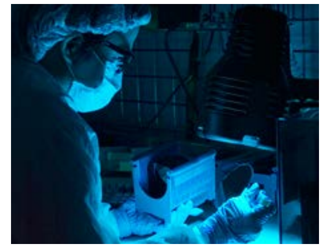
Gaiser® Precision Bonding Tools
Product Catalog

TECHNICAL CERAMICS EXPERTS

Leaders in Advanced Technical Ceramics
CoorsTek® is the world's largest manufacturer of technical ceramics and serves almost every industry in the global economy. From advanced material design and production to our varied forming and finishing operations, CoorsTek is vertically integrated throughout.



CoorsTek develops and produces advanced ceramic materials for industry-specific applications.

Proven Supplier of Components for Front-End Semiconductor Capital Equipment
CoorsTek has supplied advanced ceramic components for top-level semiconductor capital equipment for decades. We continue to develop innovative materials and processes for:

- Etch
- Lithography
- Wafer inspection
- Implant
- High-temperature – RTP, EPI
- CVD, PVD, ECP

We supply premium, high-purity ceramic components for front-end semiconductor equipment.

CoorsTek exclusive OpX manufacturing and quality system

Superior Quality
Our signature OpX™ quality and manufacturing excellence system combines best-practice methods including lean manufacturing, six-sigma, and ISO-certification to ensure high-quality products, on-time delivery, and exceptional service.

Combined Resources for Superior Products
Established in 1962, Gaiser® originally collaborated with CoorsTek (established 1910) to invent the industry-changing ceramic capillary. Since then, both companies have served their segments of the semiconductor industry with a number of technical innovations leading to significant gains in quality and productivity.

In 2007, CoorsTek purchased Gaiser and continues to infuse its vast R&D, materials, and manufacturing experience to ensure the Gaiser brand remains a symbol of innovative, high-quality bonding tools.

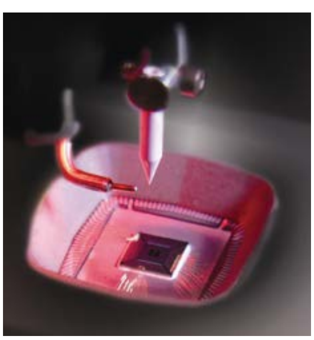
CoorsTek provides quick-turn prototyping to help shorten new product development cycle.

Serving Customers Where They Need Us Most!
CoorsTek has over 400,000 square meters (4 million square feet) of manufacturing floor space in 50 manufacturing locations worldwide.


We invented the first ceramic capillary and continue to lead the high-precision capillary market.


High-quality wire wedges ensure superior performance.

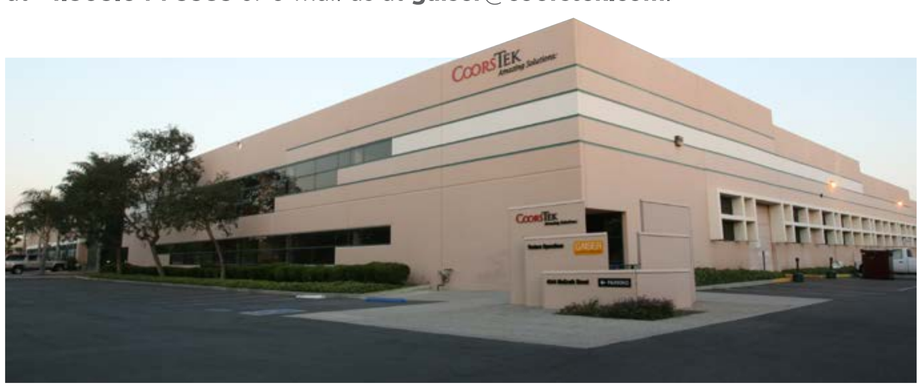

CoorsTek offers custom high-precision tools with extremely stable and durable ceramic materials.


Improve bonding performance with Gaiser brand precision ceramic capillaries.

Superior Bonding Tools for Semiconductor
For over four decades, we've served the semiconductor industry with a variety of long-life, high-quality precision tools including:

- **Fine-Pitch Ceramic Capillaries** – We invented the ceramic capillary
  and continue to refine and improve our class-leading designs with state-of-the-art process and material innovations.
- **Broad Selection of Wire Wedges**
  - **Small Wire Wedges** – Our next-generation MaxiBond™ small wire wedge design utilizes a unique raised pocket / dropped foot architecture providing a complete back radius for optimal 1st bond heels and 2nd bond tailing, precise wire centering, minimum "W" dimensions, and access into recessed bond pads.
  - **Large Wire Wedges**
  - **Standard Wire Wedges**
  - **Deep-Access Wedges**
  - **Ribbon Wedges**
- **Single Point TAB Tools** – Designed specifically for optimal compatibility with ultrasonic energy, our tape automated bonding tools are available in tungsten carbide or titanium carbide with Cermet or diamond tips.
- **Die Collets and Vacuum Pick-Up Tools** – Our static-dissipative ceramic materials ensure superior performance.
- **Parallel Gap Electrodes** – Available for Unitek, Hughes, and custom designs.
- **Custom Micro-components** – We're known for extensive micro-molding and machining capabilities with exceptionally hard materials. Bring your design challenge to our team of ceramics experts!

Expert Assistance
Call our precision bonding tool experts today for personal assistance at **+1.805.644 5583** or e-mail us at **gaiser@coorstek.com**.



CoorsTek Ventura Operations — dedicated to development and production of Gaiser® brand precision bonding tools.

capillaries
wedges
tab tools
die attach
other

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Advanced Materials and Components for Front-End Semiconductor Manufacturing

CoorsTek supports the semiconductor manufacturing industry by supplying ceramic materials and chamber-critical components used in chip-processing equipment. From raw material design and production to finished and assembled components, our vertically integrated manufacturing ensures quality for every step of the process.

Etch

Components:
- Shower heads
- Windows
- Focus Rings
- Domes
- Shields
- Nozzles

Materials:
- PlasmaPure™ Alumina
- PureSiC™ CVD SiC
- AD-995 Alumina

CVD, PVD, ECP

Components:
- Gas distribution plates
- Chamber liners
- Domes
- Plating insulators
- Cover rings

Materials:
- PlasmaPure Alumina
- PURE SiC™ CVD SiC
- Engineered arc-spray coatings
- AD-995 Alumina

High-temperature – RTP, EPI

Components:
- Edge rings
- Shields
- Low-Mass lift pins
- Thermal couple sheaths
- Susceptors

Materials:
- PURE SiC™ CVD SiC
- SC-DS Sintered SiC
- PlasmaPure™ Alumina

Implant

Components:
- RF shields
- Insulators

Material:
- PlasmaPure Alumina
- PURE SiC™ CVD SiC
- ESD Ceramics
- AD-995 Alumina

Lithography, Wafer Inspection

Components:
- Air-bearing guideaways
- Air bearings
- Interferometer reference mirrors
- Scale mounts

Materials:
- Fine-Grained Alumina
- SC-DS Sintered SiC
- Dura-Z™ Zirconia

General Applications

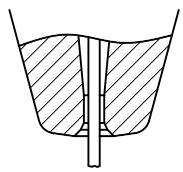
Components:
- ESD end effectors
- Lift pins
- Wafer chucks

Materials:
- ESD Ceramics
- PlasmaPure™ Alumina
- SC-DS Sintered SiC
- Brazed Ceramic Assemblies
- Dura-Z™ Zirconia
- Multi-layer Channeled Ceramic Substrates
- AD-995 Alumina

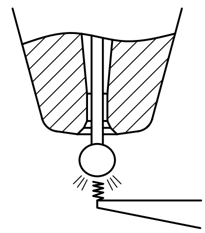
For expert assistance with your next project, please contact us at **800-455-4050** or send an e-mail to **semi@coorstek.com**.

The Ball Bonding Process

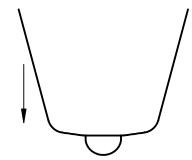
A typical step by step overview of the wire bonding process showing the formation of the free air ball, ball bond, stitch bond, and concluding with the reformation of the next free air ball.



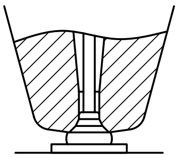
1. The bonding process begins with a threaded capillary.



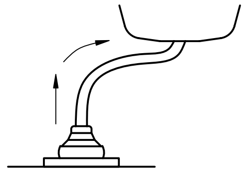
2. Electrical Flame Off (EFO) forms the free air ball.



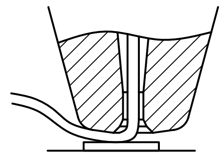
3. The capillary captures the Free Air Ball in the Chamfer Diameter and descends to the Bond Site.



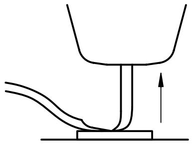
4. Force and Ultrasonic Energy are applied over Time and the Ball Bond is made.



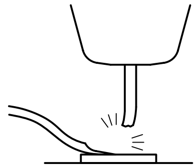
5. The Looping Sequence



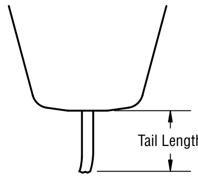
6. Force and Ultrasonic Energy are applied over Time to make the Stitch Bond.



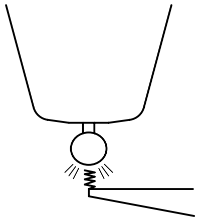
7. The capillary rises with the Wire Clamps off for a specific distance.



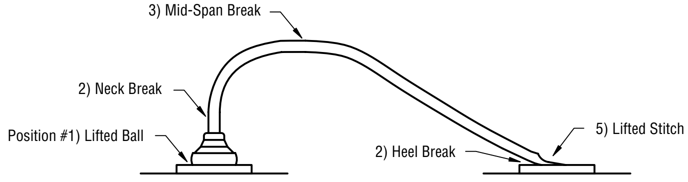
8. The Wire Clamps are applied and the wire breaks away from the 2nd Bond leaving a specific tail length.



9. The Tail Length after breaking away from the 2nd Bond.



10. The EFO forms the next Free Air Ball and the cycle begins again.



Preferred Failure Modes
- Mid-Span Break (Bond Strength exceeds Wire Tensile Strength)
- Neck Break at Heat Affected Zone (HAZ)
- Heel Break

Undesireable Failure modes
- Lifted Stitch
- Lifted Ball

The Ball Bonding Capillary — A Brief History

From the historical standpoint, Au-Al semiconductor wire bonding was done only by heat and pressure (thermo compression) using heat-drawn glass capillaries which provided a metal-to-metal weld. This was an acceptable process for some years but the 300ºC plus temperatures and relatively high bonding forces became a problem with thinner chips, device sensitivity, lead frame oxidation, etc.

Capillary material advancements, initially Tungsten Carbide, lead to more robust and dimensionally consistent capillaries. They also allowed the reduction of bonding temperatures for sensitive devices by transferring the heat directly to the capillary. Capillary heaters were a popular form of bonding heat sensitive devices. However, the heat transferred via the metal capillary created a new problem by exaggerating grain growth at the ball neck region. The end result was lower pull values as the temperature of the capillary was increased to offset reductions in the stage temperature.

The early bonding process depended on Hydrogen-Oxygen based torches to form a free air ball. This torch mechanism, if not set properly, exhibited a tendency to cause early oxidation of the WC (Tungsten Carbide) capillaries. This prompted Gaiser to search for new solutions which resulted in our invention of the ceramic capillary. With the invention of the ultrasonic transducer, acoustic energy was introduced into the equation, greatly improving bond strengths and bondability (Thermosonic and Ultrasonic Bonding).

Around the late 1970's, someone thought that adding an ultrasonic vibration to the capillary along with the usual parameters that the "scrubbing" action of the metal surfaces would improve the bond reliability. As luck would have it, it also lowered bonding temperature requirements and created better Au-Al reactivity so the Thermosonic process was born.

Typical processes were designed around 60 kHz for many years and still remain so, even today. In the late 1980's, a group of bonding scientists pioneered a revolutionary improvement in the ball bond process by increasing the transducer frequencies beyond the standard 60 kHz. Their work set the foundation for high-frequency processes where transducer frequencies range from 90 to 250 kHz covering a wide field of applications. Capillary materials had to be modified to better utilize the necessary changes in process application as well as being better tuned to the higher frequency transducers.

Basic Requirements for Successful Ball Bonding

Following are the basic requirements for successful ball bonding:

1. A maintained ball bonder and a knowledge of its operation
2. An appropriate part number capillary in functional condition
3. Quality wire property handled, correct hardness, elongation, and tensile strength
4. Optimized tuning of the bonder (time, force, and ultrasonic power)
5. Heat - adequate stage temperature, paying special attention to material properties [i.e Glass Transition Temperature (Tg)]
6. Good metallization
7. Clean metallization
8. A securely clamped and leveled workpiece

Factors such as bond pad size, bond pad pitch, wire diameter, bonding surfaces, metallization, loop height, loop length, bonder speed and accuracy, and package design will effect the capillary chosen for a wire-bonding application. CoorsTek offers a number of standard industry capillary designs as well as the ability to customize part numbers for individual applications.

Basic Capillary Design Dimensions

Capillaries have two basic sets of industry standard dimensional characteristics: large geometry and small geometry. Large geometry dimensions generally refer to the shank, back hole, and cone. Small geometry dimensions refer to the tip details.

Virtually all capillaries in use today are 1/16 inch diameter (0.0625 in./1.58mm). The most common capillary length is 0.437 in./11.1mm, followed by the 0.375 in./9.52mm length. Also available for the longer lengths are 0.625 in./15.88mm and 0.750 in./19.05mm.

The industry standard cone angle is 30° with 20° and 15° being optional. A 20° cone angle is becoming increasing popular for an all purpose capillary with today's shrinking packages. Sharper cone angles provide additional clearance in tight packages. Use of a 15° cone angle may result in some loss of ultrasonic energy transfer.

For fine-pitch applications, an angle bottleneck tip design may be required. Most angle bottlenecks have a 10° or 5° angle and are normally 0.006 in./150µm to 0.015 in./380µm high. The angle bottleneck height and angle are driven mainly by the bond pad pitch and loop height of the application. See the fine pitch section for more information.

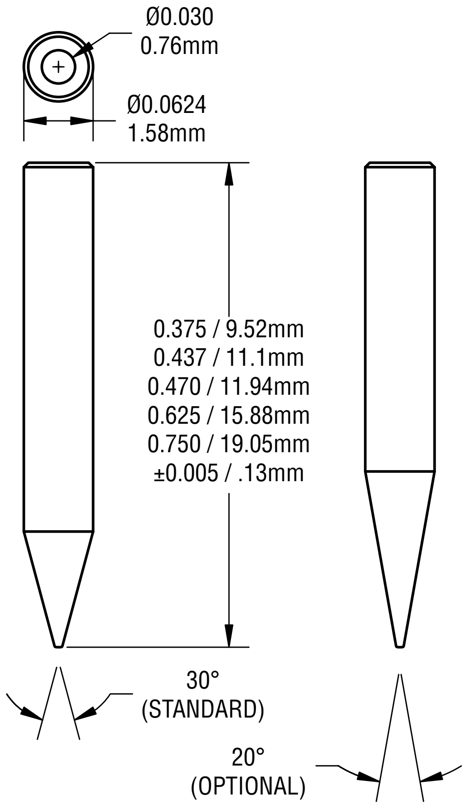


Figure 1 – Large geometry dimensions

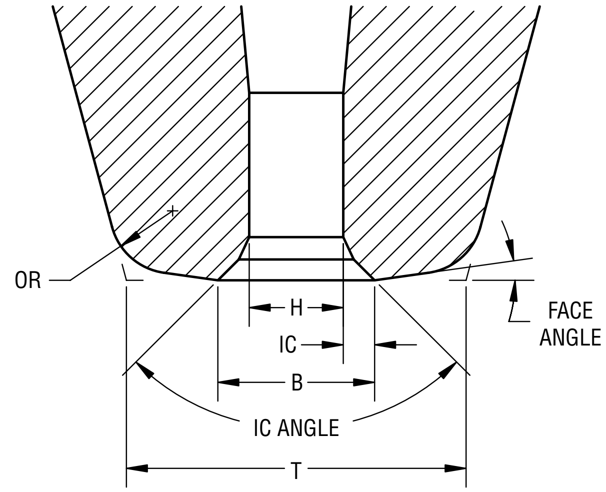


Figure 2 – Small (tip) geometry dimensions

Industry standard large geometry dimensions:

1. Shank Diameter (SD)
2. Tool Length (L)
3. Cone Angle or Main Taper Angle
4. Back Hole

Industry standard small geometry dimensions:

1. Tip Diameter (T)
2. Hole Diameter or Size (H)
3. Chamfer Diameter (CD or B)
4. Inside Chamfer (IC)
5. Inside Chamfer Angle (IC Angle)
6. Face Angle (Note: may be flat, 0°)
7. Outside Radius (OR)

The Tip Diameter ("T" Dimension)

The capillary tip diameter should generally be as large as the bonding application will allow (within reason – there is a law of diminishing returns). A large tip diameter provides the maximum effective 2nd bond length, therefore the maximum bonded surface area between the wire and the bonding surface for the stitch bond.

Most "full size" capillaries for 0.0010 in./25µm to 0.0013 in./33µm wire have tip diameters ranging from 0.0055 in./140µm to 0.0090 in./229µm. For tighter packages and smaller wire diameters, such as 0.0008 in./20µm, tip diameters as small as 0.0040 in./102µm may be needed. With fine pitch applications, tip diameters smaller than 0.0030 in./76µm may be necessary. See the fine-pitch wire bonding section for more information.

The tip diameter selection is mostly affected by the ball bond pitch or other package-related constraints such as clearance issues. There are many Gaiser brand capillary part numbers available with various tip sizes to suit most applications.

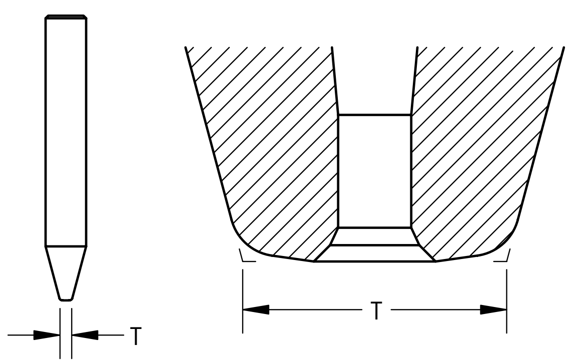


Figure 3 – The tip (T) diameter

Main aspects of the tip diameter:

1. Provides the overall size of the bond length, 2nd bond, or stitch bond
2. Contains all the capillary tip features: Hole, Chamfer Diameter, Face Angle, & Outside Radius
3. Fine pitch or other package constraints may force the use of a smaller tip diameter

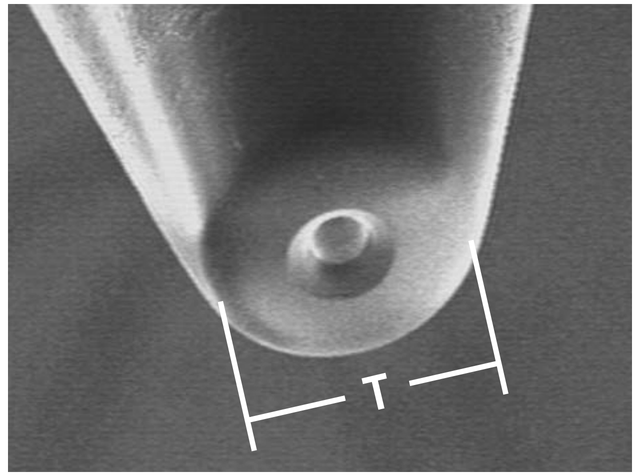


Figure 4 – Standard capillary tip (T) dimension

The tip diameter has the most direct effect on the size of the stitch bond. A larger tip diameter will produce a larger and longer stitch bond with more bonded surface area, and a generally higher peel strength.

A smaller tip diameter will produce a smaller stitch bond with less bonded surface area. Package or pitch constraints may dictate the need for a smaller tip diameter.

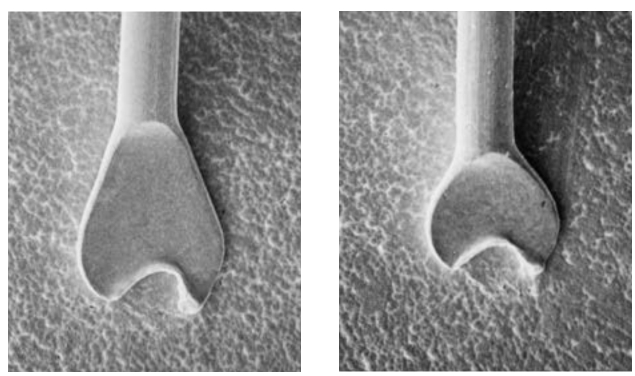


Figure 5 & 6 – The stitch bond on the left is made with a T=0.0090 in./229µm and the stitch bond on the right is made with a T=0.0059 in./150µm. A larger T dimension provides a longer bond length and therefore a larger surface area for a superior intermetallic weld.

A given tip diameter may produce a slightly different stitch bond width and length relative to the direction of the ultrasonic scrub. This condition is inherent in many wire bonders and ultrasonic transducers. The cosmetic difference is generally of no consequence as adequate bond strengths are able to be obtained on all axis.

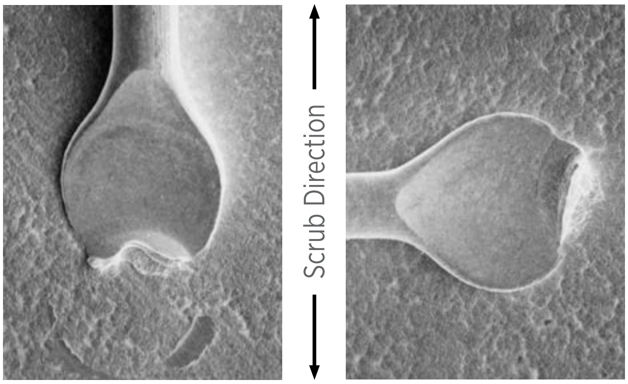


Figure 7 – Tools with the same capillary tip may render stitch bonds with different widths depending on scrub direction. A stitch bond made in the east-west direction will be wider than a stitch bond made in the north-south direction. This is due to the ultrasonic motion of the capillary scrubbing across the wire. Stitch bonds made in the north-south direction will be narrower because the ultrasonic motion scrubs in-line with the wire.

Tip Finish

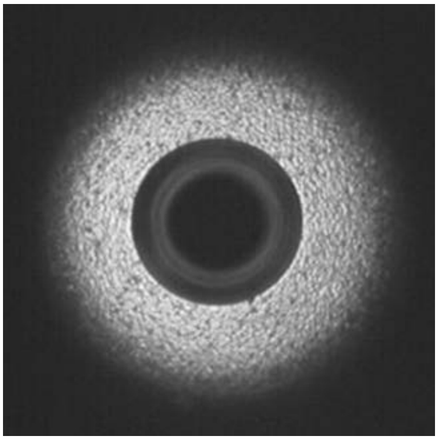


Figure 8 – The Gaiser Matte finish specified as "GM" in the part number.

Main characteristics of a matte tip finish:

1. The matte surface texture provides maximum mechanical coupling between the capillary tip and the wire
2. A matte finish may be more prone to build-up than a polished tip finish

The "GM" finish is recommended for the maximum effective transfer of ultrasonic energy from the tool to the wire during the 2nd bond.

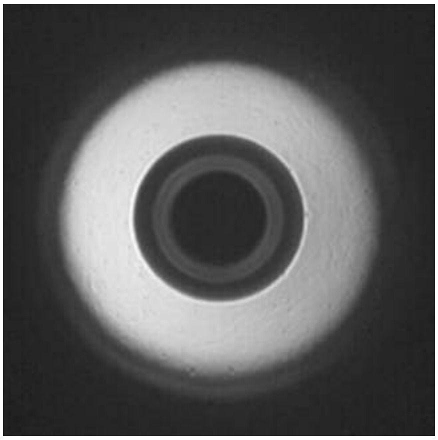


Figure 9 – The polished finish specified as "P" in the part number.

Main characteristics of a polished tip finish:

1. The polished finish may provide longer tool life in applications with excellent bondability due to being less prone to build-up than the GM finish
2. A polished finish does not provide enhanced mechanical coupling between the capillary and the wire

For applications where bondability is very good, the polished finish is recommended. If the bonding surface metallizations and wire are easily bonded, the polished finish may provide longer tool life than a matte finish tool. Although the polished finish tool is less prone to build-up on the tip but does not transmit ultrasonic energy as aggressively as a GM finish.

