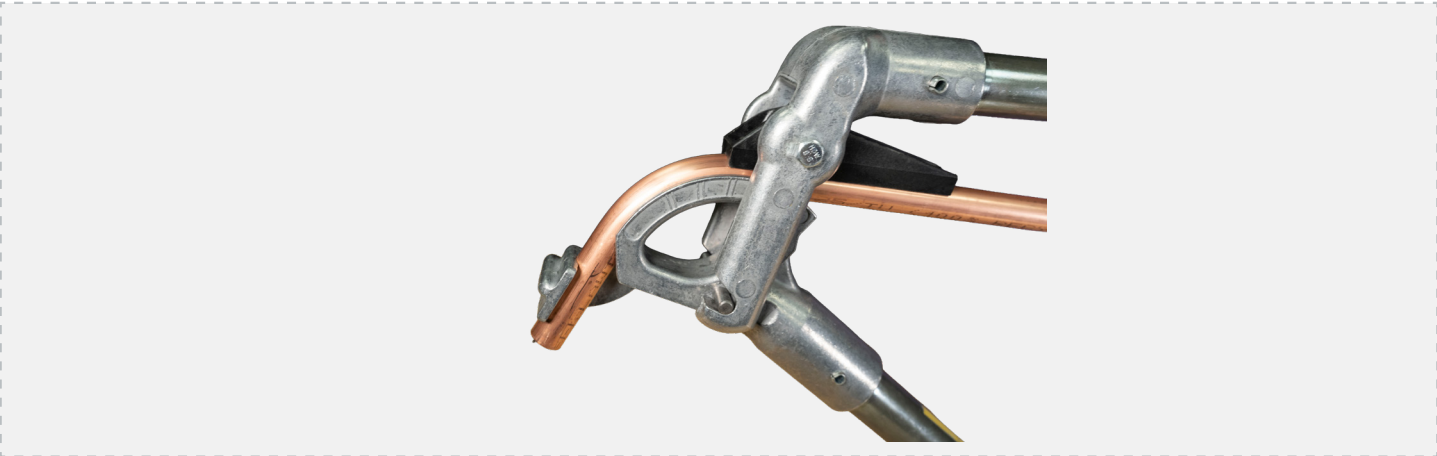


How to Bend Lawton ACR Copper Tube

Bending refrigeration and air conditioning copper tube.



Lawton ACR Copper Tube	May be bent to change direction in place of a fitting. The tube wall must be supported through the bend so that the bore is not reduced and the outside of the bend is not thinned.
Scope	A general guide for bending Lawton ACR copper tube to BS EN 12735-1, in standard sizes in common refrigeration and air conditioning applications. Large bore, industrial, or custom bending radii processes require special considerations and are outside the scope of this guide.
Tool Instructions	The sizes and tempers a tool will bend, the radius it forms, and the way it is worked are set by the bending tool manufacturer. Those instructions take precedence over this guide, as do the standards and the project specification.

Common bender types

Lever bender



Smaller soft or half-hard tube in common standard sizes

Crossbow bender



Soft tube only, in the smaller sizes

Gear bender



Medium sized soft or half-hard tube in common standard sizes

Safety

- Bending tools close on the tube and have pinch points at the former and the guide. Hands must be kept clear of the closing parts while pressure is applied.
- Cut and deburred tube throws metal slivers. Gloves must be worn when handling cut tube and swarf.
- A length of tube in a bender acts as a lever. The tool shall be secured before pressure is applied, and the swept area kept clear.

These are general precautions. Site rules and any permit to work may differ and shall be followed.

Material condition and equipment

- Material condition governs what will bend. Soft annealed tube (R220, or R200 to some tube standards) is the most formable and is supplied in coil.
- Half hard (R250) tube bends in the smaller sizes, with a machine and a former matched to the tube. Hard (R290) tube is not generally bent. It has little forming margin, and a formed fitting is normally used in place of a bend.
- A crossbow bender shall be used only on soft annealed tube. It gives no internal support, and half hard and hard tube will flatten or ripple in it.
- A bending spring supports the bore from within and suits soft annealed tube in the smaller sizes. The spring must match the tube bore.
- Lever and machine benders support the tube between a former and a guide. Each former bends at one fixed radius, so the radius is chosen by selecting the former and cannot be adjusted at the tool. Geared, powered and automatic machines cover the larger sizes.
- The equipment must be matched to the size and condition of the tube. The tool manufacturer states the sizes and material conditions its equipment covers. A worn or damaged former marks the tube and must not be used.

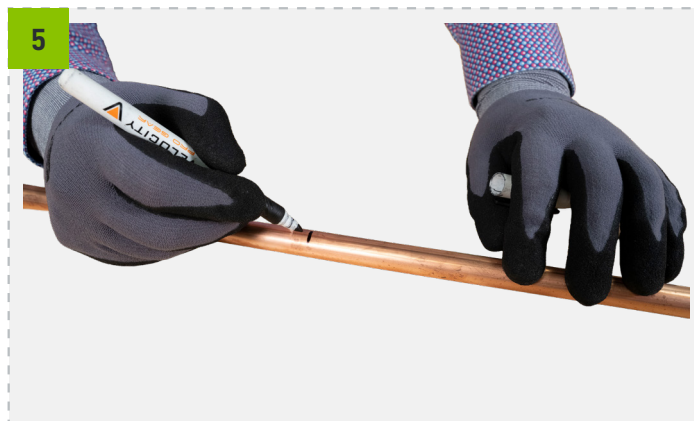
Bend radius

- A centreline radius of 3.5 to 4 times the tube diameter (3.5D to 4D) is a conservative figure for standard sizes and wall thicknesses.
- A radius below 3D is a tight bend. Tight bends are achievable, but the bending process and the machine must be considered carefully, and the work becomes harder as the radius falls, and are outside the scope of this general guide.
- The mechanical design of the bending equipment and the bending process will influence the radius that can be achieved. Where the project specification sets a radius, that figure applies.

