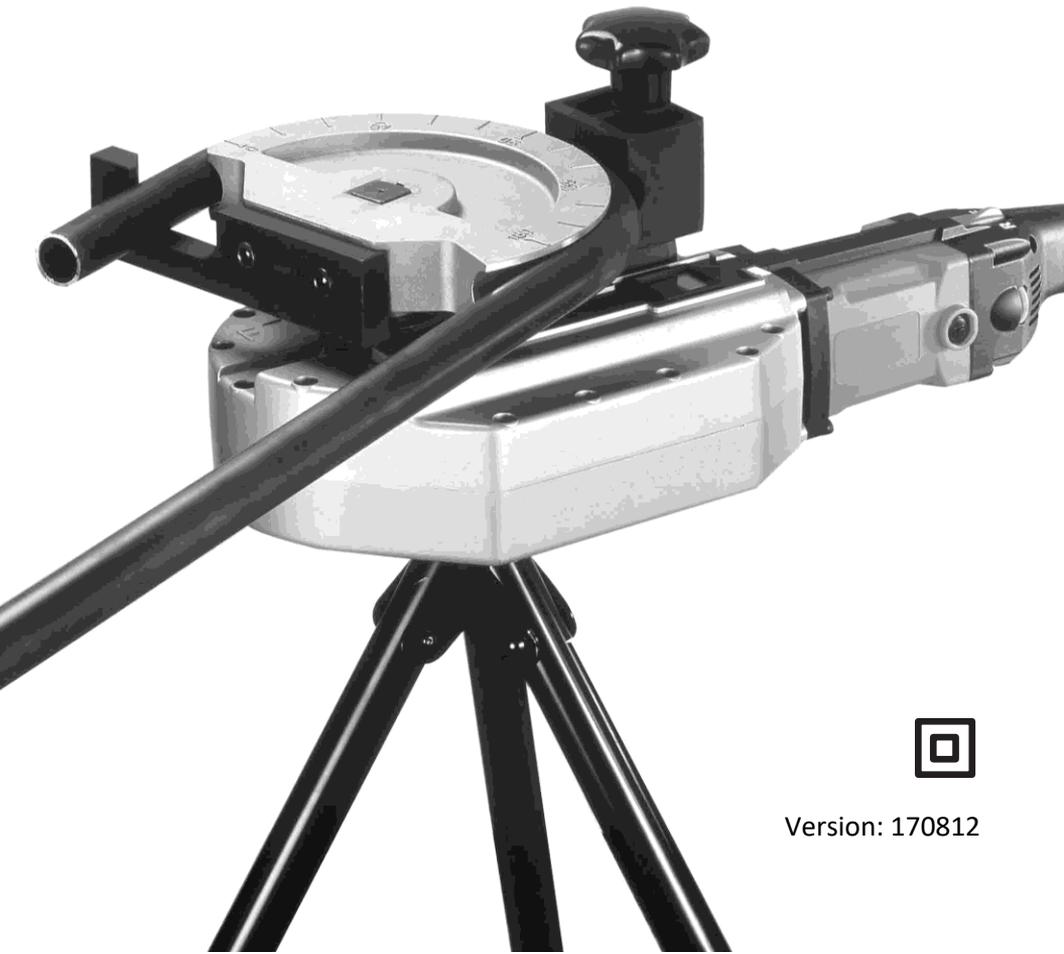


**REFTEKK**  
INTEGRATED PIPING SOLUTIONS

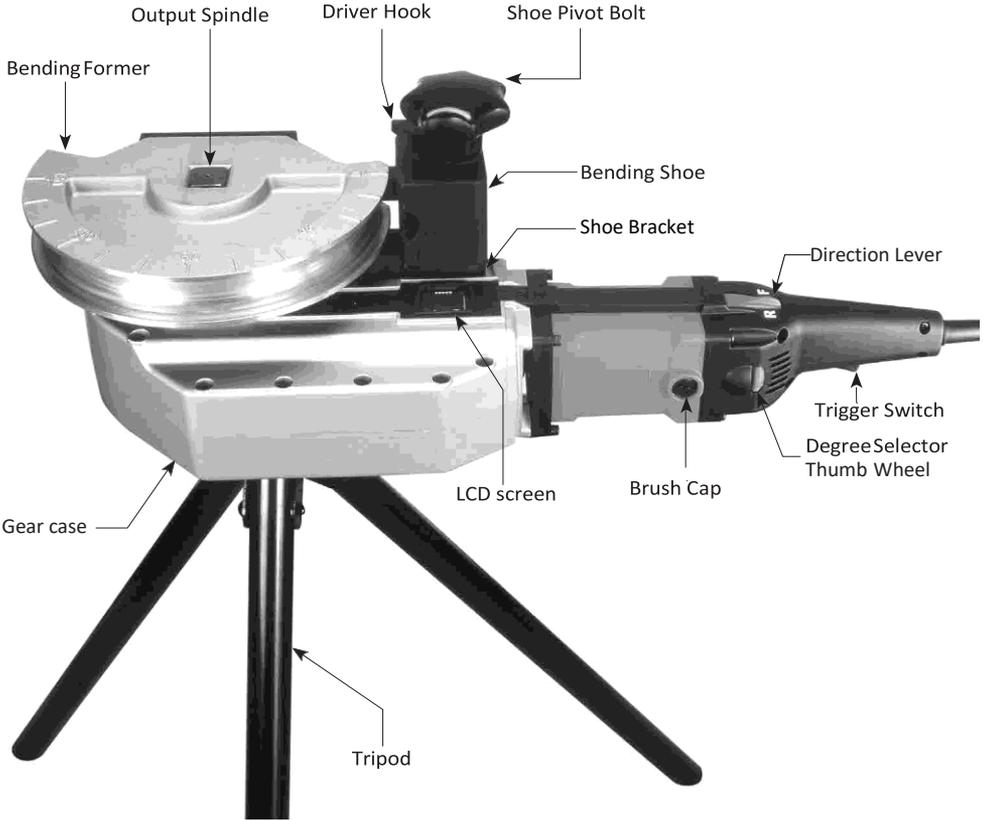
# DIGI BENDER

OPERATIONS MANUAL



Version: 170812

# FUNCTIONAL DESCRIPTION



## Bending Former & Bending Shoe



1. 5/8" R = 4D
2. 3/4" R = 4D
3. 7/8" R = 4D
4. 1-1/8" R = 4D
5. 1-3/8" R = 3.5D

Voltage	110-120 V ~ 50-60 Hz
Power Input	1700W
No Load min <sup>-1</sup>	3.5
Max. Capacity	1-3/8"
Insulation	Double Insulation (Class II)

## GENERAL SAFETY INSTRUCTIONS



**WARNING!** Read all safety warnings and all instructions. Failure to follow the warnings and instructions may result in

electric shock, fire, and/or serious injury.

Save all warnings and instructions for future reference. The term “power tool” in the warnings refers to your corded Digi-Bender power tool.

### 1) WORK AREA SAFETY

- a. **Keep work area clean and well lit.** Cluttered or dark areas invite accidents.
- b. **Do not operate power tools in explosive atmospheres, such as in the presence of flammable liquids, gases, or dust.** Power tools create sparks which may ignite the dust or fumes.
- c. **Keep children and bystanders away while operating a power tool.** Distractions can cause you to lose control.

### 2) ELECTRICAL SAFETY

- a. **Power tool plugs must match the outlet. Never modify the plug in any way. Do not use any adapter plugs with earthed (grounded) power tools.** Unmodified plugs and matching outlets will reduce risk of electric shock.
- b. **Avoid body contact with earthed or grounded surfaces such as tubes, radiators, ranges, and refrigerators.** There is an increased risk of electric shock if your body is earthed or grounded.
- c. **Do not expose power tools to rain or wet conditions.** Water entering a power tool will increase the risk of electric shock.
- d. **Do not abuse the cord. Never use the cord for carrying, pulling, or unplugging the power tool. Keep cord away from heat, oil, sharp edges or moving parts.** Damaged or entangled cords increase the risk of electric shock.
- e. **When operating a power tool outdoors, use an extension cord suitable for outdoor use.** Use of a cord suitable for outdoor use reduces the risk of electric shock.
- f. **If operating a power tool in a damp location**

is unavoidable, use a ground fault (earth leakage) circuit breaker. Use of an earth leakage circuit breaker reduces the risk of electric shock.