The Hole Diameter ("H" Dimension)

The capillary hole diameter (H) is determined by the wire diameter and the application. Manual bonder hybrid applications, ball bumping applications, and fully-automated bonder fine pitch applications, require different capillary hole diameter to wire diameter relationships. For wire diameters of 0.0010 in./25µm to 0.0013 in./33µm, the hole diameter is typically designed 0.0005 in./13µm to 0.0008 in./20µm larger than the wire diameter. This relationship can affect wire looping, wire drag, and ball bond size and appearance.

Capillary Wire Bonding

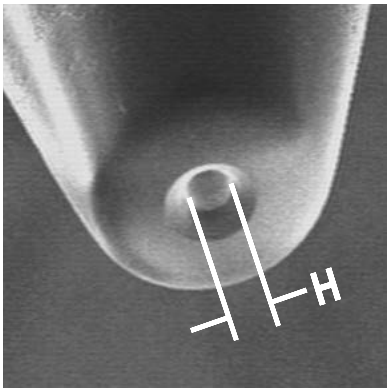


Figure 10 – Standard capillary hole (H) dimension

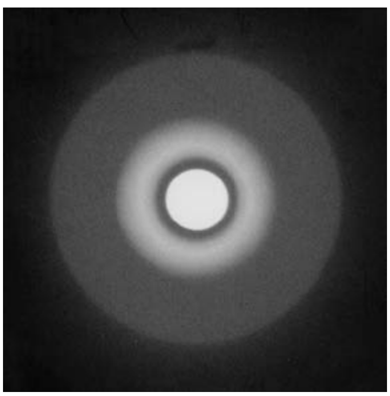


Figure 11 – Back-lit view of capillary hole diameter

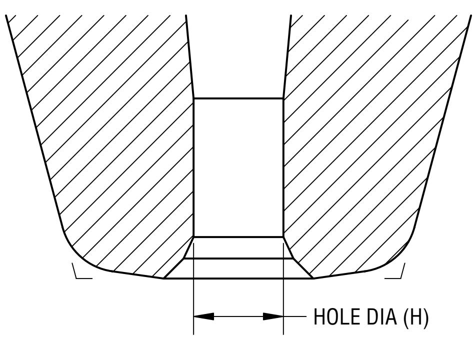


Figure 12 – The hole (H) diameter

The effects and influence of the capillary hole size (optimum vs. too small or too large):

1. Wire feed and drag, wire scratch
2. Looping characteristics, profile, and kinking
3. Ball size and shape
4. Hole plugging, swallowed ball

Manual and semi-automatic bonders in various hybrid microelectronics applications may be operated in a wide hole diameter to wire diameter relationship. Factors such as bonder speed and accuracy, operator preference, loop length, loop profile, pad size, ball size, wire hardness and elongation, and package design all play a roll. A general minimum/maximum relationship is shown below.

Manual Bonder / Semi-automatic Bonder Capillary Hole Diameter, General Guide	
Wire Diameter in. / µm	Hole Diameter in. / µm
0.0008 / 20	0.0012 / 30 to 0.0015 / 38
0.0009 / 23	0.0013 / 33 to 0.0017 / 43
0.0010 / 25	0.0014 / 36 to 0.0018 / 46
0.0012 / 30	0.0016 / 41 to 0.0020 / 51
0.00125 / 32	0.0016 / 41 to 0.0020 / 51
0.0013 / 33	0.0017 / 43 to 0.0021 / 53

Fully automatic high-speed bonders are generally operated in a tighter wire-to-hole diameter relationship as shown below.

Fully Automatic Bonder / High Speed Bonder Capillary Hole Diameter, General Guide	
Wire Diameter in. / µm	Hole Diameter in. / µm
0.0008 / 20	0.0012 / 30 to 0.0014 / 36
0.0009 / 23	0.0013 / 33 to 0.0015 / 38
0.0010 / 25	0.0014 / 36 to 0.0016 / 41
0.0012 / 30	0.0015 / 38 to 0.0017 / 43
0.00125 / 32	0.0015 / 38 to 0.0018 / 46
0.0013 / 33	0.0017 / 43 to 0.0020 / 51

Manual and semi-automatic bonders operating in fine-pitch, small-ball, or ball-bumping applications often require tighter wire-to-hole diameter relationships as shown below.

Semi-automatic Bonder Fine-Pitch Capillary Hole Diameter Guide	
Wire Diameter in. / µm	Hole Diameter in. / µm
0.0008 / 20	0.0010 / 25 to 0.0013 / 33
0.0009 / 23	0.0011 / 28 to 0.0014 / 36
0.0010 / 25	0.0013 / 33 to 0.0016 / 41
0.0011 / 28	0.0014 / 36 to 0.0016 / 41
0.0012 / 30	0.0015 / 38 to 0.0017 / 43
0.00125 / 32	0.0015 / 38 to 0.0018 / 46
0.0013 / 33	0.0017 / 43 to 0.0021 / 53

Fully automatic, high-speed, fine-pitch bonders are rapidly breaking new barriers in closer pitches, smaller wires, smaller pad openings, and ball sizes. These applications typically operate in a narrower hole diameter range as shown below.

Fully Automatic Bonder / High Speed Bonder Fine Pitch Capillary Hole Diameter Guide	
Wire Diameter in. / µm	Hole Diameter in. / µm
0.0006 / 15	0.00075 / 19 to 0.0009 / 23
0.0007 / 18	0.00085 / 22 to 0.0010 / 25
0.0008 / 20	0.00095 / 24 to 0.0011 / 28
0.0009 / 23	0.00105 / 27 to 0.0012 / 30
0.0010 / 25	0.00125 / 32 to 0.0014 / 36
0.0011 / 28	0.0013 / 33 to 0.0015 / 38
0.0012 / 30	0.0014 / 36 to 0.0016 / 41
0.00125 / 32	0.0015 / 38 to 0.0017 / 43

Note: For more information on fine-pitch and ultra-fine-pitch wire bonding, please refer to the fine-pitch bonding section.

Inside Chamfer Design (“IC” and “CD” or “B” Dimensions)

The inside chamfer has three major design parameters: the chamfer diameter (CD or B dimension), inside chamfer angle (IC Angle), and the inside chamfer size (IC).

1. Chamfer Diameter (CD or B for “Ball”)
2. Inside Chamfer Angle (IC Angle)
   - Single IC
   - Double IC
   - Blended IC (BLIC) or Inside Radius (IR)
3. Inside Chamfer Size (IC)

These design parameters generally affect the ball bonding characteristics of the capillary, but can also have an effect on the 2nd bond. As with other tool design dimensions, a change to one dimension may have an effect on another bonding characteristic at a different point in the wire bond process.

The chamfer diameter is the diameter of the chamfer surrounding the capillary hole that allows the capillary to capture the free air ball and form the ball bond. Factors which usually determine the chamfer diameter are capillary hole and wire diameter, free air ball diameter, bond pad size, and the desired squashed ball diameter. Most squashed ball diameters range from 1.0 to 1.2 times the chamfer diameter. The free air ball diameter and inside chamfer angle also affect the squashed ball diameter.

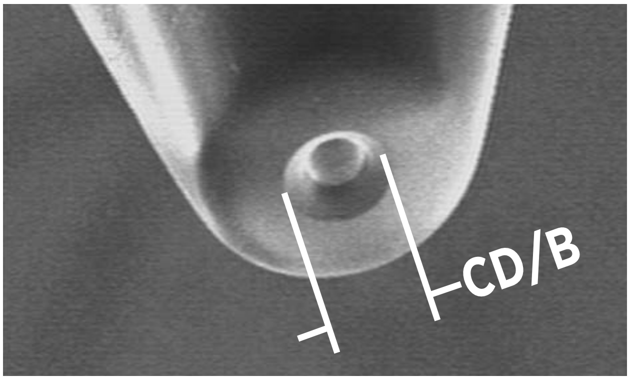


Figure 13 – Standard capillary chamfer diameter (CD or B)

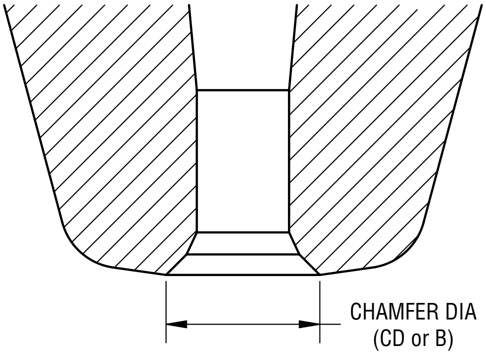


Figure 14 – The chamfer diameter (CD or B)

Major functions of the chamfer diameter:

1. Provides volume to capture the free air ball
2. Provides both downward and lateral mechanical coupling with molten ball during bonding
3. Ball size and shape
4. Contains wire extrusion in area other than the hole and face

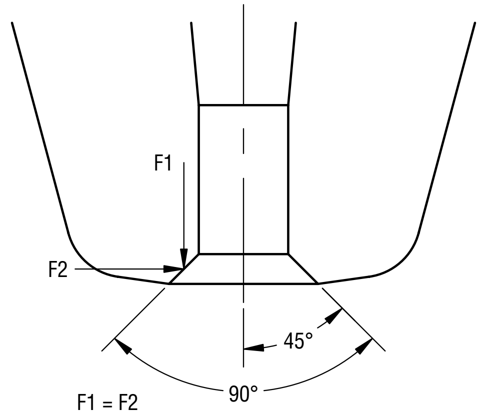


Figure 15 – The downward and lateral forces of the 90° IC angle are distributed evenly.

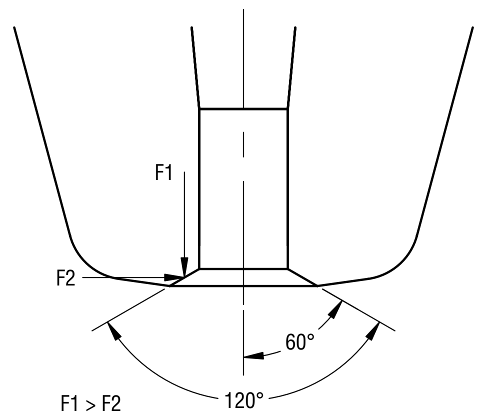


Figure 16 – The 120° IC angle produces more downward force than the 90° IC angle. This increased force affects both the ball and stitch bond.

Main effects of the IC angle:

1. 120° – Maximum downward force vector for the ball bond and reduced cut stitch at the 2nd bond (preferred for many non-fine pitch, hybrid, MCM, and thick-film applications).
2. 100° – Provides maximum free air ball capture volume and controlled squashed ball size; reduces cut stitch than smaller IC angles. The relative higher downward force increases intermetallic reaction more than smaller IC angles.
3. 90° – Greater capture volume for a taller, more compact ball bond (preferred in fine-pitch, high-frequency transducer applications).
4. 70° – Provides maximum free air ball capture volume and minimal squashed ball size; may also contribute to cut stitch. The minimum downward force vector may cause lower ball shear. Adequate ultrasonics are necessary for good ball shear when using a 70° IC.

The previous section discussed the basics of the chamfer diameter (CD or B). This section covers the inside chamfer angle (IC Angle) and the remaining component in the equation, the inside chamfer (IC).

Mathematically, the IC value is 1/2 the difference between the chamfer diameter and the hole diameter, or the delta X component of the chamfer surrounding the capillary hole.

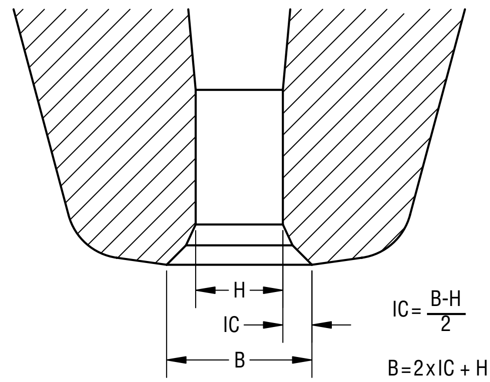


Figure 17 – The Inside Chamfer (IC) dimension

Larger capillaries for 0.00125 in./32µm wire hybrid applications may have an inside chamfer size of up to 0.0010 in./25µm. Medium to small ball capillaries have IC sizes from 0.0006 in./15µm down to 0.0003 in./8µm. Fine pitch capillaries have IC sizes from 0.0004 in./10µm down to as small as 0.00015/4µm. New developments for ultra-fine-pitch capillaries are pushing the envelope to 0.0001 in./2.5µm and below.

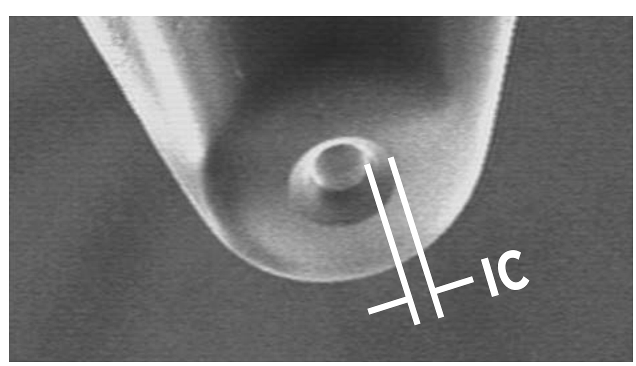


Figure 18 – Standard capillary inside chamfer (IC) dimension

The most basic IC design is the single angle IC. This was followed by the double IC angle which maintained the individual advantages of the 90° and 120° designs, but improved looping and higher speed wire bonder operation. A double IC is standard on Gaiser capillaries unless otherwise specified. Fine-pitch capillaries may require a single IC due to very small feature size. Further to the double IC design is the radiused inside chamfer or blended inside radius. Radiused inside chamfer designs are helpful in low-loop, long-loop, long-wire, or high/low bonding applications.

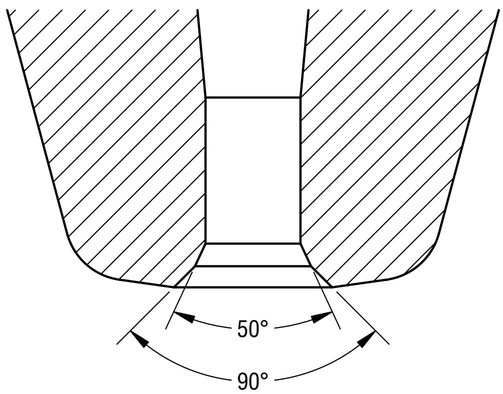


Figure 19. The 90° double IC consists of 90° and 50° angles as shown above. The 50° angle allows for a smooth transition into the hole for good looping. The 90° angle forms a taller, more compact ball and provides good tailing.

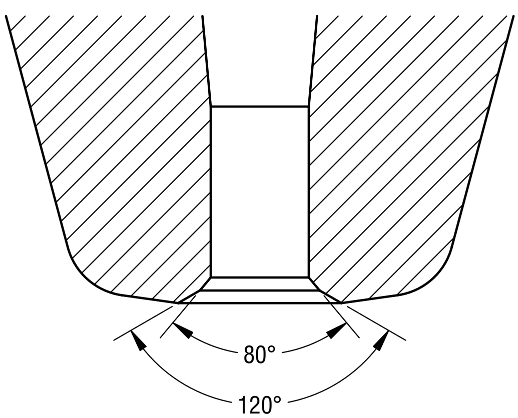


Figure 20. The 120° double IC consists of 120° and 80° angles as shown above. The 80° angle allows for a smooth transition into the hole for improved looping. The 120° angle produces strong tail bonds and higher ball shear strengths.

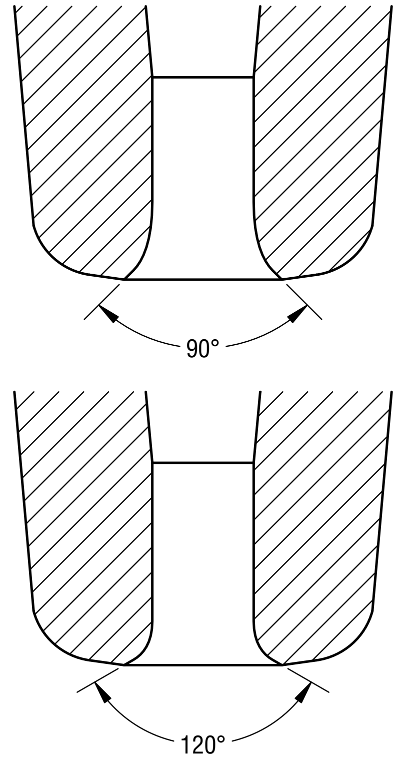


Figure 21. Radiused IC designs reduce wire drag. The 120° design provides excellent looping characteristics and wire control and is often preferred for high speed, low-loop, long-loop, and spider-leg applications.

IC Angle Impact on Bondability

Internal Chamfer Angle (ICA) on ball bond shape and integrity has long been known to bond process engineers. The differences between a 90° ICA and a 120° ICA are clear when the ball size and shape are compared. The 90° ICA provides less squash or deformation on the finished bond as compared to the 120° ICA.

The push to control bonded ball size and shape to satisfy increased demands for finer pitch bonds has forced the use of steeper ICA (< 90°). The disadvantage that comes with such steeper ICA is the negative impact they have on shear strength, intermetallic formation, and in many cases the potential for inducing subsurface damage to the bond pads.

The reason steeper angles tend to minimize ball bond deformation is because of the reduced compressive force applied perpendicular (Fy) over the Internal Chamfer (IC) surface. The smaller stress applied by this component (Fy) minimizes the amount of material being pushed out of the IC area, therefore allowing the material to be easily extruded inwards to fill the IC cavity. At the same time that the compressive forces are reduced, another compressive force component (Fx) increases as the IC meets the face angle. This component is the one responsible for potential subsurface damage on bond pads.

In order to illustrate the impact of the IC-compressive forces, a 90° ICA was used in the following calculation.

Where:
SA = Surface Area for IC
F = Bond Force in grams
P = Pressure
m = $\sqrt{IC^2+h^2}$
h = Tanσ * [(D-d)/2]
σ = ICA/2
D = B or CD diameter
d = Hole diameter
IC = (D-d)/2

So SA = (Pi/2) * m * (D+d)
and P = F/SA

When σ = 90°/2 and D = 355.6µm
and d = 228.6 µm

then SA = 2919.96 μm^2

If F = 25 grams and SA = 2919.96 μm^2

then P = 0.0086 gm/μm^2

To calculate the different pressure components the following diagram is used:

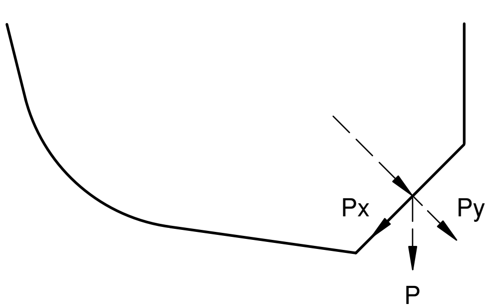


Figure 22 – Pressure components of a 90° ICA

Px = P*Cosσ and Py = P*Sinσ

So if P = 0.0086 gm/μm^2 and σ = 90°/2

Then
Px = 0.00608 gm/μm^2 and
Py = 0.00608 gm/μm^2

From P = F/SA then

Fx = Px*SA and
Fy = Py*SA

So,

Fx = 17.75 grams and
Fy = 17.75 grams

As the calculation shows, the force components are in equilibrium when a 90° ICA is used. This equilibrium can be shifted either way to satisfy process demands, small consistent bonded size or higher intermetallic formation, but not both.

Small increments in the IC angle can provide the necessary optimization for increased intermetallic formation (higher shear strength) without affecting bond shape considerably. An example of such optimizations is the Gaiser 100° ICA targeted to fine pitch applications with increased intermetallic formation and good bond deformation.

The graph below illustrates a ball size ratio (X/Y) comparison study between 90°IC, 100°IC, and 110°IC capillaries and intermetallic analysis.

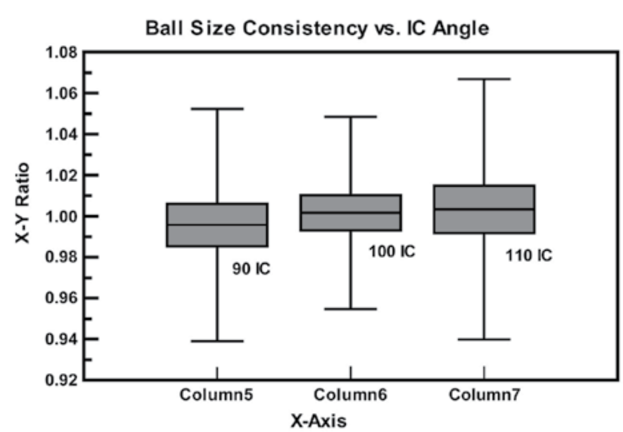


Figure 23 – Ball Consistency VS. IC Angle

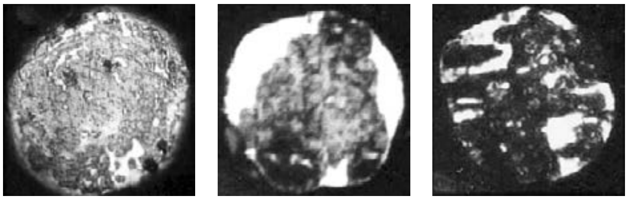


Figure 24 – Intermetallic Analysis

If the same procedure is used to calculate the force components acting upon the IC surface of a 120° ICA, the Fy increases as the Fx decreases.

The values for an ICA = 120° are
Fy = 21.65 grams and
Fx = 12.49 grams

If we now calculate the values for an ICA = 70° then
Fy = 14.34 grams and
Fx = 20.48 grams

From this last example, it is obvious that the Fx is already approaching the original F value while the Fy (perpendicular to the surface of the IC) is dropping in value – therefore less direct compression is applied over the surface of the ball bond. This will potentially result in minimal, if any, intermetallic growth at the center of the bonded ball as shown in the figure below.

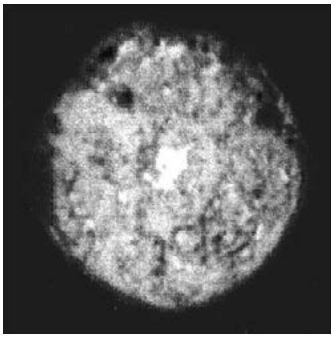


Figure 25 – Intermetallic growth at the center of the bonded ball

Face Angle and Outside Radius (OR)

Current capillaries are normally designed with either a 0°, 4°, 8°, or 11° face angle. The angle selected is usually based on the package type being bonded.

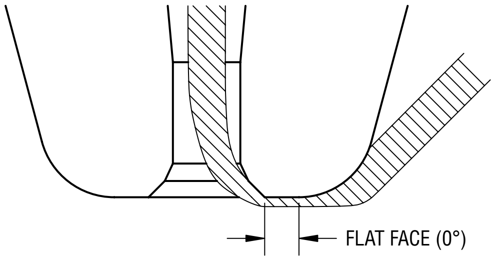


Figure 26 – The flat (0°) face angle

The 0° face angle provides the greatest downward force. This is beneficial in situations where the leadframe material or planarity creates difficult conditions for a good second bond. A potential disadvantage is the possibility of heel cracking problems as a result of the thin heel area of the second bond created. This problem can be reduced by including a large OR design with the 0° face angle. The normal OR is designed to be equal to the size of the wire being bonded.

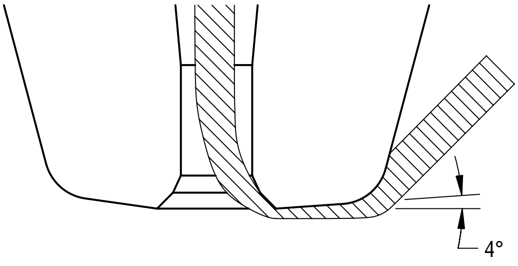


Figure 27 – The 4° face angle

The 4° face angle was developed for situations where the 0° face angle capillary caused heel crack problems but additional force down on the second bond was still required for good pull strengths.

