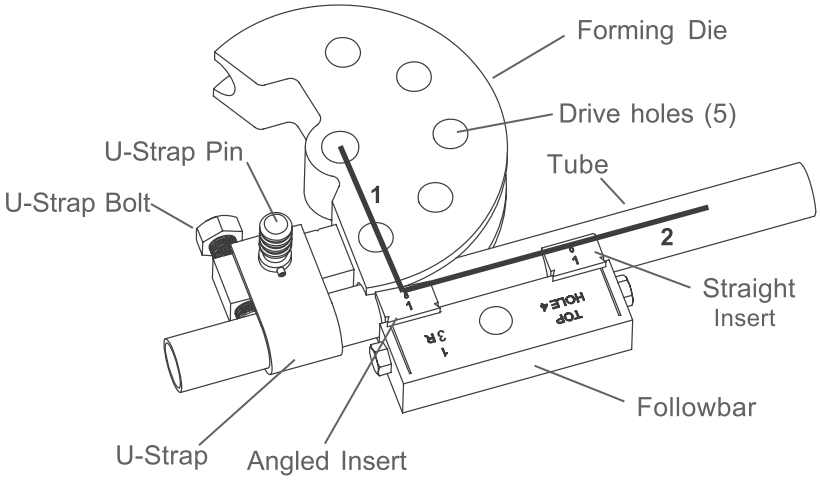
Replacing Inserts

The placement of the inserts into the backing block Chamfered must be done properly or poor quality bends will result. On This Notice one insert is marked 0 degrees. The other insert will be marked with the angle that is appropriate for the radius of the forming die (usually 3 or 5 degrees). The angle in the rear insert helps to support the tube or pipe after the point of bend, greatly reducing flattening. When bending, the

angled insert will always be closer to the forming die, and the U-strap for that matter, than the 0 degree insert. Notice in the figure to the right, that the tall side of the angled insert must face the U-strap side of the die.

The front 0 degree insert has a chamfer machined into one side of its groove. This chamfer must face away 1/2" from the rear insert, thus allowing the tube or pipe to slide through easier.

To replace the inserts, simply lay the Backing Block flat with the engraving facing up. The Backing Block may or may not be as thick as the inserts. If it is thinner, place spacers under the Backing Block so that when the inserts are inserted they are centered in the dovetails. This is important. Now tighten the locking bolts and you're done.