### 3) PERSONAL SAFETY

- a. **Stay alert, watch what you are doing and use common sense when operating a power tool. Do not use a power tool while you are tired or under the influence of drugs, alcohol, or medication.** A moment of inattention while operating power tools may result in serious personal injury.
- b. **Use personal protective equipment. Always wear eye protection.** Protective equipment such as dust mask, non-skid safety shoes, hard hat, or hearing protection used for appropriate conditions will reduce personal injuries.
- c. **Prevent unintentional starting. Ensure the switch is in the off-position before connecting to power source and/or battery pack, picking up or carrying the tool.** Carrying power tools with your finger on the switch or energizing power tools that have the switch on invites accidents.
- d. **Remove any adjusting key or wrench before turning the power tool on.** A wrench or a key left attached to a rotating part of the power tool may result in personal injury.
- e. **Do not overreach. Keep proper footing and balance at all times.** This enables better control of the power tool in unexpected situations.
- f. **Dress properly. Do not wear loose clothing or jewelry. Keep your hair, clothing, and gloves away from moving parts.** Loose clothes, jewelry or long hair can be caught in moving parts.
- g. **If devices are provided for the connection of dust extraction and collection facilities, ensure these are connected and properly used.** Use of dust collection can reduce dust-related hazards.

#### 4) POWER TOOL USE AND CARE

- a. **Do not force the power tool. Use the correct power tool for your application.** The correct power tool will do the job better and safer at the rate for which it was designed.
- b. **Do not use the power tool if the switch does not turn it on and off.** Any power tool that cannot be controlled with the switch is dangerous and must be repaired.
- c. **Disconnect the plug from the power source before making any adjustments, changing accessories, or storing power tools.** Such preventive safety measures reduce the risk of starting the power tool accidentally.
- d. **Store idle power tools out of the reach of children and do not allow persons unfamiliar with the power tool or these instructions to operate the power tool.** Power tools are dangerous in the hands of untrained users.
- e. **Maintain power tools. Check for misalignment or binding of moving parts, breakage of parts and any other condition that may affect the power tool's operation. If damaged, have the power tool repaired before use.** Many accidents are caused by poorly maintained power tools.
- f. **Keep cutting tools sharp and clean.** Properly maintained cutting tools with sharp cutting edges are less likely to bind and are easier to control.
- g. **Use the power tool, accessories, and tool bits etc., in accordance with these instructions, considering the working conditions and the work to be performed.** Use of the power tool for operations different from those intended could result in a hazardous situation.

#### 5) SPECIFIC SAFETY RULES

- a. **Keep the working area clear for the bending process.** Obstructions could cause a hazard and interfere with the bending process.
- b. **Do not exceed the maximum tube diameter and wall thickness specified for this machine.** Use of over-capacity sizes will cause a safety hazard and could damage the machine.
- c. **Keep the hands away from all moving parts during the bending process.** Tremendous forces occur during the bending process which could cause serious injury.

#### 6) GENERAL WORKING STAND SAFETY WARNINGS

**WARNING: Read all safety warnings and all instructions provided with the working stand and the power tool to be mounted.** Failure to follow the warnings and instructions may result in electric shock, fire, and/or serious injury.

- a. **Save all warnings and instructions for future reference.** The term "power tool" in the warnings refers to your corded Digi-Bender power tool.
- b. **Disconnect the plug from the power source before making any adjustments or changing accessories.** Accidental starting of the power tool is a cause of some accidents.
- c. **Properly assemble the working stand before mounting the tool.** Proper assembly is important to prevent risk of collapse.
- d. **Securely fasten the power tool to the working stand before use.** Power tool shifting on the working stand can cause loss of control.
- e. **Place the working stand on a solid, flat, and level surface.** When the working stand can shift or rock, the power tool or workpiece cannot be steadily and safely controlled.
- f. **Do not overload the working stand or use as ladder or scaffolding.** Overloading or standing on the working stand causes the stand to be "top-heavy" and likely to tip over.

## 7) SERVICE

Have your power tool serviced by a qualified repair person using only identical replacement parts. This will ensure that the safety of the power tool is maintained.