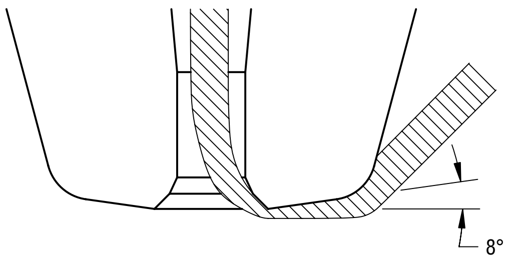


Figure 28 – The 8° face angle

The 8° face angle was designed as the most suitable compromise in providing adequate downward force and good pull tests on the second bond. It also provides a thicker heel area of the second bond to avoid heel cracks. The majority of capillary designs today utilize the 8° face angle.

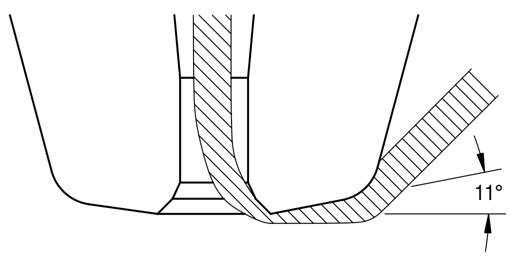


Figure 29 – The 11° face angle

In recent years, the 11° face angle capillary has gained popularity to deal with the advent of newer packages with softer surfaces for the second bond. Downward force for the second bond was increased in order to improve the strength of the second bond. The 11° face of the tool allowed the capillary to bond deeper in the lead frame material without causing heel crack problems. This design is used for some of the BGA packages.

Face Angle – Stress on the Second Bond

The impact of stresses during the second bond formation is an important subject in order to understand the mechanism behind it. Stresses applied to the wire during the formation of the second bond are responsible for the integrity and strength of that bond.

The following generic diagram illustrates the stress distribution occurring during the second bond formation.

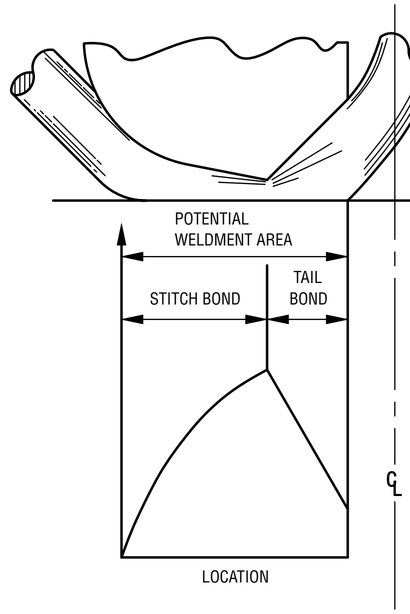
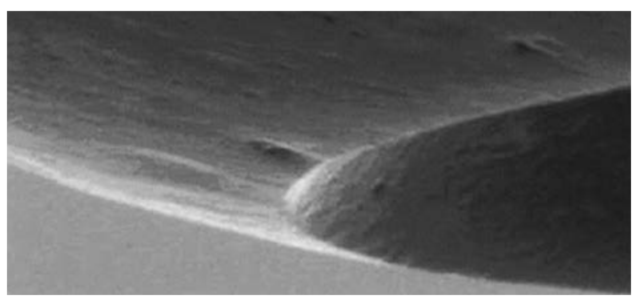


Figure 30 – Compressive stress graph

Another way of illustrating stresses is shown in the comparison below where a fixed-face-angle capillary is compared with a CDR2B type capillary.

The standard face angle capillary shows a Vertical Force component concentrated at the intersection of the IC and Face Angle. If this component is excessive, the results are cut wires resulting in missing balls.



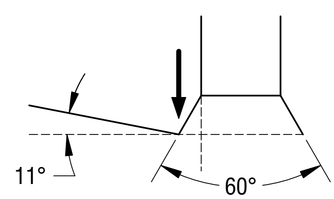
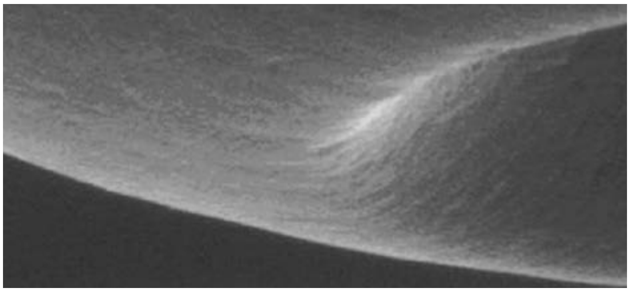


Figure 31 – Standard capillary

The CDR2B design shows the same type of Vertical Force component but distributed over a larger surface area, resulting in smaller components that reduce the potential of cutting the wire during the binding operation.



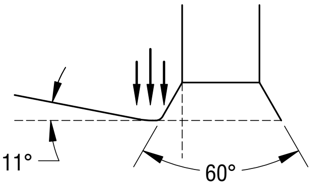


Figure 32 – CDR2B Capillary

FACE ANGLE	BOND STRENGTH	PARAMETER SETTINGS	PLANARITY SENSITIVITY	SURFACE CHARACTER
0°	Highest	Highest	Highest	Rough, Thin, Thick and Clean (Au)
4°	High	High	Lower	Thin, Thick and Clean (Au, Cu, Pd)
8°	Good	Average	Low	Soft, Rough, Thin, Thick, Hard (Ag, Au, Cu, Pd)
11°	Good	Low	Minimal	Soft and Thick (Ag, Au)

Figure 33 – Face angle comparison table

The Outside Radius (“OR” Dimension)

The outside radius (OR) of the capillary provides a gradual transition from the face of the capillary to the edge of the tip diameter. In combination with the face angle, the outside radius allows the compressed and bonded portion of the wire to transition gradually from a flattened, bonded condition back to the original round wire diameter. This gradual transition maintains strength in the portion of the wire between the bonded area and the wire diameter preventing both heel cracks and weak, easily broken stitch bonds.

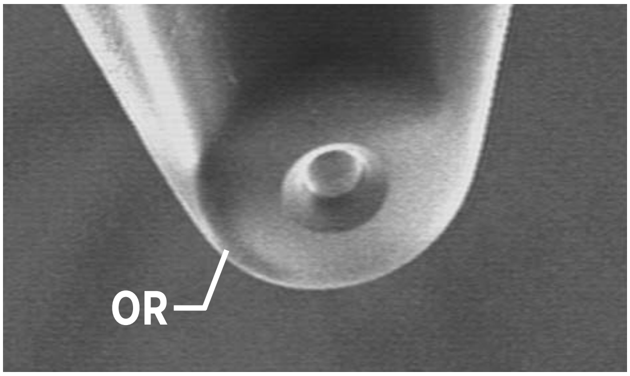


Figure 34 – Standard capillary outside radius (OR) dimension

Larger OR dimensions are generally used with flat-faced capillaries. A large OR dimension is beneficial with larger tip diameters and wire sizes because it is forgiving on surfaces with poor flatness or planarity. Smaller OR dimensions are used with face angles as less radius is required because the face angle provides part of the gradual transition. Generally, the steeper the face angle, the smaller the OR needed.

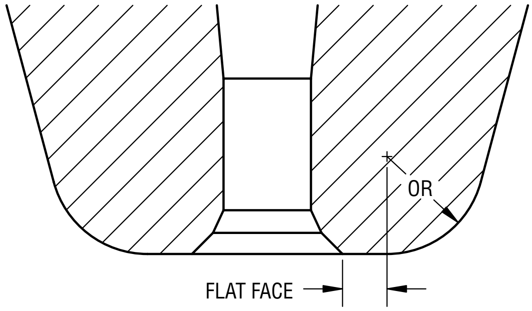


Figure 35 – Flat face capillary with OR

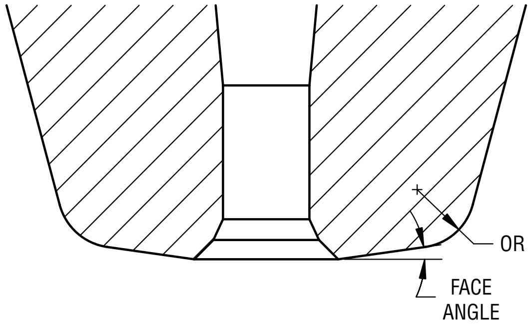


Figure 36 – Capillary with face angle and OR

For surfaces with poor flatness and/or planarity, the XX70 features an "oversize" outside radius design which is truncated by the tip diameter. This design provides a gradual transition similar to a face angle but does not become parallel to the bonding surface when the bonding surface is not flat.

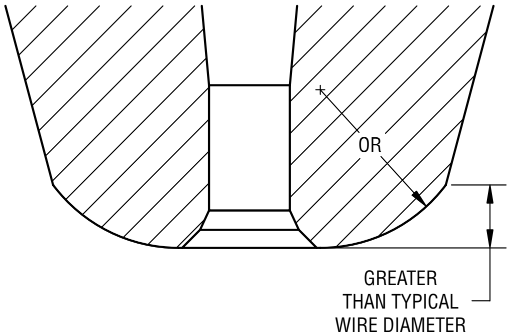


Figure 37 – XX70 style OR capillary

In fine-pitch designs, both large OR's with flat faces, and small OR's with steep face angles, are used due to the similar transition effects on the stitch bond caused by very short 2nd-bond bond lengths. For more information about fine-pitch OR design, see the fine-pitch wire bonding section (see page 41).

Bonding Problems

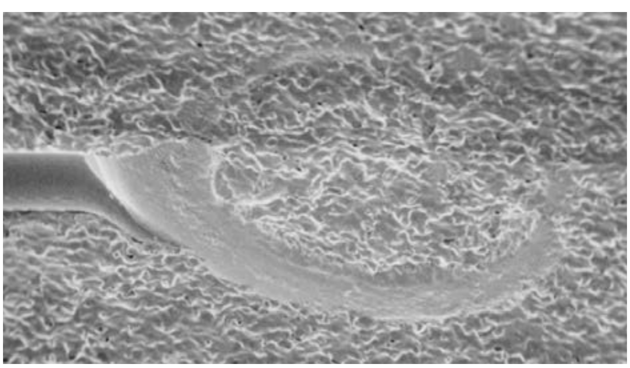


Figure 38 – Example of a weak/ chopped-off or cut bond.

The primary reasons for a weak/chopped-off or cut bond are:

1. Capillary T dimension is too small
2. Inside chamfer area of the capillary is worn away resulting in a shorter bond length
3. Excessive metals build up on the face and chamfer diameter area of the capillary

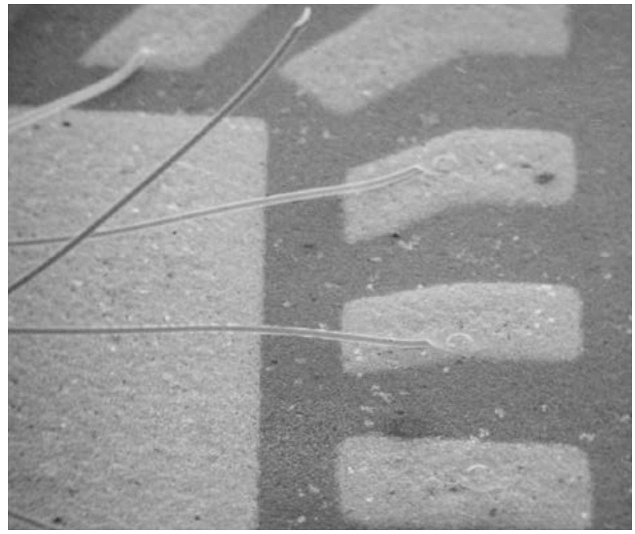


Figure 39 – Example of a non-sticking 2nd bond

The reasons for non sticking bonds are as follows:

1. Poor plating or metal type of the substrate
2. Contamination on the substrate material
3. Lead or package not clamped rigidly causing the lead to move resulting in poor ultrasonic energy transfer from the capillary to the wire and lead
4. Lead surface not planar to the capillary face
5. Improper frequencies, force, time, or heat settings – higher frequency transducer may be required for fine and ultra-fine-pitch applications
6. Capillary T dimension may be too small resulting in too short of a bond

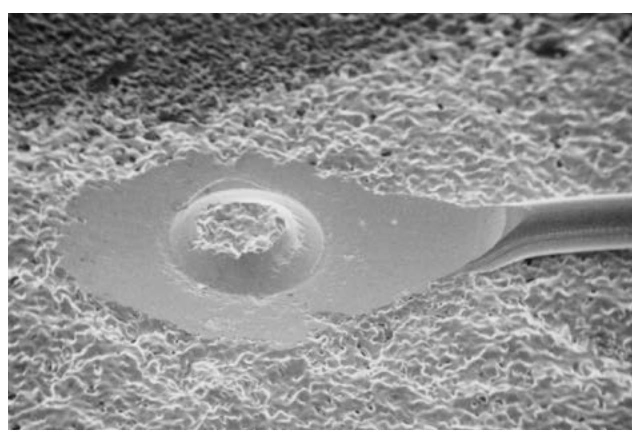


Figure 40 – Example of a weak transition from the stitch bond to the wire

Causes for a weak transition from the second bond to the wire include the following:

1. Face angle of the capillary too shallow causing the heel area to be too thin
2. Outside radius (OR) dimension too small in relationship to the wire size – Outside radius should normally be a minimum of the wire diameter
3. Excessive bonder force setting or frequency causing the capillary to cut the wire
4. Improper lead or substrate clamping allowing shifting of the capillary on the wire

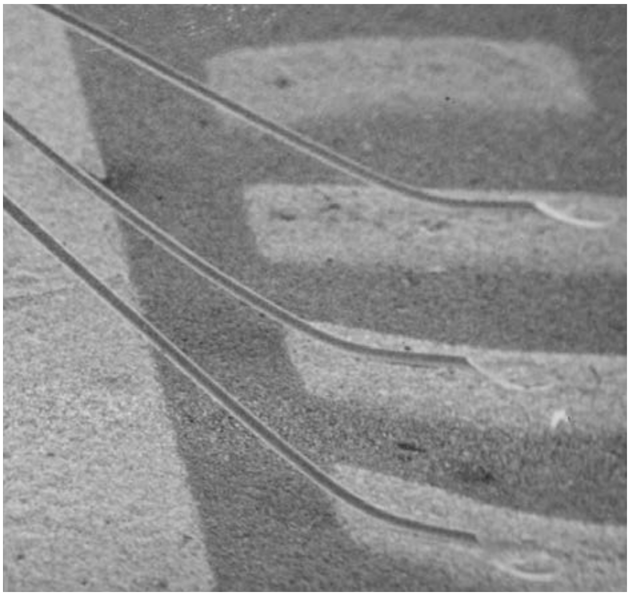


Figure 41 – Example of wavy or sagging wires

The following may cause the above wavy or sagging wires:

1. Excessive wire drag due to the hole of the capillary being too small in relationship to the wire – the hole is normally 1.3 to 1.5 times the wire diameter
2. Excessive wire drag due to the chamfer diameter being too small or metal build-up in the chamfer diameter
3. Wire elongation too high (soft)
4. Wire diameter is too small for the loop length required

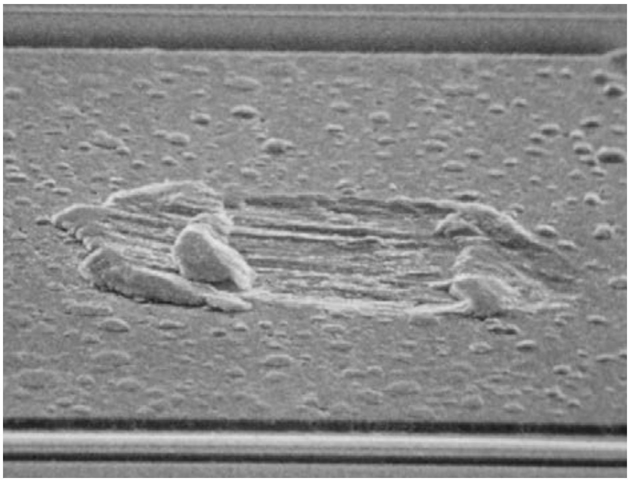


Figure 42 – Ball bond not sticking to the pad

Non-sticking of the ball bond to the pad may be caused by the following:

1. Excessive free air ball (FAB) size - normal size is 2 to 2.5 times the wire diameter
2. Insufficient force, frequency, heat, or dwell time
3. Residual silicon oxide or contamination on the bonding pad
4. IC angle too steep
   - 90° and 120° are standard
   - 70° and 50° are steeper angles for ultra-fine-pitch bonding
5. FAB size too small
6. Probe damage resulting in poor bonding surface

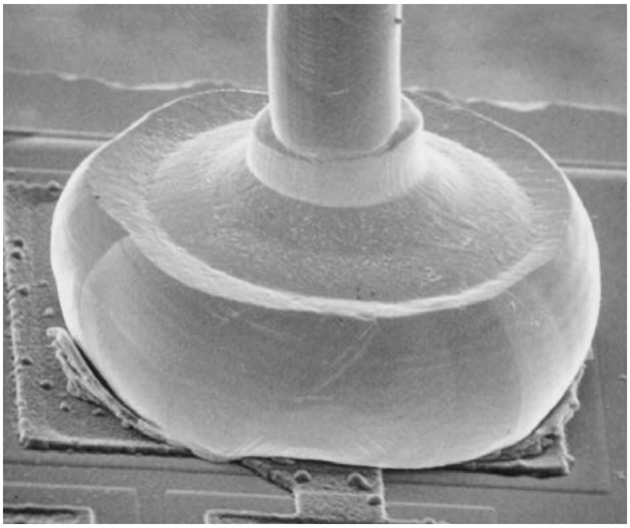


Figure 43 – Example of a ball bond larger than desired

Common causes of the ball bond being larger than the desired are:

1. IC angle is too shallow (120°)
2. Free air ball (FAB) size too large
3. Wire size too large
4. Excessive force or frequency
5. Chamfer diameter (B dimension) too large - should be smaller than the pad opening

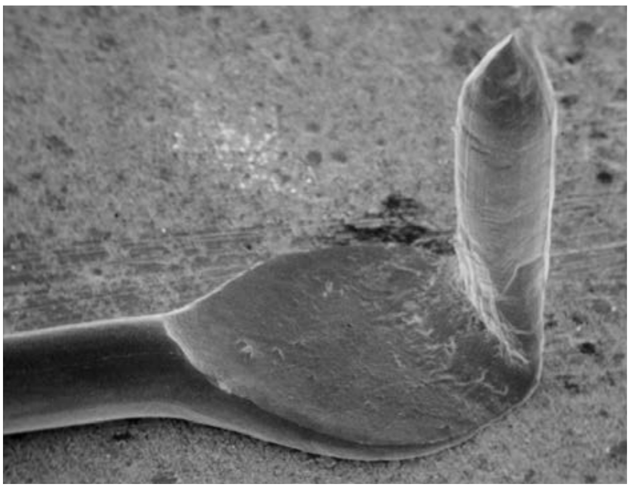


Figure 44 – Example of tailing problem normally associated with TC bonding

Common causes of tailing are as follows:

1. Metal bonding surface provides for excellent adhesion (gold or silver spot)
2. Shallow IC angle resulting in strong tail bond
3. Chamfer diameter too large resulting in strong tail bond
4. Excessive wire elongation/softness
5. Wire may be too old

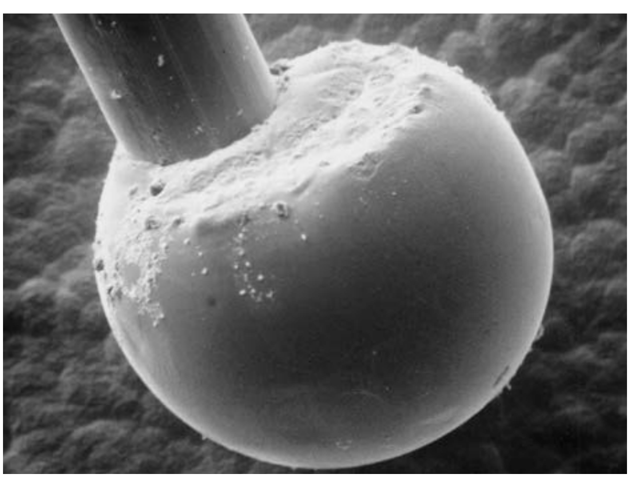


Figure 45 – Example of an off-center FAB

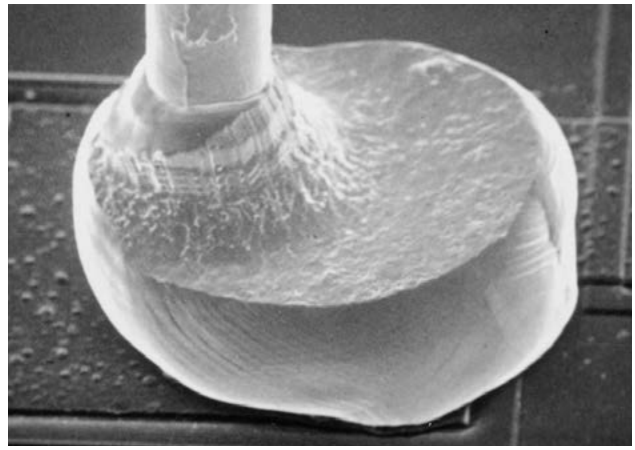


Figure 46 – Example of a golf club bond

Off-center or golf club shaped ball bonds may be caused by the following:

1. IC is too small (less than 0.0003 in./ 8µm) or IC angle is too steep (less than 90°)
2. Poor substrate metal for bonding surface (Nickel, Palladium, Copper)
3. Contamination
4. Poor clamping
5. Wire is too hard
6. Wire tension and drag not tight enough
7. Tail length setting is too long

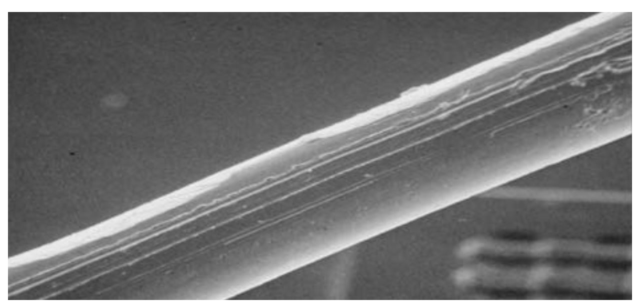


Figure 47 – Example of scratched wire

Wire scratches may be caused by the following:

1. Damaged chamfer diameter
2. Wire has existing scratches
3. Wire clamp surface is damaged
4. Wire clamp is not open
5. Excessive wire drag
6. Metal build-up in the chamfer diameter
7. Bonding condition is ball bond higher than the second bond
8. Loop is too low causing the wire to drag across the capillary face

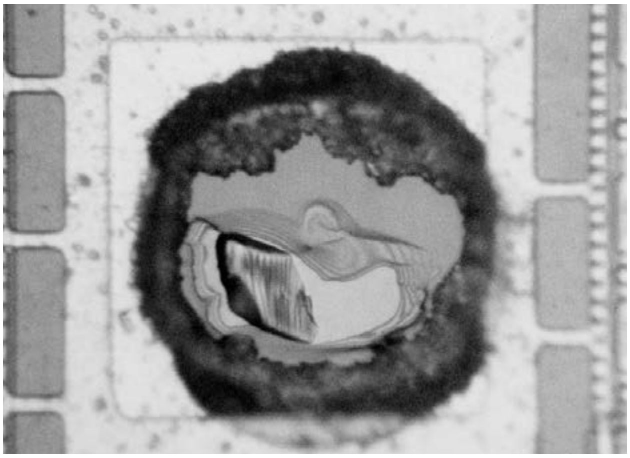


Figure 48 – Example of cratering of the bond pad

Cratering may result for the following reasons:

1. Bond heads dropping too fast in forming the ball bond
2. Excessive ultrasonic energy or power
3. Substrate movement during bonding
4. Poor metal adhesion to the bond pad
5. Bond time too long
6. Metal on bond pad is too hard, thin, or brittle

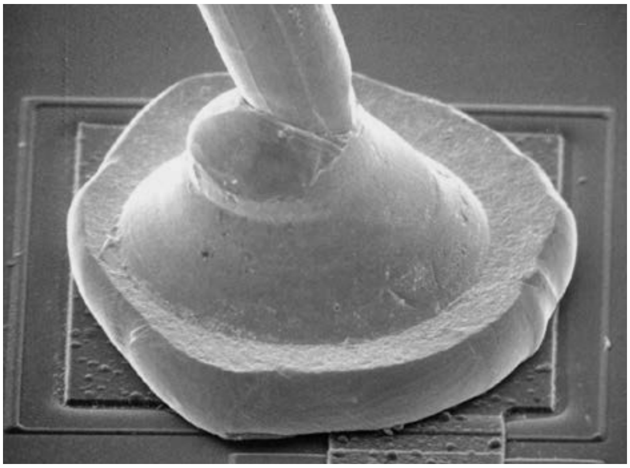


Figure 49 – Example of necking above the ball bond

Necking above the ball bond can occur for several reasons:

1. Insufficient downward force on the capillary during the ball bond formation allowing the ball to wobble
2. FAB is too small for capture in the chamfer diameter
3. Incorrect percentage of wire elongation allowing the wire to work harder above the ball
4. Low-loop bonding (below 0.006 in./150µm) causing stress above the ball bond
5. Ball bond is in higher location compared to the second bond

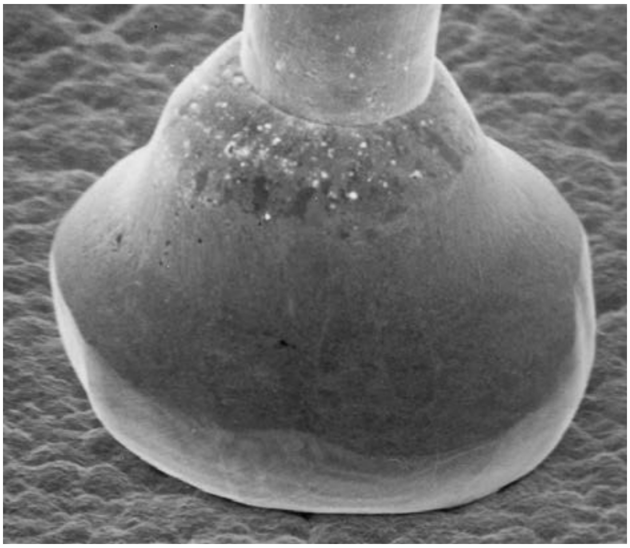


Figure 50 – Resultant ball bond of capillary with too large of a B (CD) dimension

When the capillary chamfer diameter (B or CD dimension) is too large, or if the free air ball (FAB) size is too small, the FAB can be "swallowed-up" into the chamfer and hole area. If this occurs, the ball may not have enough contact with the pad resulting in a weak bond or "no-stick". It is also possible for the capillary to "bottom-out" or actually contact the device on the first bond, damaging the device and capillary.