Die set components

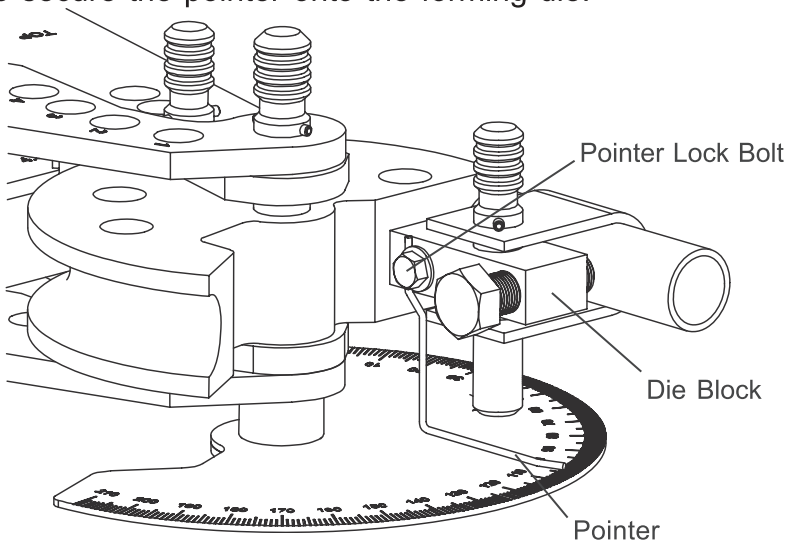
Complete Round Groove Die Set

Above is pictured all of the components which make up a complete die set for round tubing or pipe. In the figure to right, you can see two lines drawn at 90 degrees apart. These lines are marked as 1 and 2. Line 1 runs from the center of the forming die's center hole to approximately the middle of the angled rear insert. Line 2 runs from that point parallel to the tubing. This illustrates the basic principle of how the components relate to each other. It is vital that when bending the rear insert is positioned as shown. For example, suppose the followbar in engraved with hole 6 as shown, but you install it in hole 7. The rear insert will be shifted to the right of line 1 and the angle machined into it will have no effect during bending. This will generally cause flattening of the tubing's outer side and may also cause wrinkling. If you

experience this problem and you have the followbar installed in the correct hole, the rear insert's bending position can be easily checked. Simply place a short piece of tubing into the bender as if your were actually going to bent it. Apply enough bending force to remove any play but not actually bend the tubing. Now hold a 90 degree carpenter's square above the bender so that its outside edges are positioned similar to the red lines shown. The center of the angled rear insert should be roughly at the corner of the square. I say roughly because some dies are designed to shift the insert slightly to the left or right of center to improve bend quality. However, this will generally be less than 1/4". If as in the example above, you placed the followbar in the wrong hole, the insert will be very noticeably off center and almost always to the right of red line 1.

DEGREE POINTER INSTALLATION

Current production forming dies are made to accept a degree pointer. This is supplied as a straight piece of 3/32" copper coated steel rod. The illustration below shows the pointer installed on the forming die. You will need pliers and a wire cutter to fit the pointer. First install the die set into the bender, preferably with a length of tubing installed also. On the backside of the forming die's die block, you will see a thin groove with a washer and bolt installed next to it. Using the illustration below as a guide, bend the wire pointer to fit, making sure it clears the U-strap and drive links. Allow approximately 1/16" clearance above the degree markings. Notice we've placed a small bend in the pointer's lower end so that it aligns with the degree markings. This makes it easier to read when bending. When you are happy with the fit, tighten the pointer lock bolt to secure the pointer onto the forming die.



Pointer installed on the backside of the Die Block

DIE SET INSTALLATION AND BENDING PROCEDURE

Froming Dies sold separately. Those with drive holes and those without. The drive holes are the five holes drilled in a circular pattern around the forming die's center hole. A Drive Pin(12#) inserts through the Drive Links (7#) and through the forming die's drive holes when in operation. The drive holes are drilled oversize to provide easier pin installation. To prepare for bending, follow the steps below depending on the type of die set. **NOTE**: The procedures below describe using the degree indicator.To install an indicator onto your forming die, please refer to that section earlier in this manual.

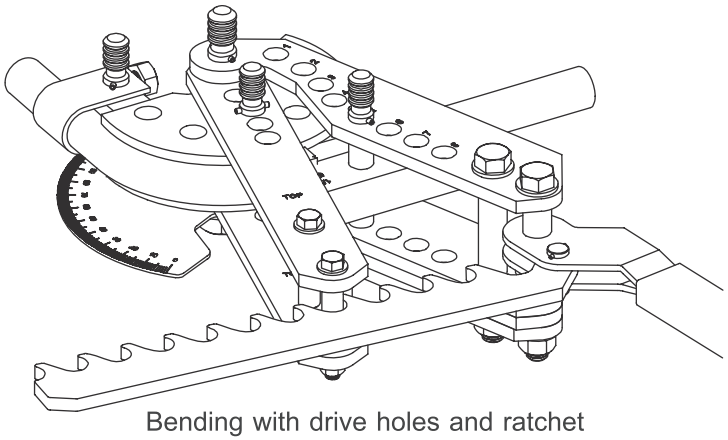
With Drive Holes:

Place the forming die into the bender using the 1" Frame Pin (1#) . If bending square tubing, thoroughly lubricate the forming die's groove. However, if bending round tubing or pipe, NEVER lubricate the forming die's groove. If you do, the tube will tend to slip backwards in the die while bending, which in turn causes the tubing to kink or wrinkle. Place the tube into the forming Die. Install the U-Strap with the shorter U-strap pin(13#). If necessary, tighten the U-strap bolt to prevent the tube from slipping through the die will bending. It's a good idea to cut a slice out of a bigger piece of tubing place it between the bolt and tubing to prevent the bolt from dimpling the tubing. If bending thin wall tubing (.065" or thinner) you must always use the U-strap bolt.

