SINGLE 45° BENDS

Determine where you want the center of the 45° bend on the tube.

(Dimension "L", Fig. (9). Measure that distance and place a mark
around the tube at "L" distance.

![Image of single 45° bend](image)

Position tube in bender as shown in Fig. (10). The "L" mark should
be directly under positioning line 45°.

With steady motion pull indexing lever around until "O" mark
on lever is directly aligned with the 45° graduation line on the
Form Wheel. Fig. (11)

![Image of positioning tube in bender](image)

Note: Both "L" and "X" marks must be placed on tube prior to bending. Fig. (13)

![Image showing "L" and "X" marks](image)

5. Reposition tube in bender as shown Fig. (14). The measured
mark 'X' should be directly under the 45° graduation line on
the Indexing Lever. Insure the bend plane is in the correct
relationship to the first bend. With a steady motion pull the
Indexing Lever around until the "O" on the Indexing Lever
is aligned with the 45° graduation line on the Form Lever.
Fig. (15)

DOUBLE 45° OFFSET BENDS

1. Determine the desired centerline dimension between the legs
of the offset (Dimension "Y"), Fig. (12)

2. Determine the center of the first 45° bend. (Dimension "L")
Fig. (12). Measure from end of tube and place mark at "L"
distance. Fig. (13)

3. Determine center-to-center distance of 45° bend (Dimension "X") in Fig. (12). Multiply offset dimension "Y" by 1.614.
Measure from "L" mark on the tube and place a mark at
"X" distance. Fig. (13)


![Diagram showing double 45° offset bends](image)

664-FH HEAVY DUTY 180° METRIC TUBE BENDER

The 664-FH Series bender can be used for bending copper, aluminum, steel, stainless steel and other tubing
of bending temper (annealed). Avoid use with extremely
thin wall and/or hard temper tubing.

⚠️ Warning! Keep body parts away from pinch/bend
areas while using. Ensure tubing is secure in tool
before bending. Always wear approved eye
protection. Broken materials may fly.

Instructions for Use

1.) Raise the Roto-Lok™ indexing Form Lever as shown
Fig. (1).

2.) Make sure the Tube Cam Locking Hook is away from the Form
Wheel Groove area. Fig. (1A)

3.) Position tubing in groove and engage the Tube Cam Hook with
tube as shown. Insure that a minimum of 3mm is past the
hook to prevent flattening at end of tube. Fig. (1) and Fig. (1B)

4.) Lower the Roto-Lok Indexing Lever to the 90° start
position. This is accomplished when the "O" on the Form
Lever is aligned with the 0° degree mark on the Form Wheel
as shown in Fig. (2).

![Diagram showing instructions for use](image)

Note: All tubing will exhibit springback after a bend is
completed. Springback is when the tube relaxes after being
stressed; with soft copper tubing it is so minor compensation
may not be necessary. With steel or stainless steel it could be
from 2° to 5°.
5.) Pull the Roto-Lok Indexing Form Lever down until the desired bend angle is obtained. Degree of bend is indicated when the "0" mark on the Form Lever aligns with the desired graduation on the Form Wheel. Fig. (3) (Example 90° Bend)

For ease in completing bends greater than 90° (180° max.) follow below: Pull Roto-Lok Indexing Form Lever to approximately 90°. While maintaining the handle position with your thumb and index finger, reach up to the releasing collar and pull towards the grip. While the collar is in the released position raise lever upwards to approximately 80° and release collar. Collar will snap into position as shown. Fig. (4)

IMPORTANT. Before proceeding with bend ensure the stopping lug on the Index Form Lever is in contact with the link and the Form Shoe rollers are in contact with tube. Fig. (4). This will ensure that you are in the correct position to finish your bend to achieve the correct angle.

Complete the downward motion of Indexing Form Lever until the "0" on lever is aligned with the degree mark on forming wheel desired. Fig. (5) (Example 180° Bend)

INSTRUCTIONS FOR MAKING ACCURATE 90° CENTERLINE BENDS

1. Determine the desired center line dimension. Dimension "L" in Fig. (6).
2. Measure from end of tube (first bend) and place a mark on the tubing at the "L" distance around tube.
3. Position tube in the bender groove as shown in Fig. (2). Move hook to engage tube lightly, but enabling the tube to be moved to position your mark on tube.
4. The positioning marks are always in the same sequence from left to right on all benders: "45°", "R" and "L". Located on the Indexing Form Lever. Fig. (7)
5. If the end from which you measured is left of the tube cam locking hook, the measured mark on the tube should align with the "L". Fig. (8)
6. With a steady motion pull Indexing Form Lever until the "0" mark on the Indexing Form Lever is directly aligned with the 90° graduation on the Form Wheel. Fig. (3)

LENGTH CORRECTION FACTORS FOR 45° AND 90° BENDS

To arrive at the exact tube length to fabricate a circuit, the following method may be used.

Add all center-to-center dimensions of tube circuit. For each 90° bend subtract the amount shown in Chart "A". Circuits are usually dimensioned to square corners. Therefore the length of tube required is always less.

<table>
<thead>
<tr>
<th>Tube Diameter</th>
<th>Bend Radius</th>
<th>Correction Factor 90°</th>
<th>Correction Factor 45°</th>
</tr>
</thead>
<tbody>
<tr>
<td>6mm</td>
<td>15mm</td>
<td>6.443</td>
<td>0.648</td>
</tr>
<tr>
<td>8mm</td>
<td>24mm</td>
<td>10.308</td>
<td>1.036</td>
</tr>
<tr>
<td>10mm</td>
<td>24mm</td>
<td>10.308</td>
<td>1.036</td>
</tr>
</tbody>
</table>

Example: Tube Size = 6mm
Number of bends = 2
Bend Radii = 15mm
Sum of Centerline Dimensions = 450mm
Correction Factor = 6.443

NOTE: For better performance, oil all moving parts regularly.
DO NOT oil form wheel groove.