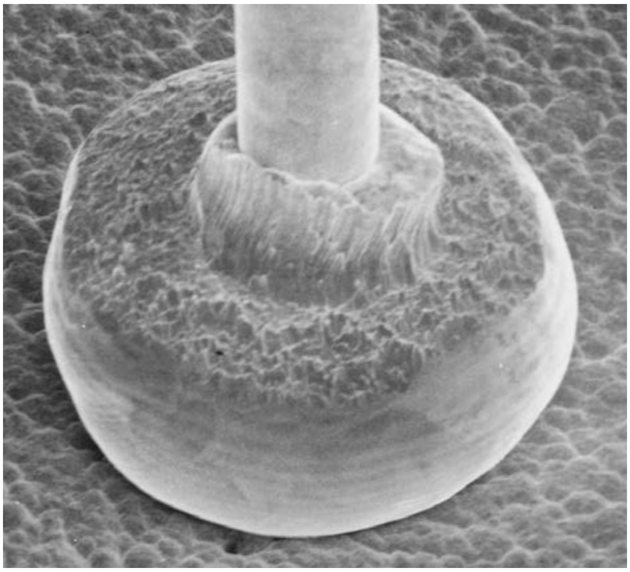


Figure 51 – Example of a ball bond made with a worn capillary. Wear can be caused by EFO damage, physical wear (high bond count), or metallization build-up inside the chamfer of the capillary.

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Bond Process Control

Stringent requirements are the norm today to be able to control ball size, bond strength and intermetallics formation as well as achieving higher throughputs.

The focus of today's semiconductor back-end assembly is on supplier capabilities to meet the tight tolerances and controls necessary to assure repeatability of product delivery. As an example of such demands, the capabilities of wire bonders have gone from the relaxed 100 -200 µm pad pitch bonding to meet the now common 50-60 µm pad pitch bonding and not too far into the future the 30-40 µm pad pitch requirements.

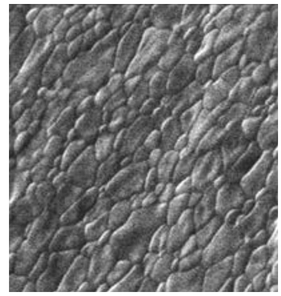
It is here where systems controls become critical; extremely accurate and repeatable hardware is necessary (X-Y tables, Optics, Z axis mechanism, etc.) as well as proper software algorithms, key to many of the proprietary features in a wire bonder. These are the features that differentiate wire bonders manufacturers because they allow the flexibility necessary to bond today's semiconductor packages and materials.

Although hardware and software are key differentiators of wire bonder capabilities there are other systems that, because of their crucial role in the quality of the finished product (wire interconnection), need to be highlighted with even higher emphasis. They are the Capillary and the Ultrasonic system.

Because of expected higher performance, the capillary design criteria has to evolve to achieve longer effective life, create smaller geometrical features, produce custom designs, implement novel ideas to address emerging new or sometimes older bond-related problems, be capable of rapid production ramp up and maintain competitive pricing.

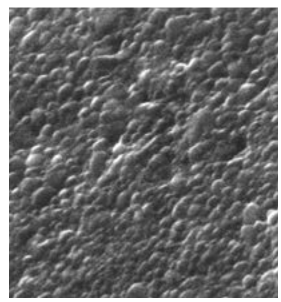
The old simple method of creating a new capillary design based on purely geometrical factors is no longer valid; new packaging materials as well as the bonding process requirements such as ball thickness, bond squash, shear strength, intermetallics formation, pull strength, and other cosmetic attributes demand a full understanding of capillary material properties. These properties not only cover the chemical but physical aspects as well with special attention to acoustical behavior of the material and of the geometrical design. Understanding why and how a particular geometrical shape will affect performance is so important to provide the solutions to many of the bonding problems found on new die or substrate materials, i.e.: copper lead frames, palladium plated lead frames, organic substrates with low glass transition temperature (Tg), etc.

As an example of the differences in ceramic material properties, see the comparison below between the four different ceramic blends. An acoustical parameter has been added to the other chemical and physical properties.



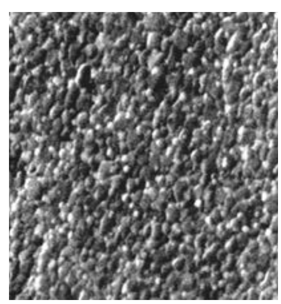
Average Grain Size = 1.3 µm
Density = 3.96 g/cm3
Bending Strength = 572 MPa
Ultrasonic Efficiency = 81.2%
Vickers Hardness = 2144 HV

Figure 52 – Standard ceramic material



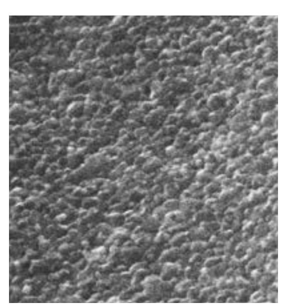
Average Grain Size = 0.5 µm
Density = 4.29 g/cm3
Bending Strength = 1013 MPa
Ultrasonic Efficiency = 85.2%
Vickers Hardness = 1716 HV

Figure 53 – CZ1 material



Average Grain Size = 0.35 µm
Density = 4.38 g/cm3
Bending Strength = 1120 MPa
Ultrasonic Efficiency = 88.8%
Vickers Hardness = 2658 HV

Figure 54 – CZ3 material



Average Grain Size = 0.4 µm
Density = 4.27 g/cm3
Bending Strength = 1046 MPa
Ultrasonic Efficiency = 84.4%
Vickers Hardness = 2000 HV

Figure 55 – CZ8 material

The chart below represents the capillary design in relationship to various packaging materials.

	Soft Surfaces	Organic Substrate or Package	Hard Surfaces	Stacked Dies	Others
	• Thick Gold • Silver	• BGA • BT resin • Glass epoxy film • Polyimide film • FBGA • MCSP • (FR-4: Glass epoxy copper clad laminate) • Paper Phenol resin • Paper epoxy resin • Glass epoxy polyimide resin	• Pd • Cu • Thin Au + Ni + Cu	• Stacked-Die • CSP • MCP • SiP	• Ceramic • Alloy 42 • Cu Alloy • Cu L/F
Face Angle	• 8° • 11°	• 8°	• 4° • 8°	• 8°	• 0° • 4° • 8° • 11°
Outside Radius	• Larger OR	• Large OR (LOR) or • Standard OR	• Large OR (LOR) or • Standard OR	• Large OR (LOR) or • Standard OR	• Standard OR
Cone Angle	• 15° • 20° • 30°	• 30° • 38°	• 20° • 30°	• 38°	• 15° • 20° • 30°
IC Angle	• 60° • 90° • 120°	• 100° • 120° • Small Ball IC (SBIC)	• Double IC	• Small Ball IC (SBIC)	• 60° • 90° • 120°
Bottleneck	• Pitch dependent	• Short	• Long	• Short	• Pitch dependent
Finish	• Any	• GM finish	• Rough Matte Finish	• Any	• Any
Material	• Standard Ceramic • CZ1 • CZ3 • CZ8	• CZ1 • CZ3 • CZ8	• CZ3 • CZ8	• CZ3	• Standard Ceramic • CZ1 • CZ3 • CZ8
Ultrasonic Matching	Excellent	Poor	Good	Bad	Good

Example Custom Part Number:

1551-18-437GM-50(4-8D-10)20D-CZ1

A. Shank Style
B. Capillary Series
C. Hole Size
D. Tool Length
E. Tip Finish
F. Tip Diameter
G. IC Dimension
H. Face Angle
I. OR Dimension
J. Optional Cone Angle
K. Optional Material

Example Standard Part Number:

1513-18-437GM-20D-CZ1

A. Shank Style
B. Capillary Series
C. Hole Size
D. Tool Length
E. Tip Finish
J. Optional Cone Angle
K. Optional Material

A. & B. Shank Style & Capillary Series:

1800 (18XX): 1/16 inch diameter shank, standard Alumina ceramic or specify optional "-CZ" series material for Zirconia Toughened Alumina ceramic, Process 1800
1500 (15XX): 1/16 inch diameter shank, standard Alumina ceramic or specify optional "-CZ" series material for Zirconia Toughened Alumina ceramic
1200 (12XX): 1/8 inch diameter shank, standard Alumina ceramic
1100 (11XX): 1/16 inch diameter shank, Tungsten Carbide material

C. Hole Size (H):

Specify Based on Wire Size
-XX = 0.00XX
-18 = 0.0018 in./46μm

D. Tool Length:

-375 = 0.375 in./9.52mm
-437 = 0.437 in./11.1mm
-470 = 0.470 in./11.94mm
-625 = 0.625 in./15.88mm
-750 = 0.750 in./19.05mm
1200 series are 0.375 in./9.52mm only (do not specify length in part number)

E. Tip Finish:

P = Polished
GM = Gaiser Matte

F. Tip Diameter (T):

-XX = 0.00XX
-50 = 0.0050 in./127μm

G. Inside Chamfer Dimension (IC):

X = 0.000X
4 = 0.0004 in./10μm

H. Face Angle:

-XD = X°
-8D = 8°

I. Outside Radius Dimension (OR):

-XX = 0.00XX
-10 = 0.0010 in./25μm

J. Optional Cone Angle:

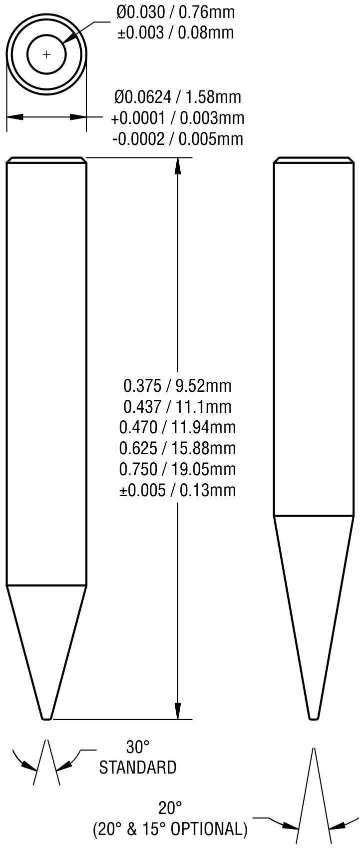
-XXD = XX°
-20D = 20°
Cone angle is 30° unless otherwise specified

K. Optional Material:

-CZ1
-CZ3
-CZ8

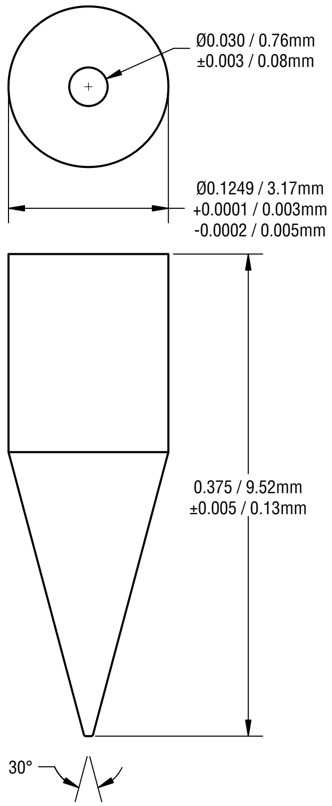
We reserve the right to change the design or specification of any catalog item without notice. Such changes will be in the interest of improving design.

Ceramic Capillaries 1/16 inch Diameter



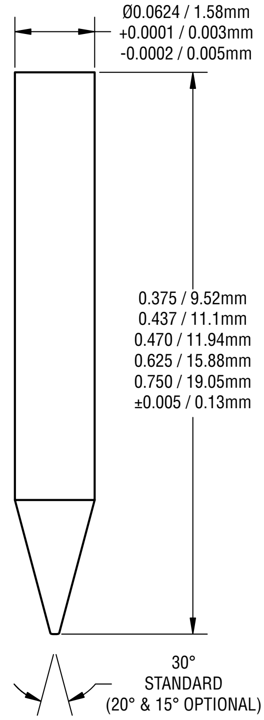
15° cone angle capillaries are available in 0.437 length and longer only - for 0.375 length tools, specify a 15° angle bottleneck

Ceramic Capillaries 1/8 inch Diameter



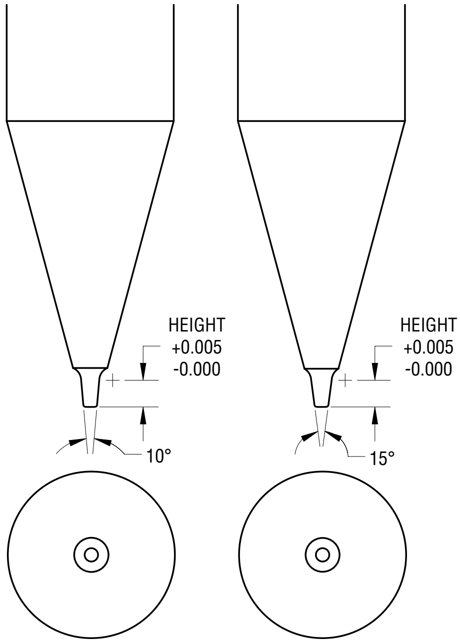
1/8 inch diameter capillaries are available at 0.375 length only

Tungsten Carbide Capillaries 1/16 inch Diameter



Tungsten Carbide capillaries longer than 0.828 may require two-piece construction and a special quotation

Non-standard lengths and tighter tolerances available at additional cost.
Non-standards lengths may alter the back hole size.
Some series are standard with tighter tolerances.
Dimensions in inches unless otherwise specified.

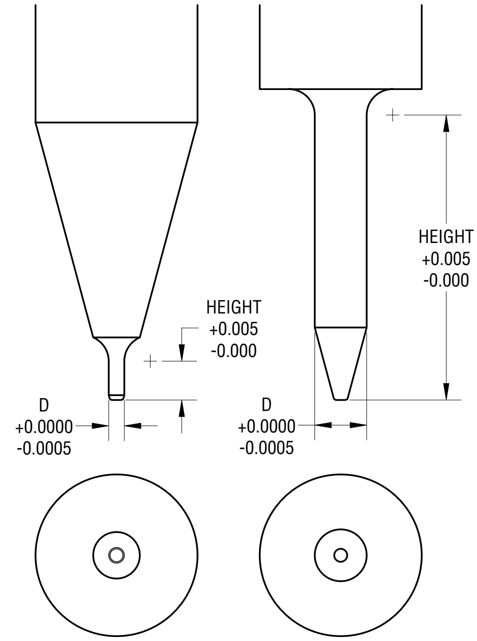


Angle Bottleneck Option

Specified in part number

-AB"Angle"x"Height"

Example: For an angle bottleneck 10°x0.012 inch high, specify "-AB10x12"
Also available in 5°, 15°, and other angles.

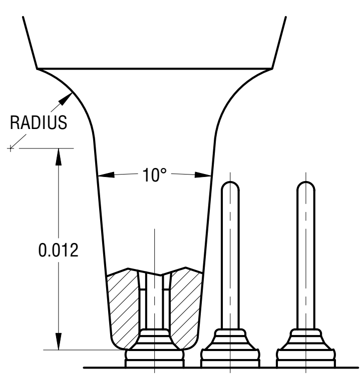


*Straight Bottleneck Option

Specified in part number

-SB"D"x"Height"

Example: For a straight bottleneck 0.009 inch diameter x 0.015 inch high, specify "-SB9x15"
"D" must be at least 0.0010 inch greater than the capillary "T" dimension.
**See bottleneck design table for design constraints.*



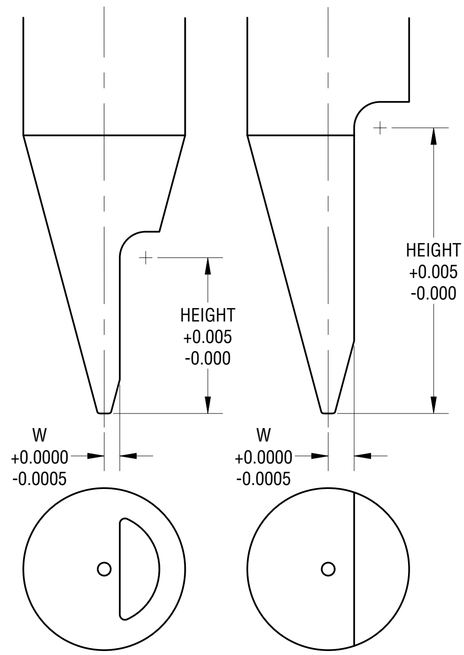
Specifying an Angle Bottleneck

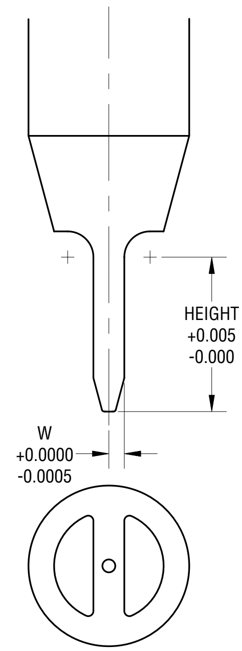
In part number:
-AB10x12

STRAIGHT BOTTLENECK DESIGN TABLE		
SB D DIMENSION in. / µm	MAXIMUM H DIMENSION 0.375 LENGTH in. / µm	MAXIMUM H DIMENSION 0.437 LENGTH in. / µm
0.005 / 127	N / A	N / A
0.006 / 152	0.007 / 178	0.007 / 178
0.007 / 178	0.010 / 254	0.010 / 254
0.008 / 203	0.015 / 381	0.015 / 381
0.009 / 229	0.020 / 508	0.020 / 508
0.010 / 254	0.025 / 635	0.025 / 635
0.011 / 279	0.032 / 813	0.032 / 813
0.012 / 305	0.038 / 965	0.038 / 965
0.013 / 330	0.044 / 1118	0.044 / 1118
0.014 / 356	0.044 / 1118	0.044 / 1118
0.015 / 381	0.044 / 1118	0.048 / 1219
0.016 / 406	0.050 / 1270	0.058 / 1473
0.020 / 508	0.072 / 1829	0.120 / 3048
0.025 / 635	0.110 / 2794	0.180 / 4572
0.030 / 762	0.180 / 4572	0.220 / 5588

*Note: The table represents the extreme minimum material conditions and combining the maximum height & minimum diameter is not recommended. If a certain height is needed, use the maximum possible diameter; if a certain bottleneck diameter is needed, use the shortest height possible.

Dimensions in inches unless otherwise specified.





Single Side Relief Option

Specified in part number

-SR"W"x"Height"

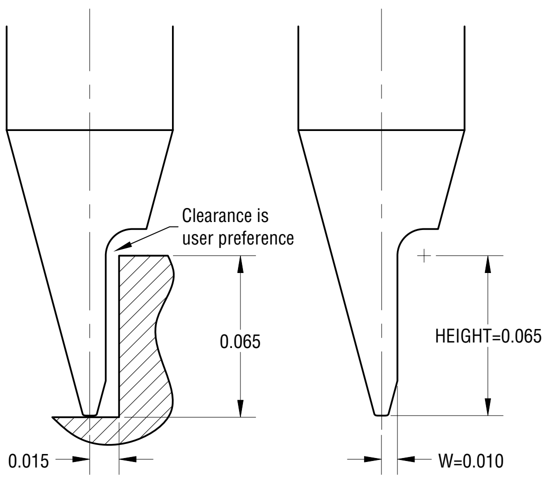
Note: Relief may cut into capillary core.

Double Side Relief Option

Specified in part number

-DR"W"x"Height"

Note: Relief may cut into capillary core.
See DR design table for design constraints.



Specifying a Side Relief

In part number:

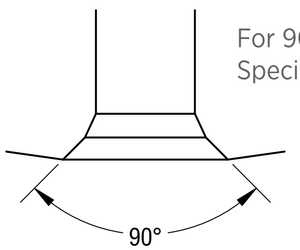
-SR10x65

DOUBLE SIDE RELIEF DESIGN TABLE		
DR OPTION W DIMENSION in. / µm	MAXIMUM H DIMENSION 0.375 LENGTH in. / µm	MAXIMUM H DIMENSION 0.437 LENGTH in. / µm
0.0025 / 64	N / A	N / A
0.0030 / 76	0.007 / 178	0.007 / 178
0.0035 / 89	0.010 / 254	0.010 / 254
0.0040 / 102	0.015 / 381	0.015 / 381
0.0045 / 114	0.020 / 508	0.020 / 508
0.0050 / 127	0.025 / 635	0.025 / 635
0.0055 / 140	0.032 / 813	0.032 / 813
0.0060 / 152	0.038 / 965	0.038 / 965
0.0065 / 165	0.044 / 1118	0.044 / 1118
0.0070 / 178	0.044 / 1118	0.044 / 1118
0.0075 / 191	0.044 / 1118	0.048 / 1219
0.0080 / 203	0.050 / 1270	0.058 / 1473
0.0100 / 254	0.072 / 1829	0.120 / 3048
0.0125 / 318	0.120 / 3048	0.190 / 4826
0.0150 / 381	0.190 / 4826	0.230 / 5842

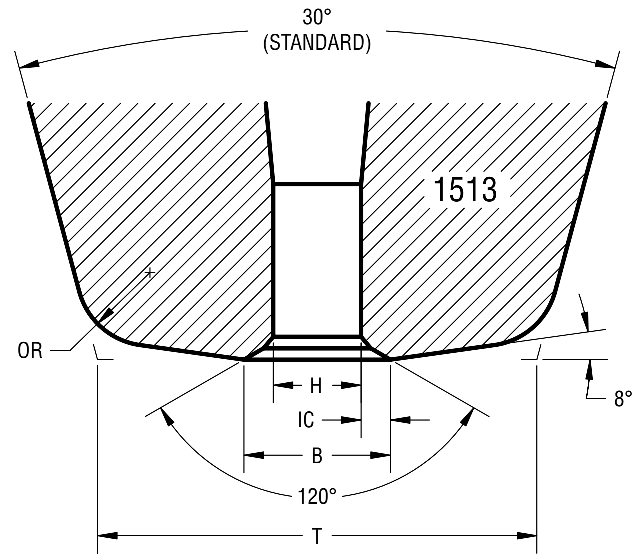
Dimensions in inches unless otherwise specified.