Next, using the Drive Pin (12#) , place the Followbar into the bender. See **page 8** for the correct way to install the Followbar. Lightly spray some lubricant on the outside of the tubing so that the tubing will slide through the Followbar easily. Any spray lubricant works well. If you are bending tubing with a wall thickness of .065" or thinner you may want to skip the lube entirely. This will help the followbar stick to the tubing during ratchet repositioning and generally helps prevent wrinkling. Make sure all pins are completely seated in their holes. Failure to do this may cause damage to the bender links or worse yet the operator may slip and fall.

Place the handle over the Swing Lever(3#) making sure the Handle is as far forward as possible on the Swing Lever(3#). Rotate the Swing Lever(3#) fully counter-clockwise. Engage the Ratchet(5#) onto the outer Drive Link Spacer Tube (16#). Lightly pull on the handle to preload the tubing. Do not pull hard enough to actually

bend the tubing. Using a free hand, loosen the degree plate nut. Rotate the degree plate until the die's pointer is at 0 degrees and then hand tighten the nut to secure it into position. Now you're ready to bend. Pull on the handle in a clockwise direction until the Swing Lever(3#) cannot rotate any further. Return the Swing Lever(3#) to the starting position. Initially release the Ratchet(5#) easily so as not to move the tubing and minimize spring back. Reengage the ratchet(5#) and pull again. When the last Ratchet tooth is reached, return the Swing Lever to its starting position. Remove the Drive Pin(12#) and rotate the Drive Links counter-clockwise until the Drive Pin(12#) may be reinstalled through another hole in the Bending Die. Be careful not to move the tube. Now repeat the above bending sequence until the desired degree of bend is obtained. To release the tubing from the bender, remove the handle from the Swing Lever(3#). Insert it diagonally through the Drive Link Spacer Tubes (16#) and pull counter-clockwise. The Followbar will release its grip and the tubing may be removed.



Bending with drive holes and ratchet

Without Drive Holes:

These dies typically have a center line radius of less than 3". Because the radius of the die is so small, drive holes cannot be drilled into the die. This does not present a problem as the tube sizes for these dies is of relatively small diameter and is easily bent. The ratchet(5#) is not used.

Die Installation Procedure:

Swing the ratchet assembly out of the way as shown below. Place the forming die into the bender. Place the tubing to be bent in the bender and using the long drive pin (not the shorter U-Strap pin that is usually used) install the U-strap. If desired, tighten the U-strap bolt to secure the tubing to the die. This is not mandatory and may be omitted if Handle installed and ready to bend without drive holes the tubing shows no signs of slipping through the die while bending. Now install the followbar being sure

the word 'TOP' is facing up. Rotate the drive links until their front edge pushes directly on the U-strap pin as shown in figure 5. Place the handle diagonally through the drive links' two spacer tubes. Lightly pull on the handle to preload the tubing. Do not pull hard enough to actually bend the tubing. Using a free hand, loosen the degree plate nut. Rotate the degree plate until the die's pointer is at 0 degrees and then hand tighten the nut to secure it into position. Now, simply pull the handle and observe the pointer until the desired degree is reached.