### SYMBOLS USED IN THIS MANUAL

V	Volts
A	Amperes
Hz	Hertz
W	Watts
~	Alternating current
$n_0$	No load speed
$\text{min}^{-1}$	Revolutions or reciprocation per minute.
	Warning of general danger.
	Class II tool.
	With electrical earth.
	Read these instructions.
	Always wear eye protection.
	Always wear a dust mask.
	Always wear hearing protection.
	Wear safety-approved hard hat.
	Keep hands clear – pinching hazard.
	Rotating parts – entanglement hazard. Keep hands, loose clothing, and long hair away from moving parts.
	Do not dispose of electrical tools, accessories, or packaging with other household waste material.
	Risk of electric shock. Do not use in or expose to wet conditions.

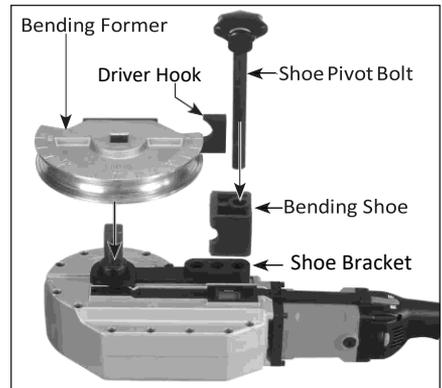
## OPERATING INSTRUCTIONS

### 1) SET UP

- a. Open the Tripod and mount the machine to the Tripod by inserting the post of the Tripod into recess in the bottom of the machine.

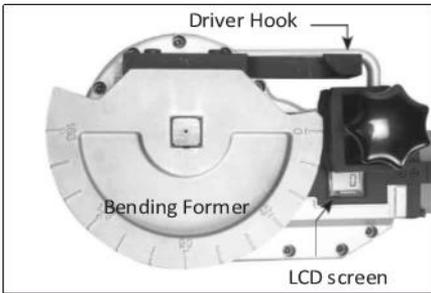


- b. Mount a Bending Former suited to the tube size onto the Output Spindle.
- c. Mount the Bending Shoe and insert the Shoe Pivot Bolt into the appropriate hole in the Shoe Bracket to lock into place.



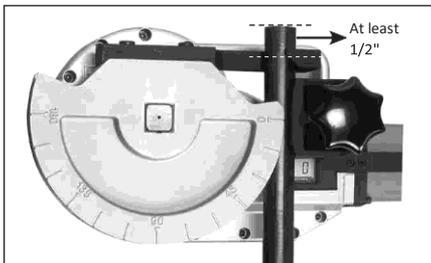
## 2) OPERATION

- a. Ensure that the unit is in its starting position. When the machine is first plugged in, "11" should be displayed, which indicates that it is at the zero-degree starting position. Select reverse by turning the direction lever to "R", press the trigger and "0" will be briefly displayed, followed by the last bending angle setting. If it isn't at the zero-degree starting position, "00" will be displayed. Select reverse, then press and hold the trigger until the spindle returns to the zero-degree starting position.

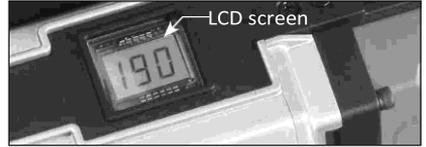
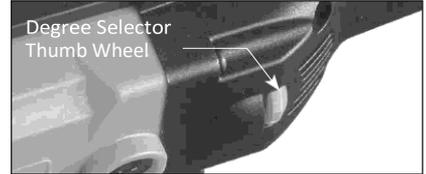


**NOTE: Whenever the machine is first plugged in always select reverse "R", then press & hold the trigger switch, and it will automatically return to its (zero degree) starting position. The LCD screen will display "0" for a moment, followed by the previous bending angle setting. The machine is now ready to perform the bending operation.**

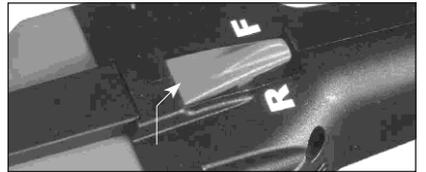
- b. Insert the tube into the Bending Former with at least 1/2" of the end of the tube projecting beyond the Driver Hook.