The 1513 series is an excellent general purpose capillary suitable for a wide range of applications on a variety of metalizations. This series employs the 120° double IC and 8° face angle architecture. The 120° IC provides maximum downward force for a strong 1st bond with high ball-shear strength and is not prone to cut-stitch on the 2nd bond. The 8° face angle is the most versatile for handling a variety of stitch-bond metalizations. Many different Hole and B and T size combinations are available in the different dash numbers of the 1513 series.

The 1513N may be specified for a 90° inside chamfer for improved 2nd bond tailing and a more compact ball bond on materials with good bondability.



For 90° IC Angle, Specify 1513N Series



Specify: Series - Dash Number - Length+Finish - Options
Example: 1513-18-437GM-20D

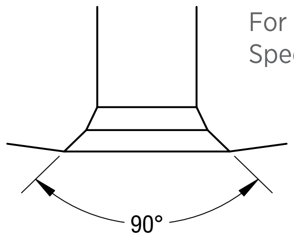
Note: For Tungsten Carbide material, specify 1113 & 1113N series (1/16 in. diameter only). For 1/8 in. diameter ceramic, specify 1213 & 1213N series.

SERIES & DASH NO.	H* in. / µm ±0.0001 / 2.5	IC in. / µm (Ref)	B in. / µm See Note**	OR in. / µm ±0.0003 / 8	T (30° CONE) in. / µm ±0.0003 / 8	T (20° CONE) in. / µm ±0.0003 / 8	SUGGESTED WIRE DIAMETER in. / µm
1513-10	0.0010 / 25	0.0007 / 18	0.0024 / 61	0.0012 / 30	0.0065 / 165	0.0067 / 170	0.0005 / 13 to 0.0008 / 20
1513-10S	0.0010 / 25	0.0004 / 10	0.0018 / 46	0.0012 / 30	0.0065 / 165	0.0067 / 170	
1513-12	0.0012 / 30	0.0006 / 15	0.0024 / 61	0.0012 / 30	0.0065 / 165	0.0067 / 170	0.0007 / 18 to 0.0009 / 23
1513-15	0.0015 / 38	0.0007 / 18	0.0029 / 74	0.0015 / 38	0.0080 / 203	0.0082 / 208	0.0009 / 23 to 0.0011 / 28
1513-17	0.0017 / 43	0.0007 / 18	0.0031 / 79	0.0015 / 38	0.0080 / 203	0.0082 / 208	0.0010 / 25 to 0.0013 / 33
1513-17M	0.0017 / 43	0.0006 / 15	0.0029 / 74	0.0015 / 38	0.0090 / 229	0.0093 / 236	
1513-18	0.0018 / 46	0.00085 / 22	0.0035 / 89	0.0015 / 38	0.0090 / 229	0.0093 / 236	
1513-18A	0.0018 / 46	0.0006 / 15	0.0030 / 76	0.0015 / 38	0.0080 / 203	0.0082 / 208	
1513-18M	0.0018 / 46	0.0006 / 15	0.0030 / 76	0.0015 / 38	0.0090 / 229	0.0093 / 236	
1513-18S	0.0018 / 46	0.0006 / 15	0.0030 / 76	0.0012 / 30	0.0065 / 165	0.0067 / 170	
1513-20A	0.0020 / 51	0.00045 / 11	0.0029 / 74	0.0015 / 38	0.0080 / 203	0.0082 / 208	0.0013 / 33 to 0.0015 / 38
1513-20B	0.0020 / 51	0.00075 / 19	0.0035 / 89	0.0015 / 38	0.0090 / 229	0.0093 / 236	
1513-20M	0.0020 / 51	0.00045 / 11	0.0029 / 74	0.0015 / 38	0.0090 / 229	0.0093 / 236	
1513-21	0.0021 / 51	0.00095 / 24	0.0040 / 102	0.0020 / 51	0.0100 / 254	0.0103 / 262	
1513-22	0.0022 / 56	0.0009 / 23	0.0040 / 102	0.0020 / 51	0.0100 / 254	0.0103 / 262	
1513-22A	0.0022 / 56	0.00065 / 17	0.0035 / 89	0.0015 / 38	0.0090 / 229	0.0093 / 236	
1513-22M	0.0022 / 56	0.0004 / 10	0.0030 / 76	0.0015 / 38	0.0090 / 229	0.0093 / 236	
1513-25	0.0025 / 64	0.00075 / 19	0.0040 / 102	0.0020 / 51	0.0100 / 254	0.0103 / 262	0.0015 / 38 to 0.0020 / 51
1513-27	0.0027 / 69	0.00115 / 29	0.0050 / 127	0.0025 / 64	0.0120 / 305	0.0124 / 315	0.0020 / 51
1513-33	0.0033 / 84	0.0011 / 28	0.0055 / 140	0.0030 / 76	0.0140 / 356	0.0145 / 368	0.0020 / 51 to 0.0025 / 64
1513-40	0.0040 / 102	0.0010 / 25	0.0060 / 152	0.0030 / 76	0.0160 / 406	0.0165 / 419	0.0030 / 76

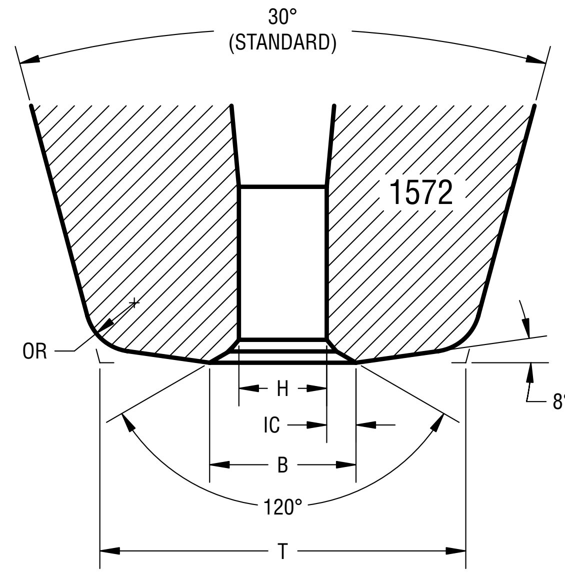
* For hole sizes 0.0025 through 0.0049, the tolerance is +0.0002/-0.0001. For hole sizes greater than 0.0049, the tolerance is +0.0003/-0.0002. Tighter tolerance available at additional charges.
** If IC < 0.0005 and/or T < 0.0050, the B tolerance is +/-0.0001, otherwise B tolerance is +/-0.0002 (if B > 0.0040, B tolerance is +0.0003/-0.0002). Dimensions in inches unless otherwise specified.

The 1572 series is an excellent general purpose capillary suitable for a wide range of applications on a variety of metalizations. This series employs the 120° double IC and 8° face angle architecture. The 120° IC provides maximum downward force for a strong 1st bond with high ball-shear strength and is not prone to cut-stitch on the 2nd bond. The 8° face angle is the most versatile for handling a variety of stitch-bond metalizations. Many different Hole and B and T size combinations are available in the different dash numbers of the 1572 series. In general, the 1572 series will have smaller feature sizes for a given dash number.

The 1572N may be specified for a 90° inside chamfer for improved 2nd bond tailing and a more compact ball bond on materials with good bondability.



For 90° IC Angle,
Specify 1572N Series



Specify: Series - Dash Number - Length + Finish - Options

Example: 1572-18-437GM

Note: For Tungsten Carbide material, specify 1172 & 1172N series (1/16 in. diameter only). For 1/8 in. diameter ceramic, specify 1272 & 1272N series.

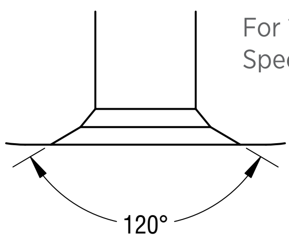
SERIES & DASH NO.	H* in. / µm ±0.0001 / 2.5	IC in. / µm (Ref)	B in. / µm See Note**	OR in. / µm ±0.0003 / 8	T (30° CONE) in. / µm ±0.0003 / 8	T (20° CONE) in. / µm ±0.0003 / 8	SUGGESTED WIRE DIAMETER in. / µm
1572-10	0.0010 / 25	0.0007 / 18	0.0024 / 61	0.0008 / 20	0.0055 / 140	0.0056 / 142	0.0005 / 13 to 0.0008 / 20
1572-10S	0.0010 / 25	0.0004 / 10	0.0018 / 46	0.0008 / 20	0.0055 / 140	0.0056 / 142	
1572-12	0.0012 / 30	0.0006 / 15	0.0024 / 61	0.0008 / 20	0.0055 / 140	0.0056 / 142	0.0007 / 18 to 0.0009 / 23
1572-13	0.0013 / 33	0.0006 / 15	0.0025 / 64	0.0008 / 20	0.0055 / 140	0.0056 / 142	0.0008 / 20 to 0.0010 / 25
1572-13S	0.0013 / 33	0.0004 / 10	0.0021 / 53	0.0008 / 20	0.0055 / 140	0.0056 / 142	
1572-15	0.0015 / 38	0.0007 / 18	0.0029 / 74	0.0010 / 25	0.0065 / 165	0.0067 / 170	0.0009 / 23 to 0.0011 / 28
1572-15S	0.0015 / 38	0.0006 / 15	0.0027 / 69	0.0008 / 20	0.0055 / 140	0.0056 / 142	
1572-17	0.0017 / 43	0.0006 / 15	0.0029 / 74	0.0010 / 25	0.0090 / 229	0.0092 / 234	0.0010 / 25 to 0.0013 / 33
1572-17S	0.0017 / 43	0.0006 / 15	0.0029 / 74	0.0010 / 25	0.0065 / 165	0.0067 / 170	
1572-18	0.0018 / 46	0.0006 / 15	0.0030 / 76	0.0010 / 25	0.0090 / 229	0.0092 / 234	
1572-20	0.0020 / 51	0.0010 / 25	0.0040 / 102	0.0015 / 38	0.0090 / 229	0.0093 / 236	0.0013 / 33 to 0.0015 / 38
1572-22	0.0022 / 56	0.0009 / 23	0.0040 / 102	0.0015 / 38	0.0090 / 229	0.0093 / 236	
1572-25	0.0025 / 64	0.0013 / 33	0.0051 / 130	0.0020 / 51	0.0115 / 292	0.0118 / 300	0.0015 / 38 to 0.0020 / 51
1572-30	0.0030 / 76	0.0013 / 33	0.0056 / 142	0.0025 / 64	0.0130 / 330	0.0134 / 340	0.0020 / 51
1572-35	0.0035 / 89	0.0010 / 25	0.0055 / 140	0.0030 / 76	0.0140 / 356	0.0145 / 368	0.0020 / 51 to 0.0025 / 64
1572-40	0.0040 / 102	0.0010 / 25	0.0060 / 152	0.0030 / 76	0.0140 / 356	0.0145 / 368	0.0030 / 76
1572-50	0.0050 / 127	0.0013 / 33	0.0076 / 193	0.0030 / 76	0.0160 / 406	0.0165 / 419	0.0040 / 102
1572-70	0.0070 / 178	0.0015 / 38	0.0100 / 254	0.0050 / 127	0.0280 / 711	0.0288 / 732	0.0050 / 127
1572-100	0.0100 / 254	0.0020 / 51	0.0140 / 356	0.0070 / 178	0.0380 / 965	0.0391 / 993	0.0060 / 152

* For hole sizes 0.0025 through 0.0049, the tolerance is +0.0002/-0.0001. For hole sizes greater than 0.0049, the tolerance is +0.0003/-0.0002. Tighter tolerance available at additional charges.

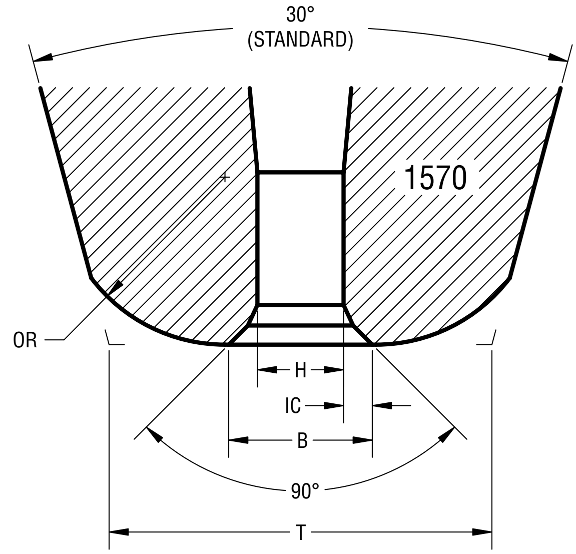
** If IC < 0.0005 and/or T < 0.0050, the B tolerance is +/-0.0001, otherwise B tolerance is +/-0.0002 (if B > 0.0040, B tolerance is +0.0003/-0.0002). Dimensions in inches unless otherwise specified.

The 1570 series features a very large value outside radius (OR) and 90° double IC architecture. The oversize OR performs well with uneven metalizations or in applications where the 2nd bond or stitch-bond surface has problems with flatness or planarity. The 90° IC allows for a taller, more compact ball bond. An optional 120° IC may be specified for increased downward force on the ball bond.

The 1570N may be specified for a 120° inside chamfer for applications with poor 1st bond bondability.



For 120° IC Angle, Specify 1570N Series



Specify: Series - Dash Number - Length+Finish - Options
Example: 1570-18-437GM-20D

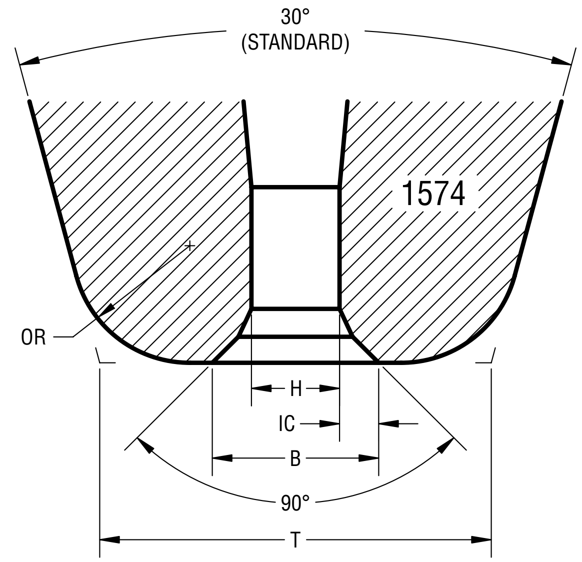
Note: For Tungsten Carbide material, specify 1170 & 1170N series (1/16 in. diameter only). For 1/8 in. diameter ceramic, specify 1270 & 1270N series.

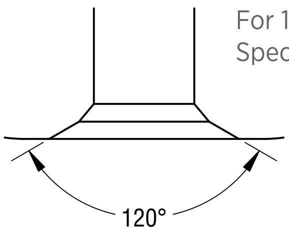
SERIES & DASH NO.	H* in. / µm ±0.0001 / 2.5	IC in. / µm (Ref)	B in. / µm See Note**	OR*** in. / µm ±0.0003 / 8	T (30° CONE) in. / µm ±0.0003 / 8	T (20° CONE) in. / µm ±0.0003 / 8	SUGGESTED WIRE DIAMETER in. / µm
1570-10	0.0010 / 25	0.0003 / 8	0.0016 / 41	0.0020 / 51	0.0050 / 127	0.0051 / 130	0.0005 / 13 to 0.0008 / 20
1570-12	0.0012 / 30	0.0003 / 8	0.0018 / 46	0.0020 / 51	0.0050 / 127	0.0051 / 130	0.0007 / 18 to 0.0009 / 23
1570-13	0.0013 / 33	0.0004 / 10	0.0021 / 53	0.0025 / 64	0.0060 / 152	0.0062 / 157	0.0008 / 20 to 0.0010 / 25
1570-15	0.0015 / 38	0.0005 / 13	0.0025 / 64	0.0030 / 76	0.0070 / 178	0.0072 / 183	0.0009 / 23 to 0.0011 / 28
1570-17	0.0017 / 43	0.0006 / 15	0.0029 / 74	0.0035 / 89	0.0080 / 203	0.0083 / 211	0.0010 / 25 to 0.0013 / 33
1570-18	0.0018 / 46	0.0006 / 15	0.0030 / 76	0.0035 / 89	0.0080 / 203	0.0083 / 211	
1570-20	0.0020 / 51	0.0007 / 18	0.0034 / 86	0.0040 / 102	0.0090 / 229	0.0093 / 236	0.0013 / 33 to 0.0015 / 38
1570-22	0.0022 / 56	0.0007 / 18	0.0036 / 91	0.0040 / 102	0.0090 / 229	0.0093 / 236	
1570-25	0.0025 / 64	0.0008 / 20	0.0041 / 104	0.0050 / 127	0.0115 / 292	0.0119 / 302	0.0015 / 38 to 0.0020 / 51
1570-30	0.0030 / 76	0.0009 / 23	0.0048 / 122	0.0060 / 152	0.0140 / 356	0.0144 / 366	0.0020 / 51
1570-35	0.0035 / 89	0.0011 / 28	0.0057 / 145	0.0070 / 178	0.0165 / 419	0.0170 / 432	
1570-40	0.0040 / 102	0.0013 / 33	0.0066 / 168	0.0080 / 203	0.0190 / 483	0.0196 / 498	0.0030 / 76
1570-45	0.0045 / 114	0.0014 / 36	0.0073 / 185	0.0090 / 229	0.0211 / 536	0.0218 / 554	
1570-50	0.0050 / 127	0.0015 / 38	0.0080 / 203	0.0100 / 254	0.0240 / 610	0.0247 / 627	0.0040 / 102
1570-60	0.0060 / 152	0.0018 / 46	0.0096 / 244	0.0120 / 305	0.0290 / 737	0.0299 / 759	0.0050 / 127
1570-70	0.0070 / 178	0.0021 / 53	0.0112 / 284	0.0140 / 356	0.0350 / 889	0.0360 / 914	

* For hole sizes 0.0025 through 0.0049, the tolerance is +0.0002/-0.0001. For hole sizes greater than 0.0049, the tolerance is +0.0003/-0.0002.
** If IC < 0.0005 and/or T < 0.0050, the B tolerance is +/-0.0001, otherwise B tolerance is +/-0.0002 (if B > 0.0040, B tolerance is +0.0003/-0.0002).
***OR tolerance ±0.0003 for OR less than or equal to 0.0030; for OR greater than 0.0030, tolerance is ±10%.
Tighter tolerance available at additional charges.
Dimensions in inches unless otherwise specified.

The 1574 series utilizes a flat-face design combined with 90° double IC architecture. This series can be configured for making relatively smaller ball bonds by specifying the dash numbers with the smaller IC sizes and adjusting the free-air ball accordingly. This series is designed for applications with good overall bondability, equivalent to the old 40470 series.

The 1574N may be specified for a 120° inside chamfer for surfaces with poor 1st bond bondability.





For 120° IC Angle, Specify 1574N Series

Specify: Series - Dash Number - Length+Finish - Options
Example: 1574-18-437GM-20D

Note: For Tungsten Carbide material, specify 1174 & 1174N series (1/16 in. diameter only). For 1/8 in. diameter ceramic, specify 1274 & 1274N series.

SERIES & DASH NO.	H* in. / µm ±0.0001 / 2.5	IC in. / µm (Ref)	B in. / µm See Note**	OR*** in. / µm ±0.0003/8	T (30° CONE) in. / µm ±0.0003 / 8	T (20° CONE) in. / µm ±0.0003 / 8	SUGGESTED WIRE DIAMETER in. / µm
1574-10	0.0010 / 25	0.0002 / 5	0.0014 / 36	0.0025 / 64	0.0065 / 165	0.0068 / 174	0.0005 / 13 to 0.0008 / 20
1574-12	0.0012 / 30	0.0002 / 5	0.0016 / 41	0.0025 / 64	0.0065 / 165	0.0068 / 174	0.0007 / 18 to 0.0009 / 23
1574-13	0.0013 / 33	0.0003 / 8	0.0019 / 48	0.0025 / 64	0.0065 / 165	0.0068 / 174	0.0008 / 20 to 0.0010 / 25
1574-15S	0.0015 / 38	0.0003 / 8	0.0021 / 53	0.0035 / 89	0.0080 / 203	0.0085 / 216	0.0009 / 23 to 0.0011 / 28
1574-17	0.0017 / 43	0.0007 / 18	0.0031 / 79	0.0024 / 61	0.0080 / 203	0.0083 / 211	0.0010 / 25 to .00013 / 33
1574-17S	0.0017 / 43	0.0002 / 5	0.0021 / 53	0.0035 / 89	0.0080 /203	0.0085 / 216	
1574-18	0.0018 / 46	0.0008 / 20	0.0034 / 86	0.0024 / 61	0.0080 / 203	0.0083 / 211	
1574-18M	0.0018 / 46	0.00055 / 14	0.0029 / 74	0.0024 / 61	0.0080 / 203	0.0083 / 211	
1574-18S	0.0018 / 46	0.0002 / 5	0.0022 / 56	0.0035 / 89	0.0080 / 203	0.0085 / 216	
1574-20	0.0020 / 51	0.0007 / 18	0.0034 / 86	0.0024 / 61	0.0080 / 203	0.0083 / 211	0.0013 / 33 to 0.0015 / 38
1574-20M	0.0020 / 51	0.00045 / 11	0.0029 / 74	0.0024 / 61	0.0080 / 203	0.0083 / 211	
1574-22	0.0022 / 56	0.0006 / 15	0.0034 / 86	0.0024 / 61	0.0080 / 203	0.0083 / 211	
1574-22M	0.0022 / 56	0.00035 / 9	0.0029 / 74	0.0024 / 61	0.0080 / 203	0.0083 / 211	
1574-25	0.0025 / 64	0.0005 / 13	0.0035 / 89	0.0024 / 61	0.0080 / 203	0.0083 / 211	0.0015 / 38 to 0.0020 / 51
1574-30	0.0030 / 76	0.0010 / 25	0.0050 / 127	0.0055 / 140	0.0165 / 419	0.0172 / 437	0.0020 / 51
1574-35	0.0035 / 89	0.0008 / 20	0.0051 / 130	0.0065 / 165	0.0165 / 419	0.0174 / 442	0.0020 / 51 to 0.0025 / 64
1574-35S	0.0035 / 89	0.0008 / 20	0.0051 / 130	0.0055 / 140	0.0165 / 419	0.0172 / 437	
1574-40	0.0040 / 102	0.0010 / 25	0.0060 / 152	0.0065 / 165	0.0165 / 419	0.0174 / 442	0.0030 / 76
1574-50	0.0050 / 127	0.0012 / 30	0.0074 / 188	0.0070 / 178	0.0190 / 483	0.0200 / 508	0.0040 / 102

* For hole sizes 0.0025 through 0.0049, the tolerance is +0.0002/-0.0001. For hole sizes greater than 0.0049, the tolerance is +0.0003/-0.0002.
** If IC < 0.0005 and/or T < 0.0050, the B tolerance is +/-0.0001, otherwise B tolerance is +/-0.0002 (if B > 0.0040, B tolerance is +0.0003/-0.0002).
***OR tolerance ±0.0003 for OR less than or equal to 0.0030; for OR greater than 0.0030, tolerance is ±10%.
Tighter tolerance available at additional charges. Dimensions in inches unless otherwise specified.

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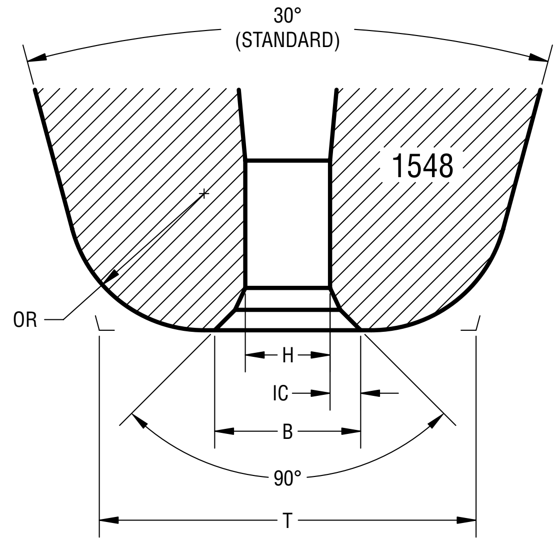
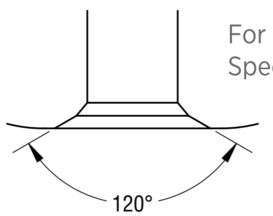
www.gaisertool.com

The 1548 series utilizes a flat-face design combined with 90° double IC architecture. This series is the equivalent to the old 41480 series and is suitable for applications with good bondability. An optional 120° IC may be specified for increased downward force on the ball bond.