Forming the bend



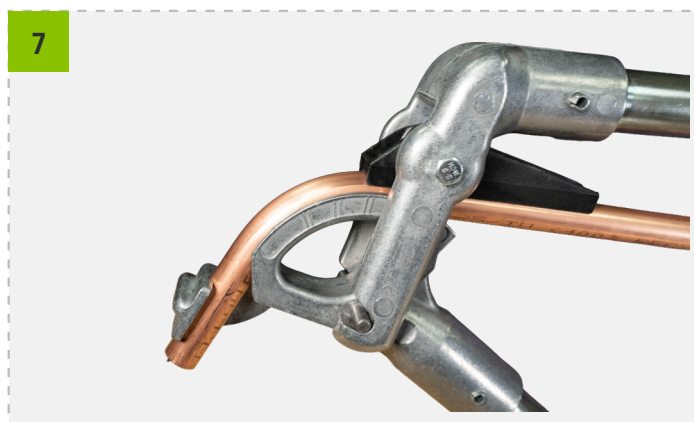
1. Check that the tube is round, clean, and free from scores, dents, and swarf. A defect in the tube wall opens up as the bend is formed.



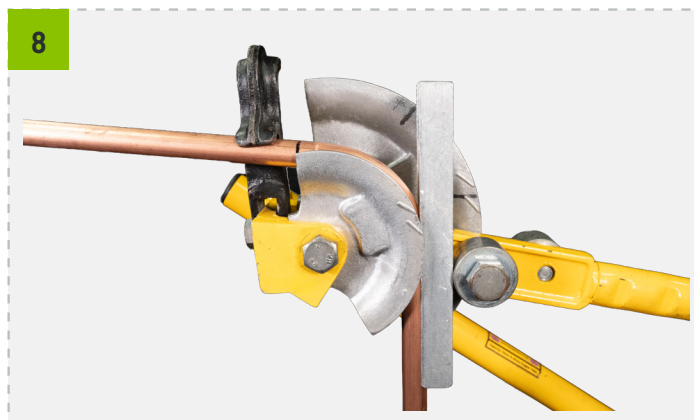
2. Mark the position of the bend on the tube.



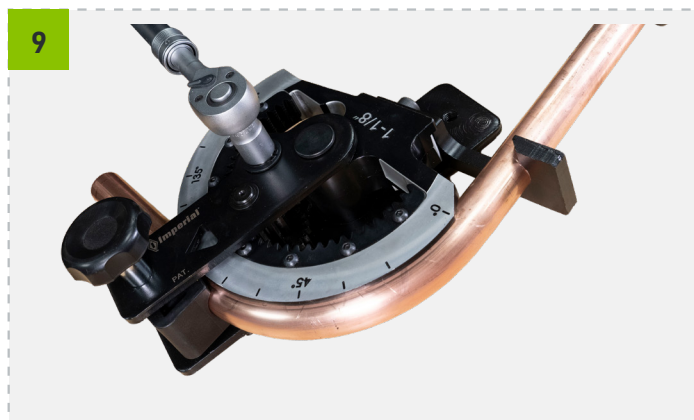
3. Set the tube in the former with the mark against the guide, or pass the bending spring into the tube so that it lies across the bend.



4. Apply steady pressure and form the bend to the angle required. The tube must not be forced.



5. Release the tool and remove the tube. A bending spring is withdrawn by turning it in the direction that closes its coils.



6. Inspect the bend before the tube is installed.

Inspecting the bend

- The bend must be free from ripples, flats, and cracks, and the bore must not be reduced. A defective bend shall be cut out and the length remade.
- A bend must not be straightened and re-formed. Copper work hardens as it is bent, and working the same length twice cracks it.
- Bends shall be clear of joints. Tube must not be bent at or next to a soldered, brazed, or pressed joint.
- Pre-insulated coil shall be bent with the insulation in place. The insulation must not be split, crushed, or drawn thin at the bend.
- The bore must be kept clean and dry, and open ends recapped after bending. Debris or moisture carried into the system damages the compressor and blocks expansion valves and capillaries.

Troubleshooting

Fault	Likely cause
Ripples on the inside of the bend	The tube wall is not supported, or the former does not match the tube.
Flattening across the bend	The bender or former is the wrong size for the tube.
Cracking on the outside of the bend	The tube is too hard for the equipment, or a bend has been re-formed in work hardened tube.
The bending spring will not withdraw	The tube has closed onto the spring. Over-bend slightly, then ease back to the angle required before turning the spring out.
The bend is out of position	The mark was not aligned to the datum on the former.

Further information

Contact us where the tube, the equipment, or the radius required falls outside this guide.

For more details, please refer to our website or contact us by e-mail at technical@lawtontubes.co.uk