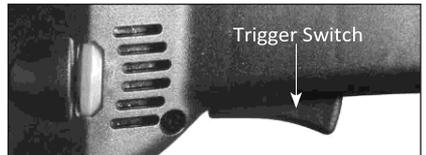
- c. View the LCD screen and set to the desired angle by turning the Degree Selector Thumb Wheel.



- d. Set the Direction Lever to Forward by pushing the lever to the "F" position.



- e. Press the Trigger Switch and hold until the tube is bent to the desired angle. When the angle is reached, the machine will automatically stop.



- f. To remove the tube, set the Direction Lever to Reverse by pushing the lever to the left "R" position. Press the Trigger Switch. The machine will first back out about 15 degrees and stop. This is to allow the operator to remove the Shoe Pivot Bolt and Bending Shoe, which in turn allows the tube to be removed.
- g. Press the Trigger Switch for a second time and hold. The machine will return to its starting position.
- h. The machine is now ready to perform the next bending operation.

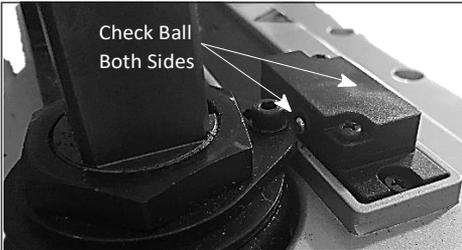
## MAINTENANCE

Every 50 hours of operation blow compressed air through the motor while running at no load to clean out accumulated dust. (If operating in especially dusty conditions, perform this operation more often.)

1. Keep the machine clean and free of dust.
2. Check for loose fittings and tighten as needed.
3. Ensure that the ventilation slots are clear so that motor can be cooled normally. Blow low pressure compressed air through the ventilation slots with the motor running to keep motor clean.

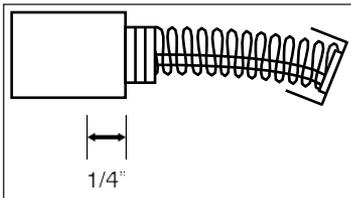
### 1) CLEANING THE CHECK BALL

The check ball located on the electronics cover acts on a switch to send a signal to the electronics system. With use, dust can accumulate in the check ball which will affect the function of the electronics. Periodically clean the check ball with compressed air to maintain normal functioning.

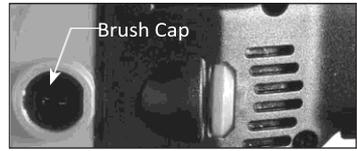


### 2) THE CARBON BRUSHES

The carbon brushes are a normal wearing part and must be replaced when they reach their wear limit.



To replace, simply remove the brush caps and withdraw the old brushes. Replace with new brushes (always replace as a pair) ensuring that they align properly and slide freely. Then replace the brush caps.



All machine repairs should be performed by a qualified repair technician.

## ERROR CODES

**E1:** The machine has moved in the forward direction too long. Return to zero and restart. If problem persists, contact a service agent.

**E2:** The machine has moved in the reverse direction for too long. Return to zero and restart. If problem persists, contact a service agent.

**E3:** The feedback sensor pickup has no signal. This is an internal electronics problem. Contact a service agent.

**11:** When the machine is first plugged in, **11** indicates that the machine is at the proper zero degree starting position. When the switch is triggered it will display 0, then after a moment, will display the selected bending angle. This is very useful if the machine has been disassembled, as it allows the eccentric plate to be very accurately set at the exact zero position on the micro switch and locked in place.

**00:** When the machine is first plugged in, **00** indicates that the machine is not at the zero-degree starting position. If this is the case, select reverse and trigger the switch until the machine returns to the zero-degree starting position.

**Caution:** If the LCD screen is damaged and showing "E1", "E2" & "E3" it must be replaced by the service organization.

If the replacement of the power supply cord is necessary, this must be done by the manufacturer or their agent to avoid a safety hazard.

**WARNING:** All repairs must be entrusted to an authorized service center. Incorrectly performed repairs could lead to injury or death.

## BENDING CALCULATIONS

It is important in bending to have the ability to calculate the position where you need to start the bend to achieve a desired leg length. It is also important to know how long the tube needs to be to start with. These can be calculated using the formulas and charts on the next page.

### 1) Key:

**A** = The applied size: This is the starting point of the bend, measured from the end of the tube (at the hook end of the former) to the zero-degree position of the former with the machine returned to the rest position (before bending begins).