The 1548N may be specified for a 120° inside chamfer for applications with poor 1st bond bondability.





For 120° IC Angle, Specify 1548N Series

Specify: Series - Dash Number - Length+Finish - Options
Example: 1548-18-437P

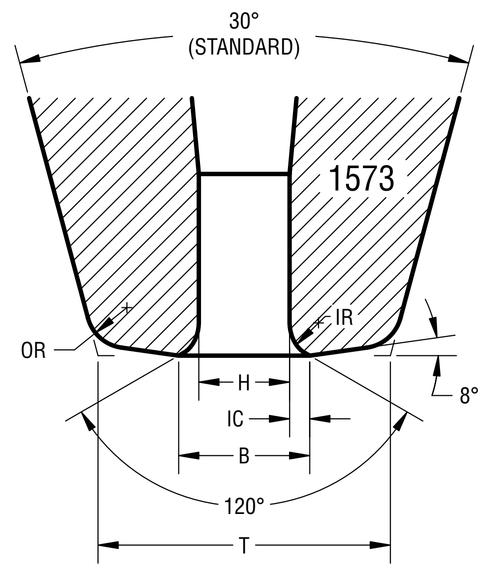
Note: For Tungsten Carbide material, specify 1148 & 1148N series (1/16 in. diameter only). For 1/8 in. diameter ceramic, specify 1248 & 1248N series.

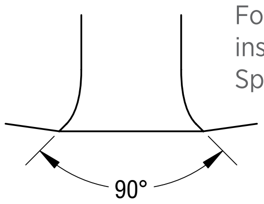
SERIES & DASH NO.	H* in. / µm ±0.0001 / 2.5	IC in. / µm (Ref)	B in. / µm See Note**	OR*** in. / µm ±0.0003 / 8	T (30° CONE) in. / µm ±0.0003 / 8	T (20° CONE) in. / µm ±0.0003 / 8	SUGGESTED WIRE DIAMETER in. / µm
1548-10	0.0010 / 25	0.0004 / 10	0.0018 / 46	0.0018 / 46	0.0050 / 127	0.0052 / 132	0.0005 / 13 to 0.0008 / 20
1548-12	0.0012 / 30	0.00035 / 9	0.0019 / 48	0.0018 / 46	0.0050 / 127	0.0052 / 132	0.0007 / 18 to 0.0009 / 23
1548-13	0.0013 / 33	0.0004 / 10	0.0021 / 53	0.0021 / 53	0.0060 / 152	0.0063 / 160	0.0008 / 20 to 0.0010 / 25
1548-15	0.0015 / 38	0.0005 / 13	0.0025 / 64	0.0025 / 64	0.0070 / 178	0.0073 / 185	0.0009 / 23 to 0.0011 / 28
1548-17	0.0017 / 43	0.0006 / 15	0.0029 / 74	0.0029 / 74	0.0080 / 203	0.0084 / 213	0.0010 / 25 to 0.0013 / 33
1548-18	0.0018 / 46	0.00065 / 17	0.0031 / 79	0.0029 / 74	0.0080 / 203	0.0084 / 213	
1548-20	0.0020 / 51	0.0007 / 18	0.0034 / 86	0.0032 / 81	0.0090 / 229	0.0094 / 239	0.0013 / 33 to 0.0015 / 38
1548-22	0.0022 / 56	0.0007 / 18	0.0036 / 91	0.0032 / 81	0.0090 / 229	0.0094 / 239	
1548-30	0.0030 / 76	0.0009 / 23	0.0048 / 122	0.0048 / 122	0.0140 / 356	0.0147 / 373	0.0020 / 51
1548-35	0.0035 / 89	0.0009 / 23	0.0053 / 135	0.0065 / 165	0.0165 / 419	0.0174 / 442	0.0020 / 51 to 0.0025 / 64
1548-40	0.0040 / 102	0.00125 / 32	0.0065 / 165	0.0065 / 165	0.0185 / 470	0.0194 / 493	0.0030 / 76

* For hole sizes 0.0025 through 0.0049, the tolerance is +0.0002/-0.0001. For hole sizes greater than 0.0049, the tolerance is +0.0003/-0.0002.
** If IC < 0.0005 and/or T < 0.0050, the B tolerance is +/-0.0001, otherwise B tolerance is +/-0.0002 (if B > 0.0040, B tolerance is +0.0003/-0.0002).
***OR tolerance ±0.0003 for OR less than or equal to 0.0030; for OR greater than 0.0030, tolerance is ±10%.
Tighter tolerance available at additional charges. Dimensions in inches unless otherwise specified.

The 1573 series is the original "fine-pitch", small-T capillary, designed before the 100µm barrier had been broken and before the angle bottleneck feature became commonplace for fine-pitch bonds. This series is typically equipped with a 15° or 20° cone and is designed for pitches above 100µm. The IC size is configured for making a small ball bond as well as having a radiused inside chamfer design for good looping characteristics in an automatic bonder. For bond pad pitches below 100um, refer to the fine pitch section of the catalog.

The 1573N may be specified for a 90° radiused inside chamfer for a more compact ball bond on materials with good bondability.





For 90° radiused inside chamfer, Specify 1573N Series

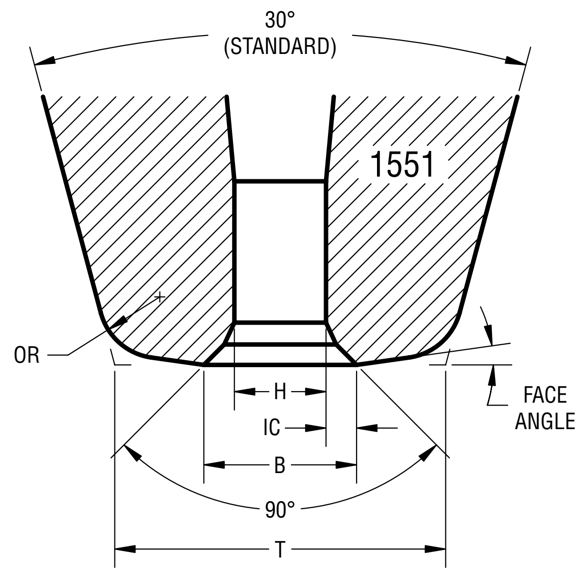
Specify: Series - Dash Number - Length+Finish - Options
Example: 1573-18-437GM-20D

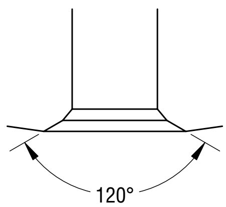
Note: For Tungsten Carbide material, specify 1173 & 1173N series (1/16 in. diameter only). For 1/8 in. diameter ceramic, specify 1273 & 1273N series.

SERIES & DASH NO.	H* in. / µm ±0.0001 / 2.5	IR in. / µm (Ref)	B in. / µm See Note**	OR*** in. / µm ±0.0003 / 8	T (30° CONE) in. / µm ±0.0003 / 8	T (20° CONE) in. / µm ±0.0003 / 8	SUGGESTED WIRE DIAMETER in. / µm
1573-11	0.0011 / 28	0.0004 / 10	0.0019 / 48	0.0008 / 20	0.0054 / 137	0.0055 / 140	0.0005 / 13 to 0.0008 / 20
1573-12	0.0012 / 30	0.0004 / 10	0.0020 / 51	0.0008 / 20	0.0054 / 137	0.0055 / 140	0.0007 / 18 to 0.0009 / 23
1573-13	0.0013 / 33	0.0004 / 10	0.0021 / 53	0.0008 / 20	0.0054 / 137	0.0055 / 140	0.0008 / 20 to 0.0010 / 25
1573-14	0.0014 / 36	0.0004 / 10	0.0022 / 56	0.0008 / 20	0.0054 / 137	0.0055 / 140	
1573-15	0.0015 / 38	0.0004 / 10	0.0023 / 58	0.0008 / 20	0.0054 / 137	0.0055 / 140	0.0009 / 23 to 0.0011 / 28
1573-17	0.0017 / 43	0.0004 / 10	0.0025 / 64	0.0008 / 20	0.0058 / 147	0.0059 / 150	0.0010 / 25 to 0.0013 / 33
1573-18	0.0018 / 46	0.0004 / 10	0.0026 / 66	0.0008 / 20	0.0058 / 147	0.0059 / 150	
1573-19	0.0019 / 48	0.0006 / 15	0.0031 / 79	0.0010 / 25	0.0063 / 160	0.0065 / 165	0.0011 / 28 to 0.0013 / 33
1573-21	0.0021 / 53	0.0006 / 15	0.0033 / 83	0.0010 / 25	0.0063 / 160	0.0065 / 165	0.0013 / 33 to 0.0015 / 38
1573-22	0.0022 / 56	0.0006 / 15	0.0034 / 86	0.0010 / 25	0.0063 / 160	0.0065 / 165	

* For hole sizes 0.0025 through 0.0049, the tolerance is +0.0002/-0.0001. For hole sizes greater than 0.0049, the tolerance is +0.0003/-0.0002.
** If IC < 0.0005 and/or T < 0.0050, the B tolerance is +/-0.0001, otherwise B tolerance is +/-0.0002 (if B > 0.0040, B tolerance is +0.0003/-0.0002).
***OR tolerance ±0.0003 for OR less than or equal to 0.0030; for OR greater than 0.0030, tolerance is ±10%.
Tighter tolerance available at additional charges. Dimensions in inches unless otherwise specified.

The 1551 series allows the user to specify all dimensions of the capillary within the part number and should be used when an existing catalog series will not meet the requirements of an application. This series comes standard with a 90° double inside chamfer, but may be specified with a 120° or other chamfer angles.



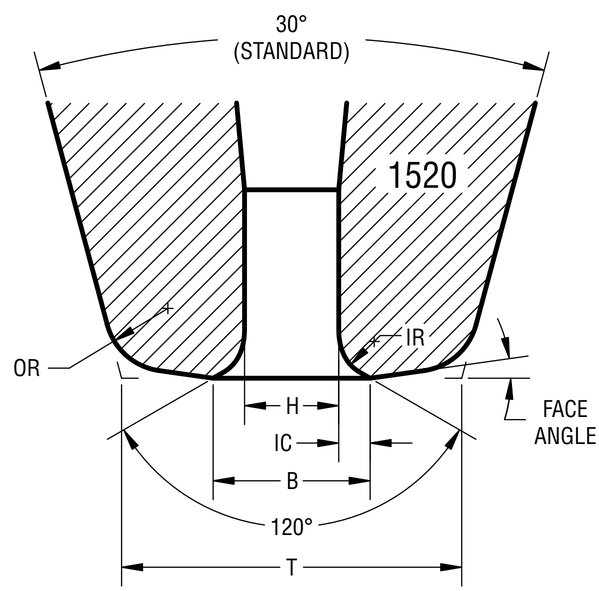


For 120° IC angle, specify "x120D" in part number. Other angle options also apply.

For single IC angle, specify as 1553 series. Standard angle is 90° unless otherwise specified.

Example:
1551-15-437GM-60(3x120D-8D-10)
1551-18-437GM-80(3x70D-8D-15)
1553-17-375GM-55(4x100D-4D-12)

The 1520 series also allows the user to specify all dimensions of the capillary but is designed with a standard 120° full radiused inside chamfer. This design is optimized for use in high-speed, automated bonders and provides improved looping and wire control. The 1520 series helps to reduce sagging and wavy-wire problems making the 1520 ideal for long-loop and low-loop bonding.

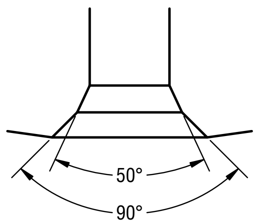
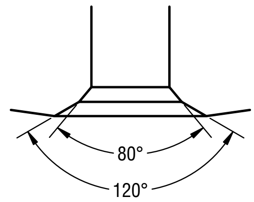
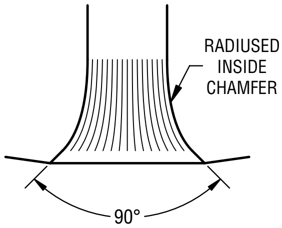
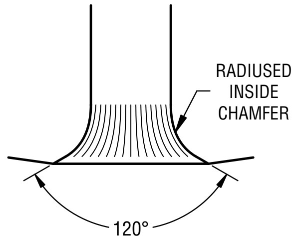
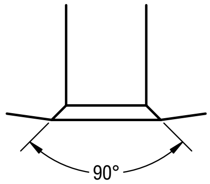
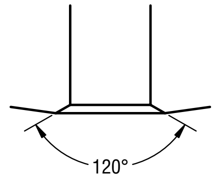
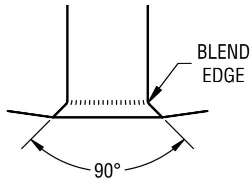
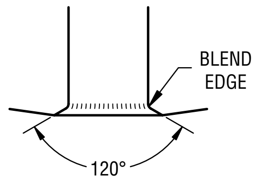


For smaller IC sizes, consider the 1553 and 1554 single IC series.

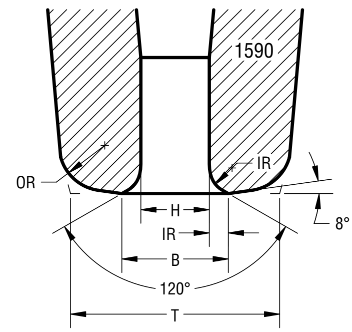
Specify:
Series - H - Length+Finish - T(IC - Face Angle - OR) Options

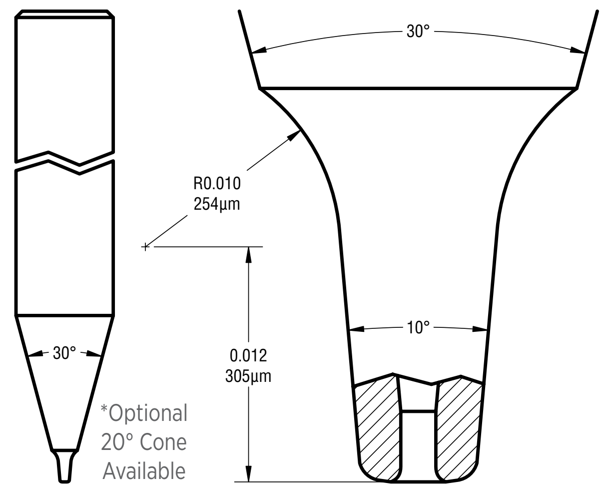
Example:
1551-18-437GM-60(3-8D-10)20D
1520-18-437GM-60(3-8D-10)
1551-18-437GM-60(3-F-10)20D-AB10x12-BLIC

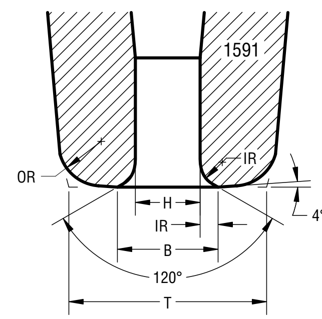
Note: A flat face 1551 or 1520 may be specified by a "-F" or by the actual numerical value in the part number.
A mathematical relationship exists between the various dimensions at the capillary tip. When designing a part number or when simply changing the cone angle, you may wish to contact a Gaiser Sales Engineer.
If a radiused inside chamfer is desired in a 90° IC 1551, specify "-BLIC" at the end of the part number.
If a radiused inside chamfer is desired in a 120° IC 1551, use the 1520 series.
For the 1553 series, a radiused inside chamfer is not available.

SERIES	90° ARCHITECTURE	120° ARCHITECTURE	DEFINITIONS
1551 Double IC Architecture	90°/50° Standard 	120°/80° and other IC angles optional 	1551 Series utilizes the Gaiser Double IC architecture. 90°/50° Double IC is standard unless otherwise specified.
1551 With BLIC (Blended Inside Chamfer)	1551 with BLIC 90° unless otherwise specified 	N/A (see 1520)	BLIC adds a Radiused/Blended Inside Chamfer to 90° Double IC and other 1551 capillaries. For 120° BLIC, use 1520 Series.
1520 Full Radius Series (120° Blended Inside Chamfer)	N/A (see 1551 with BLIC)	120° Double IC architecture with BLIC 	1520 Series utilizes the 120° Gaiser Double IC architecture with Radiused/Blended Inside Chamfer. For angle other than 120°, use BLIC.
1553 Single IC Architecture			1553 Series utilizes the basic Single IC angle design. Consider specifying when IC size is too small for Double IC.
1554 Single IC Architecture with Blend Edge			1554 Series is the same as the 1553 Single IC Series except that a very tiny edge break is applied to the transition from IC angle to the Hole.

The 1590 and 1591 series are designed for pitches of 100µm and above. The angle bottleneck design provides clearance for adjacent loops and the IC is configured for making a small ball bond. The 1590 and 1591 series utilize 120° full radius architecture for maximum downward force on the ball bond for the highest ball shear and for good looping. For a taller more compact ball bond, the 1592 & 1593 series utilize 90° radiused inside chamfer architecture. Both 8° and 4° face angles are available.







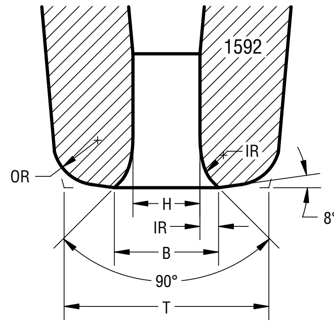
Specify: Series - Dash Number - Length+Finish - Options
Example: 1590-18E-437GM-20D

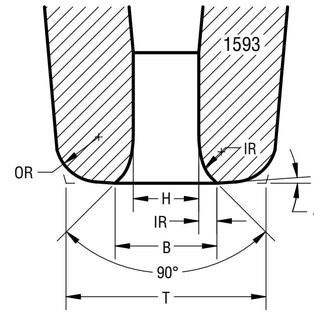
Note: A 10° by 0.012 in. (305µm) high angle bottleneck is standard in the 1590/1591 series. Other angle bottleneck configurations may be specified at the end of the part number.

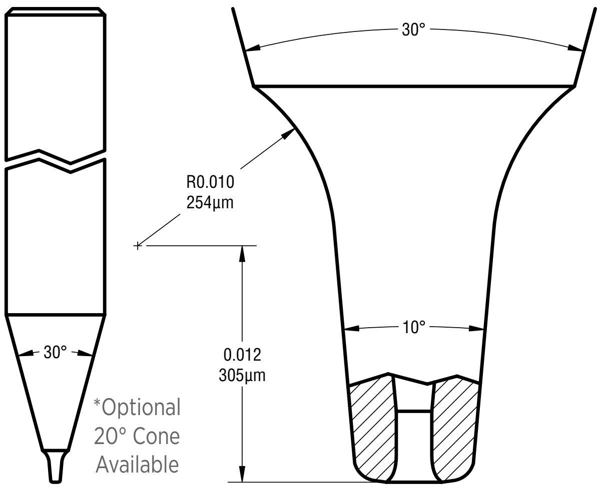
SERIES & DASH NO.	H* in. / µm ±0.0001 / 2.5	IR in. / µm (Ref)	B in. / µm See Note**	OR in. / µm ±0.0003 / 8	T (30° CONE) in. / µm ±0.0003 / 8	T (10° ABTNK) in. / µm ±0.0003 / 8	SUGGESTED WIRE DIAMETER in. / µm
159X-15C	0.0015 / 38	0.0004 / 10	0.0023 / 58	0.0012 / 30	0.0050 / 127	0.0054 / 137	
159X-15D	0.0015 / 38	0.0004 / 10	0.0023 / 58	0.0012 / 30	0.0055 / 140	0.0059 / 150	
159X-15E	0.0015 / 38	0.0005 / 13	0.0025 / 64	0.0015 / 38	0.0060 / 152	0.0065 / 165	0.0009 / 23 to 0.0011 / 28
159X-15F	0.0015 / 38	0.0005 / 13	0.0025 / 64	0.0015 / 38	0.0065 / 165	0.0070 / 178	
159X-15G	0.0015 / 38	0.0005 / 13	0.0025 / 64	0.0015 / 38	0.0070 / 178	0.0075 / 191	
159X-17C	0.0017 / 43	0.0004 / 10	0.0025 / 64	0.0012 / 30	0.0050 / 127	0.0054 / 137	
159X-17D	0.0017 / 43	0.0004 / 10	0.0025 / 64	0.0012 / 30	0.0055 / 140	0.0059 / 150	
159X-17E	0.0017 / 43	0.0005 / 13	0.0027 / 69	0.0015 / 38	0.0060 / 152	0.0065 / 165	
159X-17F	0.0017 / 43	0.0005 / 13	0.0027 / 69	0.0015 / 38	0.0065 / 165	0.0070 / 178	
159X-17G	0.0017 / 43	0.0005 / 13	0.0027 / 69	0.0015 / 38	0.0070 / 178	0.0075 / 191	
159X-17H	0.0017 / 43	0.0005 / 13	0.0027 / 69	0.0015 / 38	0.0075 / 191	0.0080 / 203	
159X-17J	0.0017 / 43	0.0005 / 13	0.0027 / 69	0.0015 / 38	0.0080 / 203	0.0085 / 216	0.0010 / 25 to 0.0013 / 33
159X-18D	0.0018 / 46	0.0005 / 13	0.0028 / 71	0.0012 / 30	0.0055 / 140	0.0059 / 150	
159X-18E	0.0018 / 46	0.0005 / 13	0.0028 / 71	0.0015 / 38	0.0060 / 152	0.0065 / 165	
159X-18F	0.0018 / 46	0.0005 / 13	0.0028 / 71	0.0015 / 38	0.0065 / 165	0.0070 / 178	
159X-18G	0.0018 / 46	0.0006 / 15	0.0030 / 76	0.0015 / 38	0.0070 / 178	0.0075 / 191	
159X-18H	0.0018 / 46	0.0006 / 15	0.0030 / 76	0.0015 / 38	0.0075 / 191	0.0080 / 203	
159X-18J	0.0018 / 46	0.0006 / 15	0.0030 / 76	0.0015 / 38	0.0080 / 203	0.0085 / 216	

* For hole sizes 0.0025 through 0.0049, the tolerance is +0.0002/-0.0001. For hole sizes greater than 0.0049, the tolerance is +0.0003/-0.0002. Tighter tolerance available at additional charges.
** If IC < 0.0005 and/or T < 0.0050, the B tolerance is +/-0.0001, otherwise B tolerance is +/-0.0002 (if B > 0.0040, B tolerance is +0.0003/-0.0002). Dimensions in inches unless otherwise specified.

The 1592 and 1593 series are designed for pitches of 90μm and above. The angle-bottleneck design provides clearance for adjacent loops and the IC is configured for making a small ball bond. The 1592 and 1593 series utilize 90° radiused inside chamfer architecture for small ball bond size and improved looping. Both 8° and 4° face angles are available. For bond pad pitches less than 90μm, see the Process 1800 series.







Specify: Series - Dash Number - Length+Finish - Options
Example: 1592-18E-437GM-20D

Note: A 10° by 0.012 in. (305μm) high angle bottleneck is standard in the 1592/1593 series. Other angle bottleneck configurations may be specified at the end of the part number.