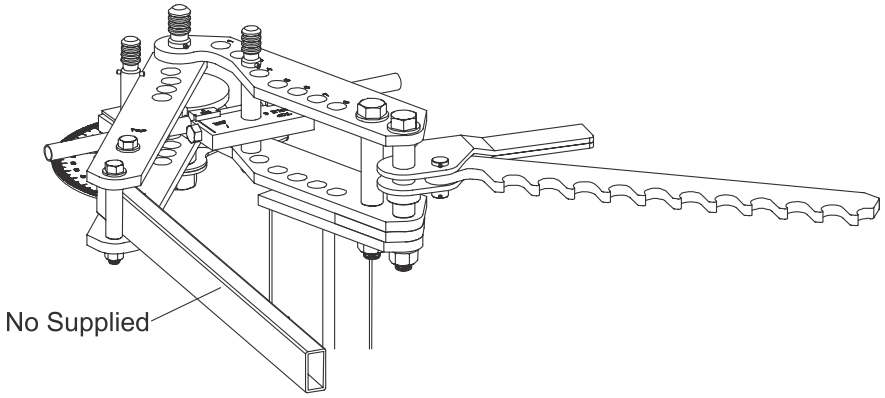


Figure 5 Handle installed and ready to bend without drive holes

PARTS LIST

Part NO.	Description	Qty
1	Upper Frame Link	1
2	Lower Frame Link	1
3	Swing Lever	1
4	Handle	1
5	Rachet	1
6	Frame Base	1
7	Drive Link	2
8	Collar	1
9	Degree Plate	1
10	Rachet Pin	1
11	Stand	1
12	Drive Pin	2
13	U-Strap Pin	1
14	1" Frame Pin	1
15	Frame Spacer Tube	2
16	Drive Link Spacer Tube	2
17	Bolt M20X175	2
18	Washer 20mm	5
19	Nut M20	3
20	Bolt M14X110	2
21	Washer 14mm	4
22	Nut M14	2
23	Screw M8X8	1

Part NO.	Description	Qty
24	Pin 5X32	6
25	1" Forming Die	1
26	1" U-Strap	1
27	1" Front Straight Insert	1
28	1" Rear Angled Insert	1
29	1" Blacking Block	1
30	1-1/2" Forming Die	1
31	1-1/2" U-Strap	1
32	1-1/2" Front Straight Insert	1
33	1-1/2" Rear Angled Insert	1
34	1-1/2" Blacking Block	1
35	1-3/4" Forming Die	1
36	1-3/4" U-Strap	1
37	1-3/4" Front Straight Insert	1
38	1-3/4" Rear Angled Insert	1
39	1-3/4" Blacking Block	1
40	Pointer	3
41	Bushing	2
42	Bolt M10X12	3
43	Washer 10mm	3
44	Bolt M12X65	1
45	Bolt M12X25	6
46	Bolt M16X65	2

PLEASE READ THE FOLLOWING CAREFULLY

THE MANUFACTURER AND/OR DISTRIBUTOR HAS PROVIDED THE PARTS DIAGRAM IN THIS MANUAL AS A REFERENCE TOOL ONLY. NEITHER THE MANUFACTURER NOR DISTRIBUTOR MAKES ANY REPRESENTATION OR WARRANTY OF ANY KIND TO THE BUYER THAT HE OR SHE IS QUALIFIED TO MAKE ANY REPAIRS TO THE PRODUCT OR THAT HE OR SHE IS QUALIFIED TO REPLACE ANY PARTS OF THE PRODUCT. IN FACT, THE MANUFACTURER AND/OR DISTRIBUTOR EXPRESSLY STATES THAT ALL REPAIRS AND PARTS REPLACEMENTS SHOULD BE UNDERTAKEN BY CERTIFIED AND LICENSED TECHNICIANS AND NOT BY THE BUYER. THE BUYER ASSUMES ALL RISK AND LIABILITY ARISING OUT OF HIS OR HER REPAIRS TO THE ORIGINAL PRODUCT OR REPLACEMENT PARTS THERETO, OR ARISING OUT OF HIS OR HER INSTALLATION OF REPLACEMENT PARTS THERETO.

PARTS DIAGRAM