**$\theta_1$**  = The preset angle: This is the angle to preset on the bender's LCD Screen to closely achieve the desired bend angle. The provided preset angles compensate for spring-back of ACR-L Half-Hard (H55) Copper Tubing. Results may vary based on machine and/or tubing dimensional tolerances.

**L** = The total length of the tube before it is bent.

**L<sub>1</sub>** = The resulting leg length on the end which is bent, measured from the centerline of the tube. (See diagram)

**L<sub>2</sub>** = The resulting leg length of the other end of the tube which is not bent, measured from the centerline of the tube. (See diagram)

**L<sub>R</sub>** = The reserve length correction. (This is from the chart.) This is the correction factor which must be subtracted from the intended leg length (L<sub>1</sub>) to know where to begin the bend (A).

**L<sub>M</sub>** = The minimum length correction. (This is from the chart.) This is the correction factor which must be added or subtracted from L<sub>1</sub> and L<sub>2</sub> to find how long the straight tube needs to be at the beginning.

**Example 1:** Finding the starting position to get the desired leg length at 90 degrees. If you have a 7/8" tube and we want to make a 90-degree bend in the tube with a resulting leg length of 5", where would we position the tube in the former?

Since  $A=L_1-L_R$ , we would take the desired leg length L<sub>1</sub>, which is 5" in this example, and subtract L<sub>R</sub> from the chart for a 7/8" tube at 90 degrees, which  $L_R = 3-1/2"$  in this example. Using  $A=L_1-L_R$ ,  $5" - 3-1/2" = 1-1/2"$ . Thus, for our starting position A, we would place the tube at the 0-degree position on the former 1-1/2" from the end.

**Example 2:** Finding the required tube length to get the desired two leg lengths at 90 degrees. If we needed the leg length of the remaining other side of the tube in the example above to be 8", how long a tube would we need?

For a 90-degree bend and using  $L=L_1+L_2-L_M$ , the desired leg length L<sub>1</sub> is 5", the other remaining leg length L<sub>2</sub> is 8" and the correction factor L<sub>M</sub> from the chart for a 7/8" tube at 90 degrees is 1-1/2". Thus  $5" + 8" - 1-1/2" = 11-1/2"$ . We would need to start with a tube which is 11-1/2" long.

### 2) Spring-Back and Finding the Spring-Back Correction Factor

Spring-back exists with tube bending. In other words, when you bend a tube to a certain angle, after the bending pressure releases, it will spring back somewhat to a slightly smaller angle. The only reliable way to compensate for spring-back is by trial and error. There are many factors which effect how much a workpiece will spring back; material type, wall thickness, etc. Steel tends to spring back more than copper and stainless tends to spring back more than steel. This machine has built in spring-back compensation, but it may need to be augmented with fine tuning of the preset bend angle. The digital preset system of this machine makes it extremely easy to consistently repeat results once the settings have been found from experience.

To find the spring back correction factor for a given size and type of tube:

- First perform a trial bend in the tube.
- Then measure the actual angle of the completed bend with an appropriate measuring tool.
- If it is slightly less than the desired angle, increase the digital preset, a small amount at a time, until the desired angle is achieved.
- If it is slightly more than the desired angle, decrease the digital preset, a small amount at a time, until the desired angle is achieved.

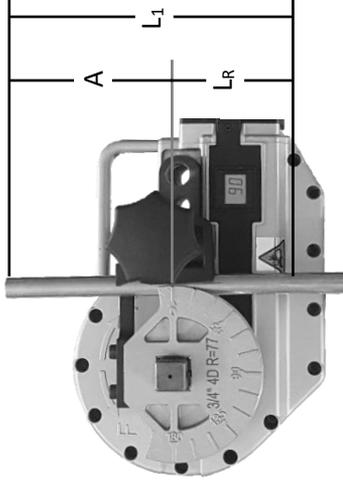
So, for example, a given tube may need to be set anywhere from 81-99 degrees to achieve an actual 90-degree bend. Once the correction factor is found, it will usually be consistent for a given size and type of tube.