SERIES & DASH NO.	H* in. / μm ±0.0001/2.5	IR in. / μm (Ref)	B in. / μm See Note**	OR in. / μm ±0.0003/8	T (30° CONE) in. / μm ±0.0003 / 8	T (10° ABTNK) in. / μm ±0.0003 / 8	SUGGESTED WIRE DIAMETER in. / μm
159X-15A	0.0015 / 38	0.0003 / 8	0.0021 / 53	0.0010 / 25	0.0040 / 102	0.0043 / 109	
159X-15B	0.0015 / 38	0.0003 / 8	0.0021 / 53	0.0010 / 25	0.0045 / 114	0.0048 / 122	
159X-15C	0.0015 / 38	0.0004 / 10	0.0023 / 58	0.0012 / 30	0.0050 / 127	0.0054 / 137	
159X-15D	0.0015 / 38	0.0004 / 10	0.0023 / 58	0.0012 / 30	0.0055 / 140	0.0059 / 150	0.0009 / 23 to 0.0011 / 28
159X-15E	0.0015 / 38	0.0005 / 13	0.0025 / 64	0.0015 / 38	0.0060 / 152	0.0065 / 165	
159X-15F	0.0015 / 38	0.0005 / 13	0.0025 / 64	0.0015 / 38	0.0065 / 165	0.0070 / 178	
159X-15G	0.0015 / 38	0.0005 / 13	0.0025 / 64	0.0015 / 38	0.0070 / 178	0.0075 / 191	
159X-17C	0.0017 / 43	0.0004 / 10	0.0025 / 64	0.0012 / 30	0.0050 / 127	0.0054 / 137	
159X-17D	0.0017 / 43	0.0004 / 10	0.0025 / 64	0.0012 / 30	0.0055 / 140	0.0059 / 150	
159X-17E	0.0017 / 43	0.0005 / 13	0.0027 / 69	0.0015 / 38	0.0060 / 152	0.0065 / 165	
159X-17F	0.0017 / 43	0.0005 / 13	0.0027 / 69	0.0015 / 38	0.0065 / 165	0.0070 / 178	
159X-17G	0.0017 / 43	0.0005 / 13	0.0027 / 69	0.0015 / 38	0.0070 / 178	0.0075 / 191	
159X-17H	0.0017 / 43	0.0005 / 13	0.0027 / 69	0.0015 / 38	0.0075 / 191	0.0080 / 203	
159X-17J	0.0017 / 43	0.0005 / 13	0.0027 / 69	0.0015 / 38	0.0080 / 203	0.0085 / 216	0.0010 / 25 to 0.0013 / 33
159X-18D	0.0018 / 46	0.0005 / 13	0.0028 / 71	0.0012 / 30	0.0055 / 140	0.0059 / 150	
159X-18E	0.0018 / 46	0.0005 / 13	0.0028 / 71	0.0015 / 38	0.0060 / 152	0.0065 / 165	
159X-18F	0.0018 / 46	0.0005 / 13	0.0028 / 71	0.0015 / 38	0.0065 / 165	0.0070 / 178	
159X-18G	0.0018 / 46	0.0006 / 15	0.0030 / 76	0.0015 / 38	0.0070 / 178	0.0075 / 191	
159X-18H	0.0018 / 46	0.0006 / 15	0.0030 / 76	0.0015 / 38	0.0075 / 191	0.0080 / 203	
159X-18J	0.0018 / 46	0.0006 / 15	0.0030 / 76	0.0015 / 38	0.0080 / 203	0.0085 / 216	

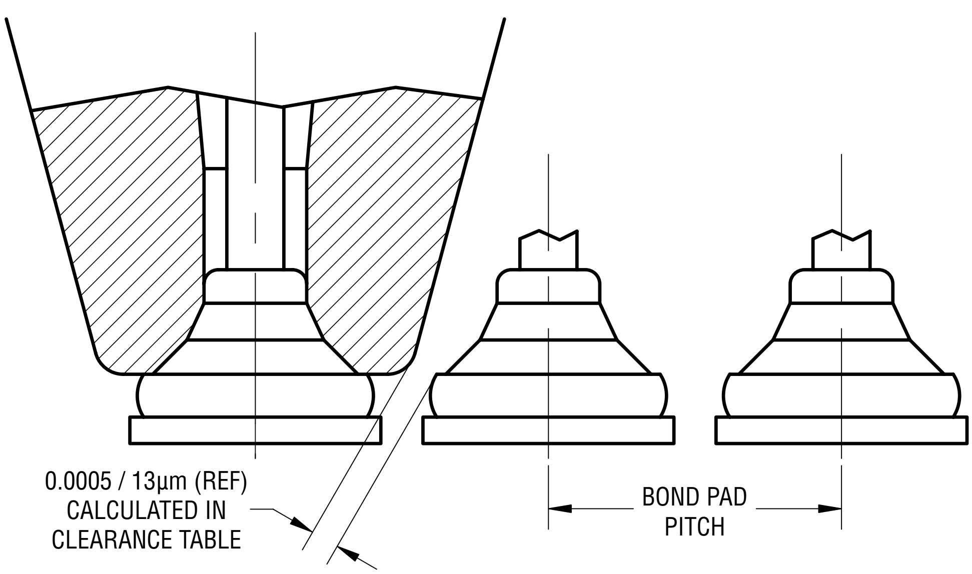
* For hole sizes 0.0025 through 0.0049, the tolerance is +0.0002/-0.0001. For hole sizes greater than 0.0049, the tolerance is +0.0003/-0.0002. Tighter tolerance available at additional charges.
** If IC < 0.0005 and/or T < 0.0050, the B tolerance is +/-0.0001, otherwise B tolerance is +/-0.0002 (if B > 0.0040, B tolerance is +0.0003/-0.0002). Dimensions in inches unless otherwise specified.

The 1732 and 1733 series capillaries are designed for applications where only a ball bond is required. The user-friendly part number allows the hole and the “B” dimensions to be specified for various wire diameters, bond pad sizes, and bond pad pitches.

The “T” dimension is automatically minimized for fine pitch applications unless otherwise specified. A flat and polished tool face is standard. Both the 1732 and 1733 are made of ceramic material unless otherwise specified as Tungsten Carbide (“-WC” in the part number).

CLEARANCE TABLE	
BALL BOND PITCH in. / µm	MAXIMUM RECOMMENDED "B" DIMENSION in. / µm See Note*
0.00350 / 89	0.0022 / 56
0.00375 / 95	0.0024 / 61
0.00400 / 102	0.0026 / 66
0.00425 / 108	0.0028 / 71
0.00450 / 114	0.0030 / 76
0.00475 / 121	0.0031 / 79
0.00500 / 127	0.0033 / 84
0.00525 / 133	0.0035 / 89
0.00550 / 140	0.0037 / 94
0.00575 / 146	0.0039 / 99
0.00600 / 152	0.0041 / 104
0.00650 / 165	0.0044 / 112
0.00700 / 178	0.0048 / 122
0.00750 / 190	0.0052 / 132
0.00800 / 203	0.0056 / 142
0.00850 / 216	0.0059 / 150
0.00900 / 229	0.0063 / 160
0.01000 / 254	0.0070 / 178

Note:
For hole sizes 0.0025 through 0.0049, the tolerance is +0.0002/-0.0001. For hole sizes greater than 0.0049, the tolerance is +0.0003/-0.0002. Tighter tolerance available at additional charges.
* If IC < 0.0005 and/or T < 0.0050, the B tolerance is +/-0.0001, otherwise B tolerance is +/-0.0002 (if B > 0.0040, B tolerance is +0.0003/-0.0002). Dimensions in inches unless otherwise specified.



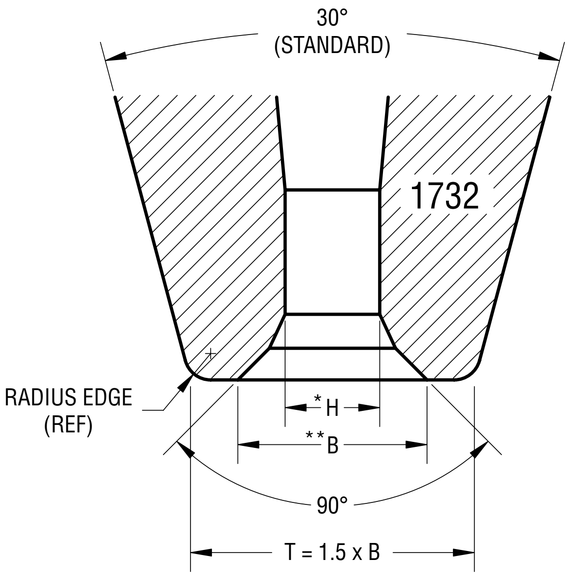
1732 Series Features:

The 90° double inside chamfer forms a tall, compact ball bond on surfaces with good to fair bondability.

Specify:
Series - H - B - Tool Length - Options

Example:
1732-18-36-437
1732-20-38-375-20D-WC
1732-17-35-437-T=90

Note: Optional T dimension must be greater than 1.5 x B dimension



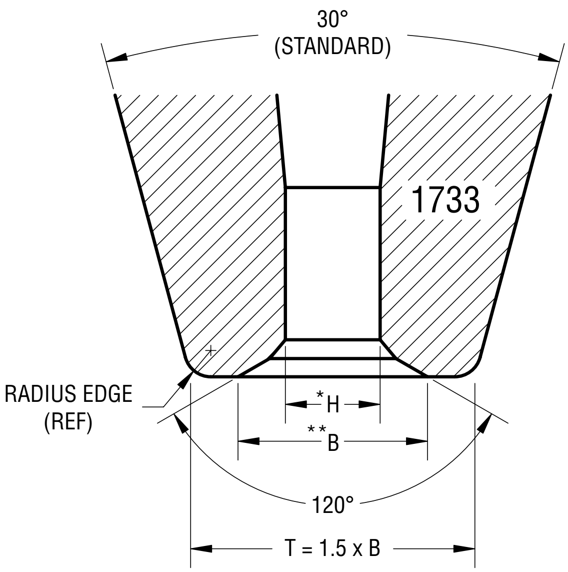
1733 Series Features:

The 120° double inside provides maximum downward force on the ball bond for use on surfaces with difficult bondability. The 1733 series tool will form a shorter, wider ball bond than the 1732.

Specify:
Series - H - B - Tool Length - Options

Example:
1733-15-25-437
1733-17-31-437-AB10x12

Note: Optional T dimension must be greater than 1.5 x B dimension



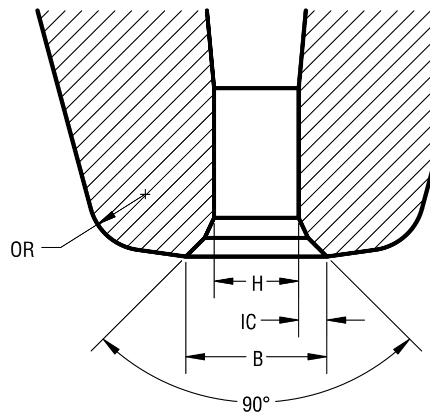
Dimensions are specified as follows:
-XX = 0.00XX inch
-18 = 0.0018 inch

* For hole sizes 0.0025 through 0.0049, the tolerance is +0.0002/-0.0001. For hole sizes greater than 0.0049, the tolerance is +0.0003/-0.0002. Tighter tolerance available at additional charges.
** If IC < 0.0005 and/or T < 0.0050, the B tolerance is +/-0.0001, otherwise B tolerance is +/-0.0002 (if B > 0.0040, B tolerance is +0.0003/-0.0002). Dimensions in inches unless otherwise specified.

The standard 90° and 120° double inside chamfer capillaries are also available with an optional radiused inside chamfer at a moderate additional cost. The inside radius enhances wire control and looping characteristics.

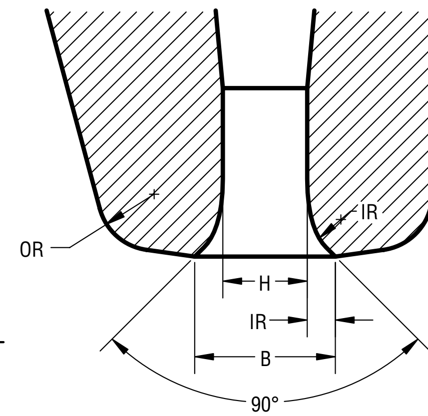
The inside radius also helps to alleviate sagging and wavy wires in long-loop, low-loop, high-speed-automated, and fine-pitch bonding applications. This is the same radiused inside chamfer design featured in the 1520 and 1590 fine-pitch series.

STANDARD 90°
DOUBLE INSIDE CHAMFER

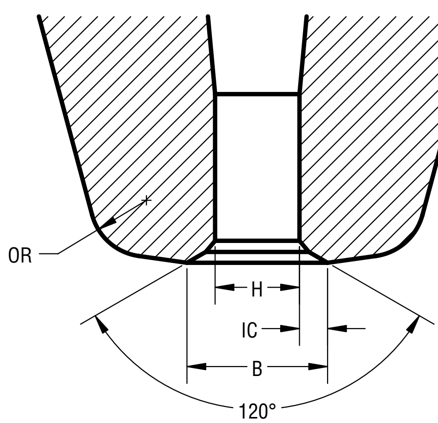


STANDARD SERIES	INSIDE RADIUS (IR) EQUIVALENTS
1513N	1523N
1572N	1522N
1574	1524
1570	1521

90° RADIUSED
INSIDE CHAMFER

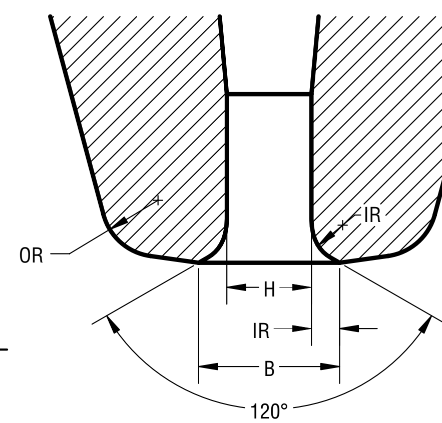


STANDARD 120°
DOUBLE INSIDE CHAMFER



STANDARD SERIES	INSIDE RADIUS (IR) EQUIVALENTS
1513	1523
1572	1522
1574N	1524N
1570N	1521N

120° RADIUSED
INSIDE CHAMFER



Fine-Pitch Capillary Basic Design Dimensions

Fine-pitch capillaries have two basic sets of industry standard dimensional characteristics: large geometry and small geometry. Large geometry dimensions generally refer to the shank, back hole, and cone. Small geometry dimensions refer to the tip and angle bottleneck details.

As with standard capillaries, fine-pitch capillaries share the basic common dimensions such as shank diameter and overall tool length. The major dimensional differences exist at the tip details of the tool and in the specialized "angle bottleneck" construction.

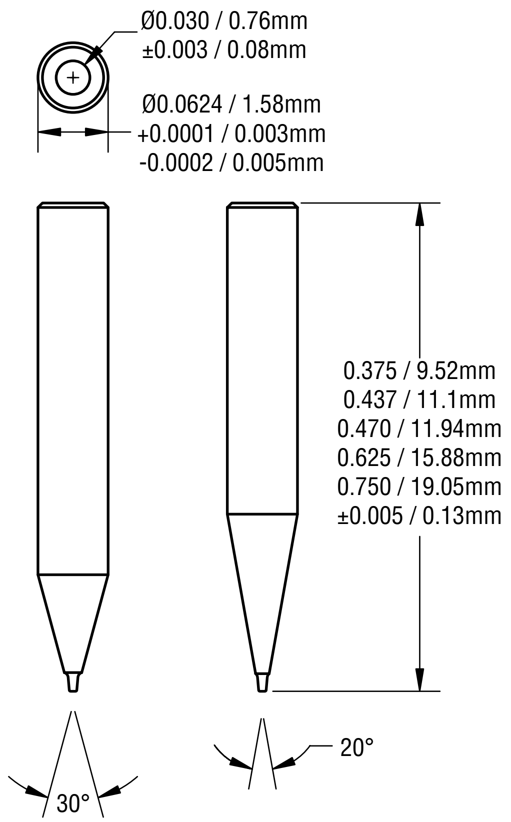


Figure 57 – Large geometry dimensions

Industry standard large geometry dimensions:

1. Shank Diameter (SD)
2. Tool Length (L)
3. Cone Angle or Main Taper Angle
4. Back Hole

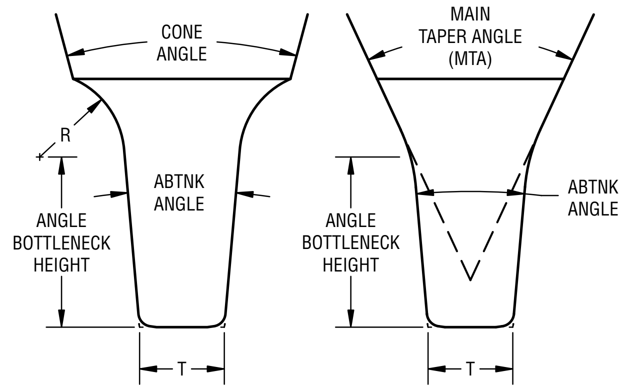


Figure 58 – Angle bottleneck (ABTNK or AB) geometry dimensions

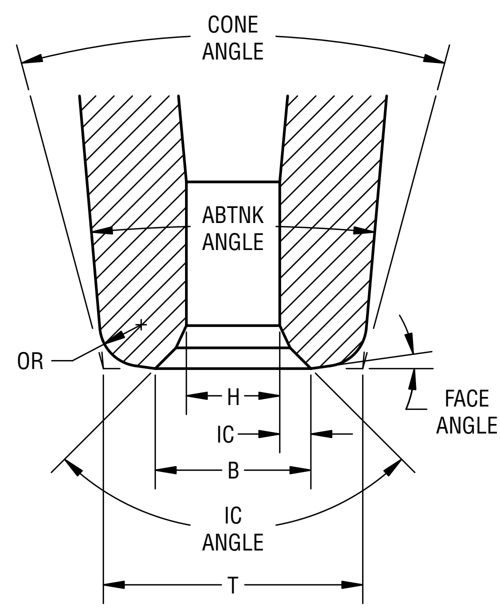


Figure 59 – Small (tip) geometry dimensions

Industry standard fine-pitch small geometry dimensions:

1. Tip Diameter (T)
2. Hole Diameter or Size (H)
3. Chamfer Diameter (CD or B)
4. Inside Chamfer (IC)
5. Inside Chamfer Angle (IC Angle)
6. Face Angle (Note: may be flat, 0°)
7. Outside Radius (OR)
8. Angle Bottleneck Angle (AB or ABTNK Angle)
9. Angle Bottleneck Height (AB or ABTNK Height)

Fine-Pitch Process Requirements

The following is a generic set of recommendations to aid those looking to implement finer-pitch bond processes:

1. Select gold wire based on process application; (i.e. low loops, molding stresses)
2. Select state-of-the-art wire bonder with high level of flexibility with special attention to the ultrasonic control capabilities (i.e. finer ultrasonic control resolution)
3. Make sure substrate material and die are properly matched for fine-pitch process
4. Select proper capillary material and geometric design to fit your bonding requirements (i.e bonded ball size and thickness)
5. Molding and mold compound suitability

Fine-Pitch Process

Although the ball-bond process depends on the interaction of multiple variables, a few generic recommendations can be made:

1. Use Design of Experiments (DOE) whenever unknown variables could be present
2. Process window as large as possible
3. Be ready to maximize reliability (i.e. highest shear and pull values possible)
4. Select proper capillary material and geometric design to fit your bonding requirements (i.e bonded ball size and thickness)
5. Optimize bonded ball size to fit bond pad opening (BPO)

Capillary Design Considerations

The bond pad opening (BPO) restricts the size of the bonded ball and the bond pad pitch (BPP) controls the optimum size of the capillary tip diameter that can be used. It is essential that the bonded ball be placed completely within the BPO. The capillary tip diameter must be large enough to provide a strong second bond but also clear any adjacent wires during the bonding process.

1. Hole Diameter (H): For fine-pitch applications, a hole to wire clearance can be 0.0003 in./7.6µm for 70µm-90µm pitch, 0.0002 in./5µm for 60µm pitch, and 0.00015 in./3.5µm for 50µm pitch bonding. This is critical to insure good wire movement with the hole during looping without causing wire drag, resulting in sagging, wavy, or tight loops.
2. Chamfer Diameter (CD or B): The contribution of the CD is to control the bonded ball size. With the bond pad opening (BPO) as a limiting factor, the selection of the proper CD is very important. Typically, the IC size for 0.0009 in./23µm to 0.0010 in./25µm wire is 0.0002 in./5µm to 0.00025 in./6µm. When using a 0.0012 in./30µm wire, the typical IC size can range from 0.00025 in./6µm to 0.0003 in./8µm.
3. Inside Chamfer Angle (IC Angle): The most common angle for fine-pitch bonding is 90°. For some ultra-fine-pitch applications, an angle of 40° to 70° is selected to reduce the bonded ball size. Poor ball shear results may stem from these steeper angles.
4. Angle Bottleneck Angle: This angle is critical for the capillary to avoid contact with adjoining loops during wire bonding. Generally, 10° is recommended but 5° may be required for some ultra-fine-pitch applications.
5. Angle Bottleneck Height: The height required depends on the critical loop heights immediately adjacent to the capillary or those wires which the capillary must pass between when bonding to staggered bond pads. A standard height is 0.010 in./254µm.
6. Tip Diameter (T): Optimal tip diameter selection is determined by the BPP and the desired loop height to be cleared. Loop configuration must also be considered when bonding in the corners of some devices.

Fine-Pitch Wire Bonding

Bond pad pitch spacing of 60µm is common in wafer processing. New technologies to improve die performance and reduce cost of manufacturing are pushing the implementation of even tighter pad spacing. It is common to see now 55µm pitch and 50µm pitch as normal production processes.

The introduction of smaller than 50µm pitch is slower than anticipated due to the numerous challenges facing the assembly houses. Some of these challenges include looping strength capable of resisting the mold flow stresses without damaging the wires or creating shorts between wires, and finding the optimum substrate and molding material to minimize stress to the already finer gold wire diameters. The gold wire is challenged not only to meet higher mechanical properties but dimensional and chemical as well. Any chemical changes to the wire to improve mechanical properties can affect its reactivity to the bonding surface where it must be attached. These same changes can also affect the free

air ball formation sometimes ignored or blamed on the capillary geometrical design.
Selection of the ideal wire is a balancing act where the process engineer must weigh all the consequences and decide which ones will impact the reliability and process performance.

The finer-pitch capillary is a challenge by itself. Not only must it provide good mechanical tolerances, it must also provide higher performance in terms of bond quality. Bond quality is measured based on Shear force, Pull strength, and Intermetallic reaction. The only way these properties can be enhanced is by clever geometrical design and optimized ceramic materials that can transfer ultrasonic energy with higher efficiency.

Process 1800

As the semiconductor industry moved to finer and finer pitches, the demand for smaller angle bottleneck tip diameters and tighter dimensional tolerances grew. Gaiser recognized this need and developed the Process 1800 manufacturing process.

Process 1800 eliminated the previously standard grinding operation now leaving the angle bottleneck portion with a mirror smooth finish.

- The newest bottleneck manufacturing technology providing superior bottleneck strength
- Increased shear strength and rigidity of ABTNK
- Superior ultrasonic energy transmission and a wider tuning window
- Substantially tighter dimensional tolerances
- Reduced standard deviations
- Sub-micron average grain size, near-zero porosity of the ceramic, and zirconia toughened ceramic materials
- Ideal for high-frequency transducers

Fully Automatic Bonder / High Speed Bonder Fine Pitch Capillary Hole Diameter Guide	
Wire Diameter in. / µm	Hole Diameter in. / µm
0.0006 / 15	0.00075 / 19 to 0.0009 / 23
0.0007 / 18	0.00085 / 22 to 0.0010 / 25
0.0008 / 20	0.00095 / 24 to 0.0011 / 28
0.0009 / 23	0.00105 / 27 to 0.0012 / 30
0.0010 / 25	0.00125 / 32 to 0.0014 / 36
0.0011 / 28	0.0013 / 33 to 0.0015 / 38
0.0012 / 30	0.0014 / 36 to 0.0016 / 41
0.00125 / 32	0.0015 / 38 to 0.0017 / 43

Strength Test Data		
	Standard Manufacturing of 99.9% Al_2O_3	Process 1800 Al_2O_3
Capillary ABTNK	10° ABTNK	10° ABTNK
Manufacturing Method	Standard Grinding	Process 1800
Capillary Material	99.9% Al_2O_3	99.9% Al_2O_3
Tip Diameter	0.0036in. / 90µm	0.0036in. / 90µm
ABTNK Height	0.010in. / 254µm	0.010in. / 254µm
Core Angle	10°	10°
Lot No.	L7A	L7A
No. of Tools Tested	25	25
Mean ABTNK Break Strength	142 gm	272 gm

The Chamfer Diameter Radius (CDR)

The Chamfer Diameter Radius (CDR) was developed to eliminate cut tail problems on new fine-pitch devices. This design is a blending where the IC meets the face of the capillary:

- Blending of IC and tool face
- Minimizes cut tail problems
- Reduces effects of flame-off error

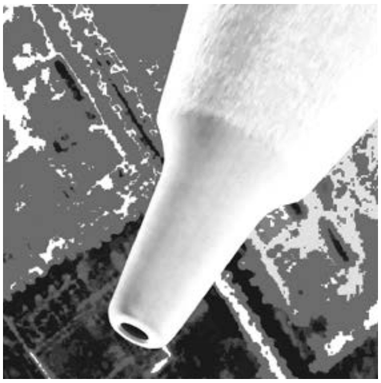


Figure 60 – Process 1800 style angle bottleneck

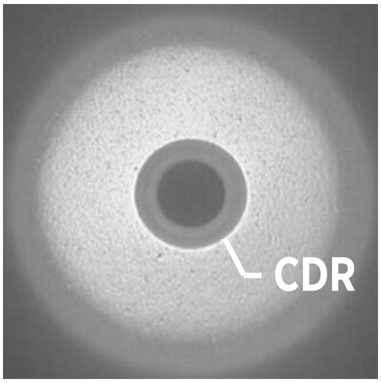


Figure 61 – Example of the chamfer diameter radius (CDR)

CDR2B, Chamfer Diameter Radius Design

The transition between the Inside 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 by the action of an electrical discharge produced by the EFO system.

