Industry Newsletter

GAISER TOOL COMPANY

• Inventors of the Ceramic Capillary •

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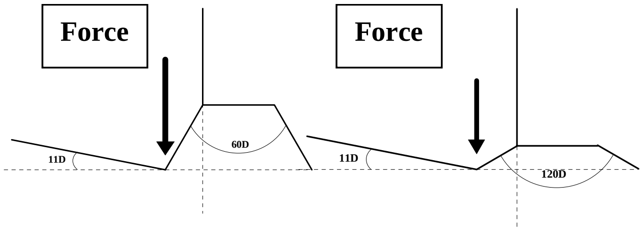
CDR2B

Chamfer Diameter Radius Design

The transition between the Internal Chamfer (IC) and the Face Angle (FA) is the surface area responsible for flattening and weakening the bonding wire during the bond termination process. At this time, the wire diameter is reduced to a few fractions of a micron in thickness allowing the bonder's wire clamping mechanism to break it free so that a straight piece of wire is left exiting the capillary tip.

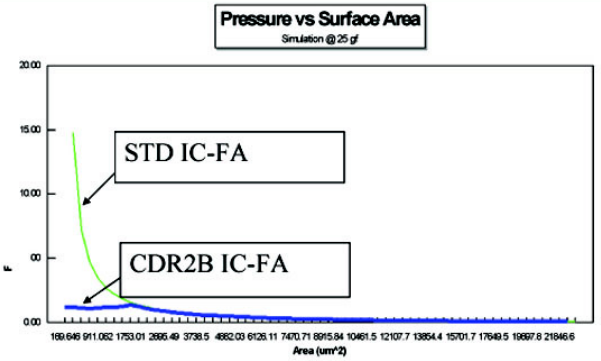
The small amount of gold wire protruding from the capillary tip is then melted into a ball (Free Air Ball or FAB) by the action of high electrical discharge produced by the EFO system. The melted ball (FAB) is used to start a new bond cycle where the ball is welded to the die pad openings. The wire is then strung across forming a loop that connects to the carrier or substrate lead points where the wire will be connected and a new termination cycle will begin.

The wire termination cycle is a process that depends on the accurate control of geometrical capillary features as well as mechanical and software features embedded in the bonding equipment. As the bonder applies the various control parameters (Force, Time, Contact Velocity, Ultrasonic Energy, etc.) over the wire area to be terminated, compressive and shear stresses experience an increase at the IC-FA transition. Depending on the IC and FA configuration (see Stress Diagram), the degree of stress varies.



Stress Diagram

The relationship between stress and capillary tip dimensions is considered inversely proportional. As the tip diameter gets smaller to fit finer pad spacing (Pitch), the stress per unit area increases. It is the increase in stresses that GTC addresses with the new CDR2B feature now available on capillaries of 50 µm pitch or less.

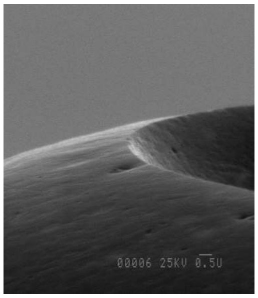


Graph #1

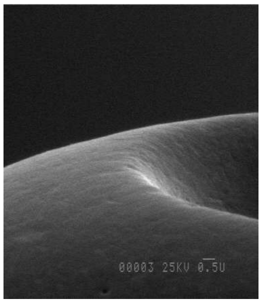
The CDR2B provides significant stress relief at the IC-FA transition reducing and/or eliminating the premature termination of the wire (also known as cut wires or missing tails).

Graph 1 shows a stress comparison between standard IC-FA configuration and the new CDR2B feature.

Photos 1 and 2 detail surface features between a standard IC-FA capillary and a capillary with the CDR2B finish.



Standard Capillary
Photo #1



CDR2B Capillary
Photo #2

Vacuum Pick-up Tools

About Vespel vs. Delrin vs. Tungsten Carbide

Vespel and Delrin plastics are the most common rigid plastic pick-up tool tip materials in use for the placement of die and components. These rigid plastics offer little compliance, but are highly dimensionally stable for placement accuracy and non-abrasive to the die. Additionally, rigid plastics are not prone to the imbedding of particulate that can mark or scratch subsequent die, a common problem with compliant rubber tips.

Delrin is a lower cost material that offers good wear characteristics and stability up to 180°F, but can hold a static charge. Vespel is a higher cost material that offers very good wear characteristics and stability up to 300°F, and is anti-static. Both plastics are available with a hole size as small as Ø.005 inch and a tip size of Ø.009 inch.

Tungsten carbide offers very long service life, the highest service temperature, and the smallest hole and tip sizes, but as a hard metallic material, is suitable only for very robust, non-sensitive die.

	Delrin (-DEL)	**Vespel (-VES)**
Continuous Service Temp (°F)	180	300 (Ideal) 500 (Maximum - not recommended)
Maximum Temp (°F) (Excursions/Brief Peaks)	250	900
Melting Temp (°F)	327-335	Does not melt (decomposes at >500 in O_2)
Rockwell Hardness (M)	94	69-79