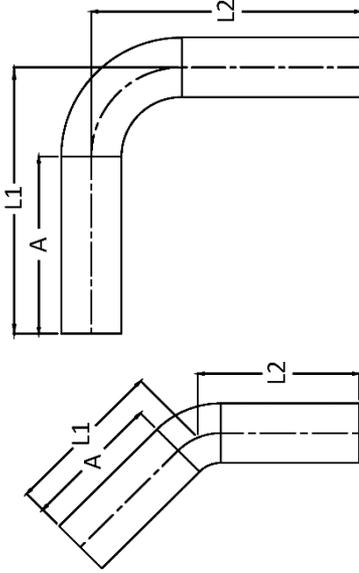
**WARNING:**

For bending OD dimensioned tubing only.

Not recommended to bend a variety of different materials (i.e. copper and then steel). If you must, thoroughly clean the formers and shoes to avoid embedding dissimilar metals that can cause corrosion.



# Precision Bending Chart for ACR-L Half-Hard (H55) Copper Tubing

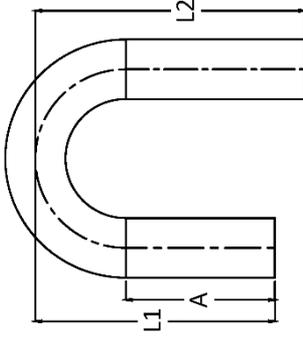


$$L = L_1 + L_2$$

$$A = L_1 - L_R$$

$$L = L_1 + L_2 - L_M$$

$$A = L_1 - L_R$$



$$L = L_1 + L_2 + L_M$$

$$A = L_1 - L_R$$

Tube Size	Bend Radius	45°			90°			180°		
		L <sub>R</sub>	L <sub>M</sub>	θ <sub>i</sub>	L <sub>R</sub>	L <sub>M</sub>	θ <sub>i</sub>	L <sub>R</sub>	L <sub>M</sub>	θ <sub>i</sub>
5/8	2.5	1-1/8		36°	2-9/16	1-13/16	83°	2-9/16	2-13/16	173°
3/4	3	1-1/4		38°	3-1/16	1-3/8	84°	3-1/16	3-5/16	174°
7/8	3.5	1-1/2		41°	3-1/2	1-1/2	88°	3-1/2	3-7/8	177°
1-1/8	4	1-13/16		42°	4-7/16	1-1/16	89°	4-7/16	4-15/16	179°
1-3/8	4.85	1-15/16		43°	4-3/4	2-5/16	89°	4-3/4	5-3/8	179°

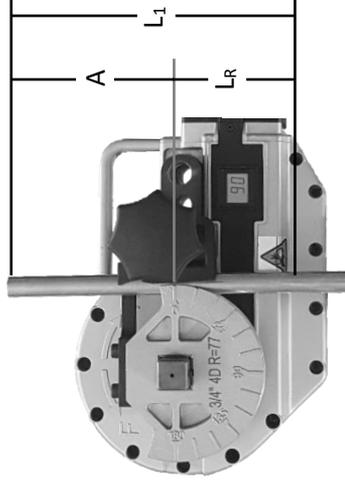
\*All sizes in inches. PLEASE NOTE θ<sub>i</sub> is the preset angle that should be set on the Digi-Bender's LCD Screen to achieve the desired angle.



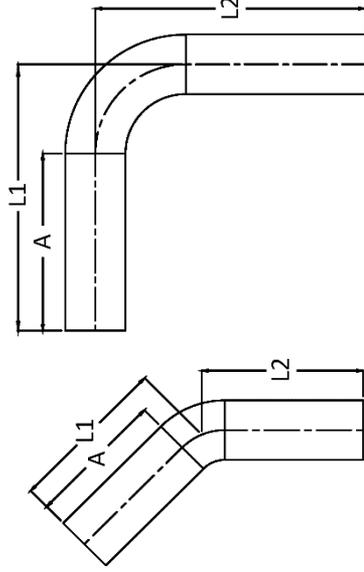
**WARNING:**

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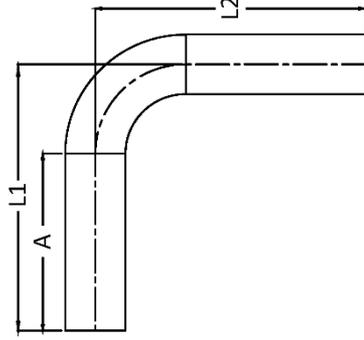
Not recommended to bend a variety of different materials (i.e. copper and then steel). If you must, thoroughly clean the formers and shoes to avoid embedding dissimilar metals that can cause corrosion.



