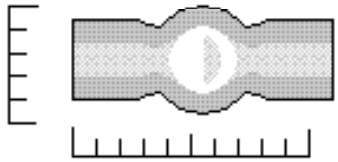
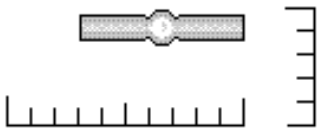
# Miniature Constant Velocity Couplings

From Silicone tube and Bearing Balls: Construction, Assembly and Use Considerations




From this: 1/8" ball, for 3/32" shaft.



To this: 1mm ball, for 0.8mm shaft.

The design of these couplings is based on the discovery that, if a ball is inserted in a flexible tube, the bore of which is smaller than the diameter of the ball, then a 'pinch' or 'neck' will be produced on either side, which is very much more flexible than the tube alone.

Further, if the ball is 20-50% larger than the shafting being coupled, then a smooth, very flexible constant velocity universal joint is produced.

## Cutting the tube

A minimum of 2.5mm overlap of the tube on the shaft is required for reliable operation. 4mm is preferable, particularly with shaft diameters of 1.5mm and over. To make a coupling, measure 2x the overlap, plus the ball diameter, and cut to that length.

Cutting the tube square can be tricky. For best results, push the end against a stop, and cut with a stroke of a sharp scalpel or razor blade on a soft material such as hardboard. The NWSL 'chopper' is ideal for this.

## Inserting the ball

After cutting the tube to length, insert a length of rod or tube, roughly the same diameter as the ball, so that a little more than the diameter of the ball is left over the end. Trap the target ball, in the dimples of a piece of kitchen towel works for the small sizes, press the open end of the tube over it and keep pressing with a circling motion, for several seconds. Once the maximum diameter of the ball is past the end of the tube, this end can be squeezed to push it further. The rod can then be extracted, and used to push the ball to it's final position.

For the very smallest sizes, 1mm ball, holding the rod in a pin chuck helps. A piece of solid tube is a little easier than rod, as there is no air pressure build-up between the ball and rod to battle against.

## In service

Make sure that there are no turning pips on the shaft ends that are to contact the ball. A touch with a small spherical burr or a centering tool will help. Stretching the sleeve over the shaft, so that it is hard against the ball will also help to ensure that the ball runs in the centre of the shaft in service.

If there is any chance of the silicon tubing touching stationary motor or gearbox bearings, fit one, or preferably two shim washers before the coupling, or the drag from such contact can be severe. These will also function as oil throwers if there is excessive lubricant about.

## Some advantages

1. Low cost.
2. Silent operation.
3. No friction surfaces to wear.
4. Self-seals against dust, dirt and debris.
5. Resistant to most chemicals including oils.
6. Temperature tolerant to 200 deg. C.
7. No lubrication needed, ever.
8. Maximum diameter no more than twice that of the shaft.
9. Constant velocity output.

## Some disadvantages

1. Some modellers will find them fiddly to assemble.
2. No resistance to sharp edges.
3. May require telescopic shafting in some applications