Industry Newsletter & Technical Bulletin

GAISER TOOL COMPANY

• Inventors of the Ceramic Capillary •

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Process1800 - Angle Bottleneck Capillaries

Fine & Ultra-Fine Pitch Capillary Wire Bonding

As the semiconductor industry moves to finer and finer pitches, Gaiser Tool Company has observed an increasing demand for smaller angle-bottleneck tip diameters and tighter dimensional tolerances. As these tip diameters and tolerances are decreased, the limits of existing ceramic materials and machining techniques have been tested.

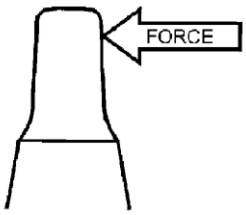
To address the need for increased strength and tightened tolerances, Gaiser Tool Company has developed a proprietary manufacturing process: Process1800, standard in our 1800 series fine-pitch capillaries.

The Process1800 Angle Bottleneck Capillary

Process1800 eliminates the previously standard grinding operation used to produce the angle-bottleneck feature on a fine-pitch capillary. It is the only fine pitch capillary that is neither ground nor injection molded. This manufacturing process substantially increases shear strength and rigidity.

The increased shear strength allows Gaiser Tool Company to produce a more robust, high-strength, small tip diameter, angle-bottleneck capillary. Increased rigidity reduces the ultrasonic energy loss inherent in the angle-bottleneck design, resulting in superior ultrasonic energy transmission and a wider tuning window - ideal for high frequency transducers and today's more challenging package types.

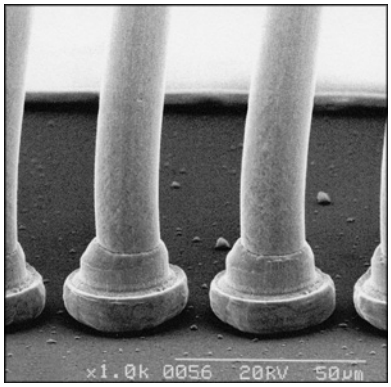
Process1800 inherently yields a tighter tolerance capillary, with substantially improved dimensional tolerances as well as reduced standard deviations. The tolerances necessary for ultra fine-pitch bonding are standard in the 1800 series. Process1800 capillaries are manufactured with our sub-micron average grain size, near-zero porosity improved ceramic / zirconia toughened alumina materials.



Process1800 improves shear strength by more than 50% compared to a ground angle bottleneck in most tip configurations.

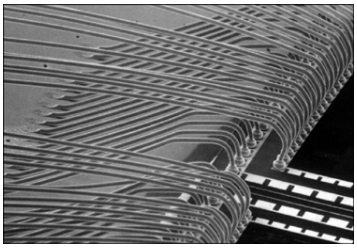
Future Fine Pitch Packages

Currently, 50µm pitch products are in mass production. As the challenge to reach finer pitches of 45µm and 40µm begins, the bonder manufacturers are looking ahead and developing equipment for 35µm pitch using 0.0006 in./15µm wire, and 30µm pitch with 0.0005 in./ 13µm wire.



Ball Bonds made with a 35µm ultra-fine pitch capillary

Gaiser Tool Company is working in partnership with several bonder and wire manufacturers by providing the necessary capillary designs to meet these new challenges.



Package with a complex looping profile incorporating a two-tier lead design

How To...

Choosing Tungsten Wire or Unplugging Probes

There are two common methods for unplugging capillaries and wedges: tungsten wire and unplugging probes. Tungsten wire is a lower cost product, three inches long, available in many diameters. The tungsten wire is fed through the back of the plugged capillary, by hand or by tweezers, and used to push out the blockage. The small tungsten wire can be challenging to see and handle, and may bend during use.

Unplugging probes are a higher cost alternative, available in one size, ¾ inch long and 0.010 inch diameter, with a very sharp conically tapered pointed tip used to unplug wedges and capillaries. The unplugging probe is inserted into the countersink of a plugged wedge and used to push out the blockage. An unplugging probe is more rigid and easier to see and handle.

Unplugging probes are more popular for wedges and tungsten wire is more popular for capillaries, but individual users may use either method based on personal preference. The unplugging of fine pitch capillaries used on high speed auto-bonders is not recommend due to the risk of scratching the hole.