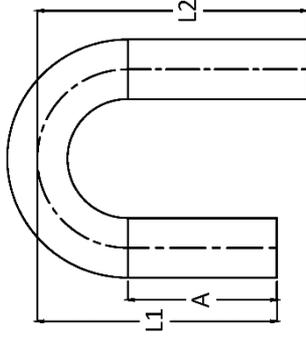
# Precision Bending Chart for



$$L = L_1 + L_2$$
$$A = L_1 - L_R$$



$$L = L_1 + L_2 - L_M$$
$$A = L_1 - L_R$$



$$L = L_1 + L_2 + L_M$$
$$A = L_1 - L_R$$

Tube Size	Bend Radius	45°			90°			180°		
		L <sub>R</sub>	L <sub>M</sub>	θ <sub>i</sub>	L <sub>R</sub>	L <sub>M</sub>	θ <sub>i</sub>	L <sub>R</sub>	L <sub>M</sub>	θ <sub>i</sub>
5/8	2.5									
3/4	3									
7/8	3.5									
1-1/8	4									
1-3/8	4.85									

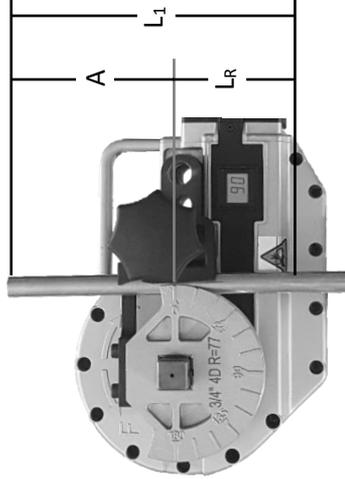
\*All sizes in inches. Values for LR and LM should be close to or the same as the values presented in the chart for Half-Hard (H55) Copper Tubing. Values of θ<sub>i</sub> will need to be determined by trial and error for any different tubing material and/or wall thickness used.



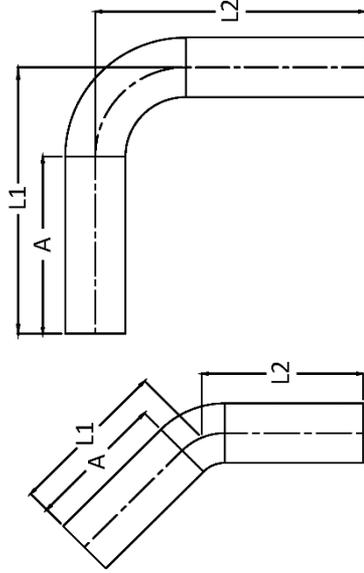
**WARNING:**

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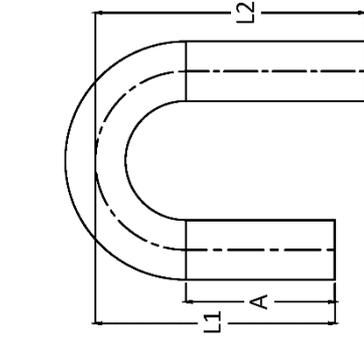


# Precision Bending Chart for



$$L = L_1 + L_2 - L_M$$

$$A = L_1 - L_R$$



$$L = L_1 + L_2 + L_M$$

$$A = L_1 - L_R$$

Tube Size	Bend Radius	45°			90°			180°		
		L <sub>R</sub>	L <sub>M</sub>	θ <sub>i</sub>	L <sub>R</sub>	L <sub>M</sub>	θ <sub>i</sub>	L <sub>R</sub>	L <sub>M</sub>	θ <sub>i</sub>
5/8	2.5									
3/4	3									
7/8	3.5									
1-1/8	4									
1-3/8	4.85									

\*All sizes in inches. Values for LR and LM should be close to or the same as the values presented in the chart for Half-Hard (H55) Copper Tubing. Values of θ<sub>i</sub> will need to be determined by trial and error for any different tubing material and/or wall thickness used.