The melted ball is used to start a new bond cycle where the ball is welded to the die-pad openings. The wire is strung across forming a loop that connects to the carrier or substrate lead points and 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 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.

The degree of stress varies depending on the IC and FA configuration (see Figure 62). 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 area unit area increases.

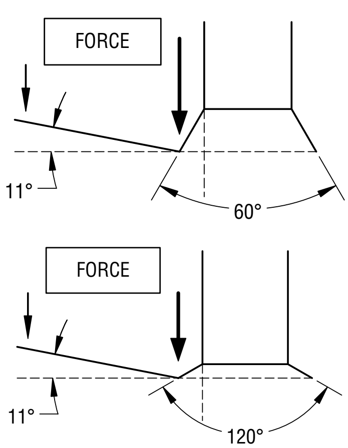
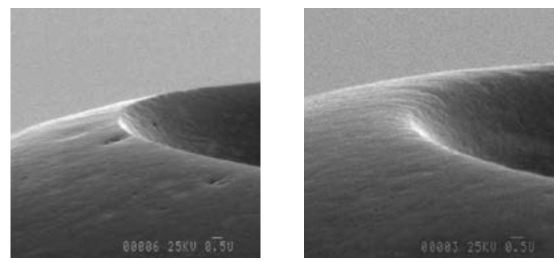


Figure 62 – Stress diagrams

It is these increased stresses that Gaiser Precision Bonding Tools addresses with the new CDR2B feature which is now available on capillaries for 50μm pitch or less.

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.

The photographs below details surface features between a standard IC-FA capillary and a capillary with the CDR2B finish.



Standard Capillary   CDR2B Capillary

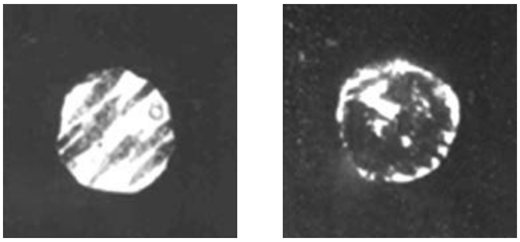
Figure 63 – A standard IC-FA capillary vs. a capillary with the CDR2B finish

SBIC - Small Ball Inside Chamfer

The proliferation of smaller geometries in the semiconductor back-end assembly industry means smaller bond pads with tighter spacing among each other. These requirements have created a demand for smaller, more tightly controlled capillary geometries to produce a bonded ball of uniform shape and form, and of similar quality found in those of larger and older semiconductor devices.

However, the function of the capillary is no longer simply to provide form and shape but to assist in the creation of a reliable bond. New capillary design rules must now include other processing factors such as pad metallization and structure (low K, etc.), packaging design and materials, and processing factors (temperature, ultrasonic frequency, etc.). Standard IC capillary designs can provide shape and form but fall short in providing higher reliability in terms of shear strength and/or intermetallic formation as well as the pad reliability (cratering, pad peeling, etc.).

Gaiser Precision Bonding Tools' new SBIC design addresses form, shape, and reliability all at once by means of a unique design that controls and distributes the stresses responsible for the bond formation. Proper manipulation of such stresses helps to control the intermetallic formation, bond deformation, and minimizes bond pad sub-layer damage such as cratering and pad peeling.



Standard
limited intermetallics

SBIC
more complete intermetallics

Figure 64 – Intermetallic reactions of a Standard IC capillary and a SBIC capillary compared

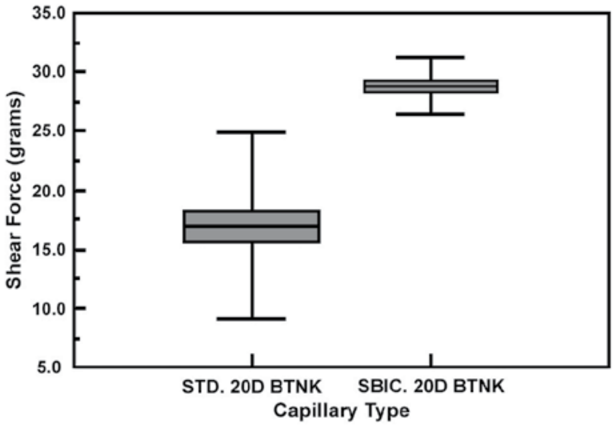


Figure 65 – Standard IC capillary vs. SBIC capillary

Ceramic Material Choices

Gaiser ceramic materials are blended to achieve higher mechanical and ultrasonic performance qualities. Each of the various blends is optimized to give the best performance for the intended application. The multiplicity of package materials, die pad metallization, and ultrasonic frequencies used on today's processes necessitates that a capillary not only meets geometrical parameters but acoustical ones as well.

The spread of fine-pitch products requires finer and tighter controls and resolution to transfer the bonding energy without detriment to ball shape and quality. This is only possible by customizing the ceramic powders to produce a capillary that is acoustically efficient to maximize bonding energy usage.

The following are the most common materials used and manufactured by Gaiser Precision Bonding Tools. For details on their application, please contact your nearest sales representative or our sales department.

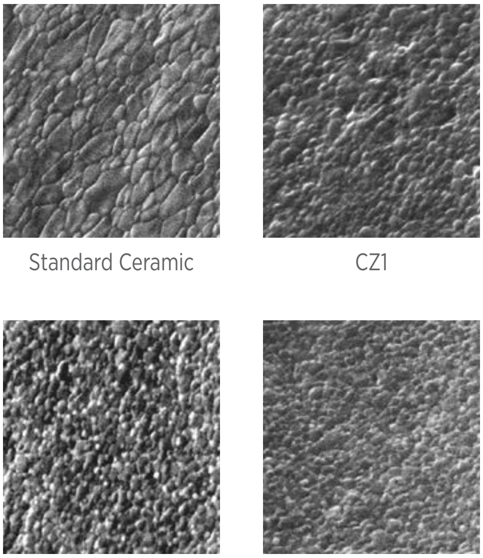


Figure 66 – Common materials used and manufactured by Gaiser

Technical Specifications				
	Std. Ceramic	CZ1	CZ3	CZ8
Avg Grain Size	1.3µm	0.5µm	0.35µm	0.4µm
Density	3.96g / cm³	4.29g / cm³	4.38g / cm³	4.27g / cm³
Bending Strenth	572MPa	1013MPa	1120MPa	1046MPa
Ultrasonic Efficiency	81.2%	85.2%	88.8%	84.4%
Vickers Hardness	2144HV	1716HV	2658HV	2000HV
Color	White	Light Pink	Dark Pink	White

Figure 67 – Technical specifications of common materials

New Package Development

The semiconductor industry is a dynamic one, always changing and evolving to fit the needs of the consumer. The drive to meet and fill customer's needs is the main reason a multiplicity of package configurations exist. Every package is designed to maximize performance and product requirements. This effort to meet design requirements is the most challenging one as it pushes the materials and processes to the limit. Use of Polyimide-based substrates has increased significantly. Fast and low temperature curing die attach material is more popular in order to minimize die stresses. Multi-die structures where die are stacked vertically are common in order to meet performance requirements. Multi-die modules within a single package are also becoming popular because of multi-tasking requirements from new consumer products.

Micro-Leadframe / QFN Packages

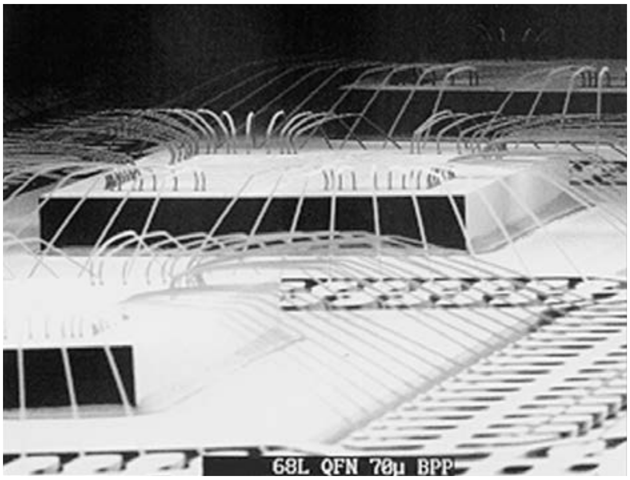


Figure 68 – Example of a QFN package

The QFN (Quad Flat Non-leaded) is at the top of the list of rapidly growing popular devices in the IC industry today. Comprised of a CSP plastic encapsulated package with a copper leadframe substrate, its small size and low profile make it ideal for high-density PCB's used in small scale electronic applications such as cellular phones, pagers, and PDA's. It is becoming part of the lower cost, low pin count SOIC, TSSOP, Mini-BGA, DIP, and QUAD configurations.

The two common types of leadframes are silver spot plated leads or nickel-palladium preplated. These leadframes are pre-taped with film at the bottom and ready to use for production. Success for bonding this package requires the following:

- Lead frame design
- Mold compound selection
- Polyimide film selection
- Window clamp design
- Choice of bonder
- Bonding parameter optimization

Failure to optimize the above selections may result in the following:

- Broken ball neck
- Weak and stressed ball neck line
- Poor stitch/crescent bond formation
- Weak pull strength

Reasons for the previous problems are as follows:

- Too much induced lateral movement and vibration of the already bonded units within the strip of devices during the bonding process
- Resonance effect of the units of the strip under the work stage during bonding
- High elasticity of the laminated film absorbs too much of the bonding energy resulting in significant second bond weakening and failure

The following efforts are being pursued in order to refine and optimize the QFN package:

- Selection of the polyimide film of the pre-tape leadframe
- Selection of the mold compound for lead-bleed prevention
- A suitable solution to the various CTE (coefficient of thermal expansion) effects to the overall package integrity

Some package engineers have resorted to ball bumping on the lead side to reduce the vibration and create a more rigid base for the second bond. For a 70µm pitch QFN package, Gaiser has developed a T=0.0035 in./89µm with an 8° face angle capillary (1851-13-437P-35(2-8D-8)20D-AB10x10-CZ1). This capillary has achieved a mid-span pull strength of 4.5 grams, maximum pull strength of 7.4 grams, and an average pull strength of 6.0 grams.

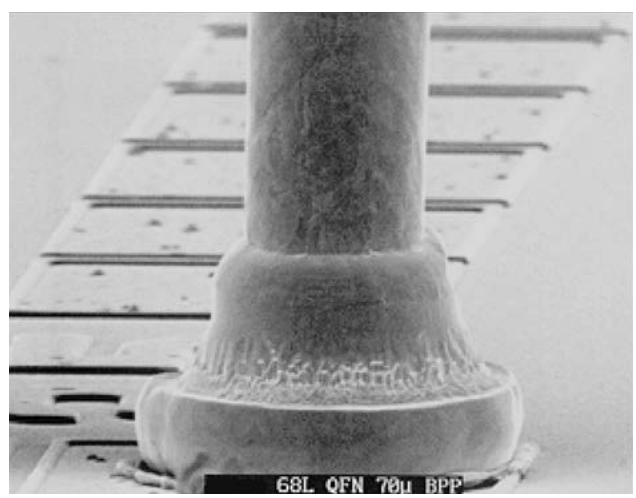


Figure 69 – Ball bond for a 70µm QFN package made with part number: 1851-13-437P-35(2-8D-8)20D-AB10x10-CZ1

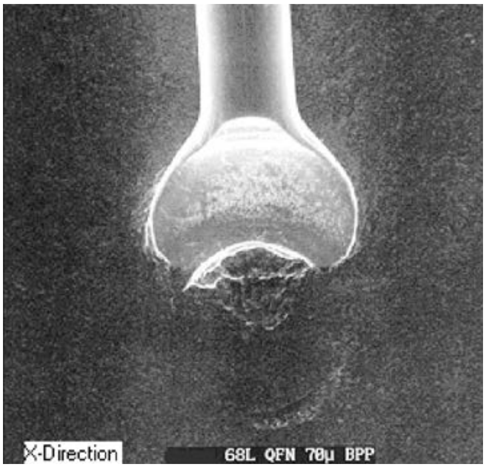
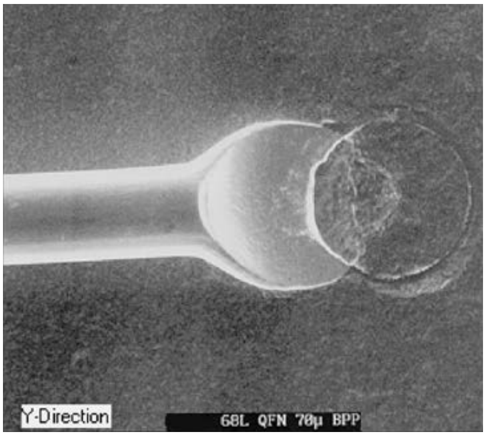


Figure 70 & 71 – Stitch bonds for a 70µm QFN package [in X(above) and Y(below) directional scrubs] made with part number: 1851-13-437P-35(2-8D-8)20D-AB10X10-CZ1



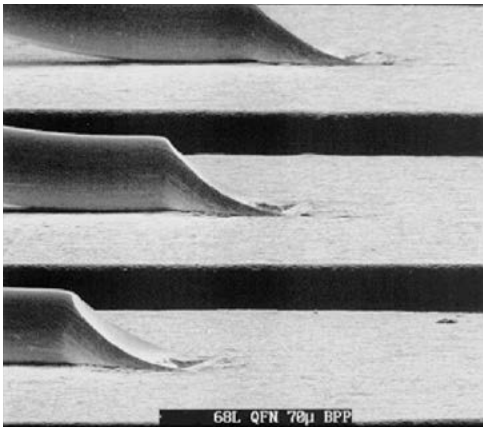


Figure 72 – Side view of stitch bond showing exhibiting good transition from the wire to the bond

Chip Scale Packages (CSP)

The two most popular types of CSP's use either flex (polyimide base) or rigid laminate. Both require low temperature bonding. Most CSP's have very shortwire loops so the second bond is as close as possible to the die edge. This design requirement demands the use of a bottleneck capillary that in many cases needs to be taller than usual in order to avoid contact with the die edge.

Because of the lack of rigidity in these type of subtrates, ultrasonic energy is easily absorbed or attenuated. So special attention to geometrical designs as well as material properties is of an utmost importance. A capillary with less attenuation properties such as a 30° as opposed to a 20° cone angle and CZ8 or CZ3 material would be ideal for applications like those mentioned here. Higher frequencies are strongly recommended since they reduce exaggerated mechanical vibration amplitude and increase velocity of vibration, which increases energy applied at the interface of the bond.

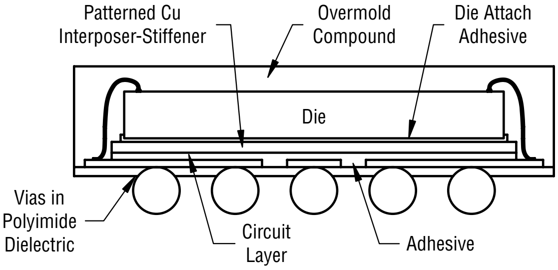


Figure 73 – Cavity-up enhanced ball grid array (CUEBGA) package that incorporates a stiffer laminated with adhesive to the polyimide flex circuit

Stacked Die Packages

The trend of the semiconductor technology is to achieve higher package performance (electrical, mechanical, thermal, etc.). One way to get closer to those goals is the vertical stacking of dies. These dies share a common package giving them a performance advantage that a multi-chip package does not have. The performance advantage is in the form of communication speed, a parameter that has become of greater importance as multi-task systems are becoming more and more popular.

The performance advantage is not without its sacrifices. These sacrifices are usually related to the assembly process. The main concern is the lack of rigidity exhibited by this type of package. The use of multiple layers of die attach adhesive further reduces its mechanical rigidity making the entire package sensitive to energy losses due to absorption or attenuation. The mechanical rigidity is reduced even more when dies are offset from each other creating a mechanical cantilever effect that absorbs bonding energy.

The solutions for such an unstable package are found in our 38° cone angle, specifically designed for this type of application. Complementing the cone angle design is the new ceramic material CZ3 which provides amongst the highest ultrasonic transmissivity of any capillary material in the industry today. Again high frequencies are a necessity when processing these types of packages. The higher the energy the better in order to substitute the predominant mechanical vibration for purer form of energy, Phonon generation.

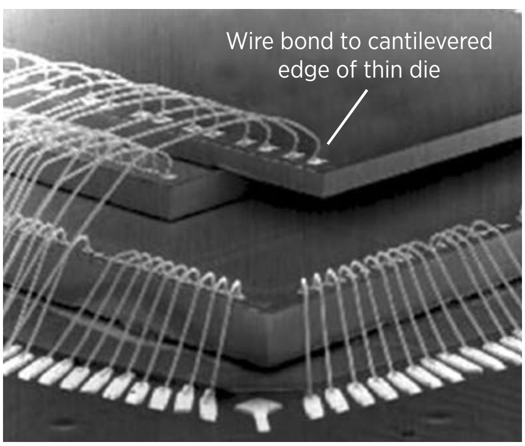


Figure 74 – Example of a 3-die stack package

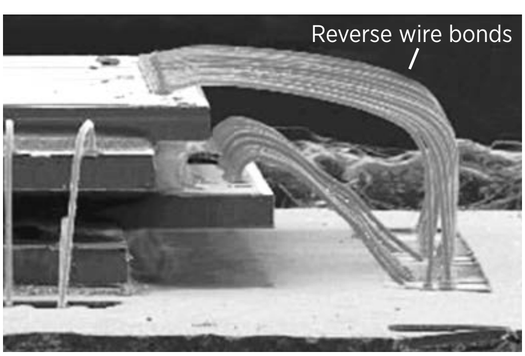


Figure 75 – Example of a quad stack package

Copper Wire Ball Bonding

Copper wire bonding has always had a special appeal because of the comparative price against gold wire. The cost factor is mainly the driving force behind the preference to implement copper as a substitute for the most expensive material, gold, in most of the semiconductor products.

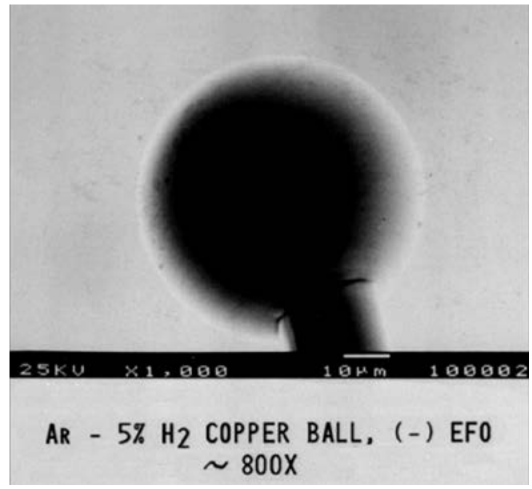


Figure 76 – A consistently shaped free air copper ball

The one aspect that is usually ignored is the less publicized material differences that exist between the well known gold wire and the copper wire. These differences are Hardness, Cyclic Fatigue Resistance, Heat Affected Zone, and Oxidation.

Hardness – This is one of the main culprits for bondability issues. These issues range from poor welding of the first bond and second bond to sub-layer damage (cratering, chip-out) of the bond pad structure. The limiting welding performance is associated with the reduced intermetallic formation when the copper ball bond gets in contact with the aluminum bond pad. The effect of hardness on the second bond impacts most the tool life as the need for higher bonding parameters increases in order to maximize welding area.

Cyclic Fatigue – In order to minimize the impact of hardness, high-purity copper must be used. This means no dopants or impurities should be aloud. A high-purity copper material can also be highly susceptible to work hardening due to cyclic phenomena. The work hardening effect can be detrimental to product life performance as brittle neck failure could appear during device temperature cycling.

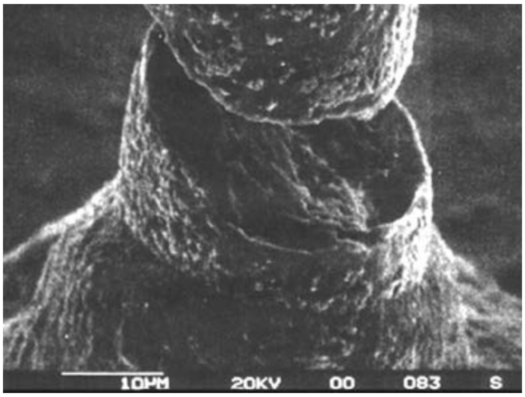


Figure 77 – Typical brittle neck failure that occurred during temperature cycling tests. The results of high expansion mold compound and work hardening phenomena at the ball neck.

Oxidation – Copper is a highly reactive material in the presence Oxygen forming CuO_2, a hard and difficult to remove oxide that hinders the welding process between Copper and Aluminum, Copper to Silver, or Copper to Copper surfaces. This is the reason an inert atmosphere must be used to protect the Copper from reacting with Oxygen. Any amount of Oxygen, either during the process of ball formation or during the actual bond process cycle, can create serious bonding issues that range from ball shape to bond integrity. Presence of Oxygen during the ball formation has been associated with mis-shapened ball bonds, blow holes, and voids on the surface of the copper balls as well.

The Process – Once the proper inert gas, wire purity, package, and machine hardware are selected, the next step is to select the proper capillary design that will provide a consistent and reliable bond process. Such a process will consist of minimum bonding parameter levels, with an extended tool life, and maximum bond quality and integrity. Gaiser's materials CZ3 and CZ8 can provide the best alternative with a selected set of geometrical features to maximize bondability.

Coppper Wire Bonding Part Numbers Currently Used	
Wire Diameter in. / µm	Part Number
0.0010 / 25	1854-12-437GM-38(2-F-10)20D-AB10x10-CZ3
0.0013 / 33	1551-18-437GM-65(4-8D-15)20D
0.0020 / 51	1520-25-437GM-82(5-8D-15)20D-CDR
	1551-22-437GM-100(7.5-8D-20)20D-CZ1
	1551-22-437GM-93(6.5-8D-20)20D-CZ1
0.0030 / 76	1551-35-437GM-120(7.5x120D-8D-25)20D
0.0040 / 102	1551-45-437GM-165(10-8D-30)20D

50µm and Below Pad Pitch Bonding

The constant trend of the semiconductor industry to increase die performance while maintaining the cost of manufacturing has pushed front-end foundries to shrink silicon dies even further. The impact of this shrinkage is most obvious in the spacing (Pitch) between bond pads and the reduction in size. This, in turn, exerts higher demands on chip assembly bond processes and associated materials.

The impact on the bond process comes in many forms in order to maintain current quality standards which are easily achieved with larger pad pitches. The bond process for interconnections under 50µm demands better and more repeatable shear and pull values, exceptional control of Free Air Ball (FAB), higher resolution hardware responsible for Bond Forces, Bond Head Velocities, and Ultrasonic Power.

The FAB requires a state of the art Electronic Flame Off (EFO) system capable of controlling Current and Breakdown Voltage with a higher resolution than older systems in order to produce consistent and repeatable ball sizes.

The Bond Force applied during the bonding cycle must be equally important and with even higher resolution (grams/bit) in order to maximize bond information with higher shear values but without excessive deformation. At the same time, one must not forget the equally important Contact Velocity and Search Height parameters which can also affect the overall bonded shape.

The Ultrasonic Power parameter is one of the most significant but the least understood. It must be controlled in such a way that higher resolution, capable of allowing minute adjustments, is possible so bonds are consistent and repeatable. Variations in power delivered either because of hardware variations (capillary clamping method impedance, frequency) or because of poorly designed control systems (phase angle control, frequency range, etc.) can cause significant process variations. Eventually it can affect short and long term product quality and reliability such as lifted bonds, low shear values, missing tails, opens (no ball), intermetallic formation, and many more.

The Ultrasonic Frequency is also important, since higher frequencies provide less mechanical excursion but higher acoustical energy. They are ideal to provide minimum bond deformation but with higher bond strength. The suggested frequencies for pad pitches of 50µm or less is one greater than 100kHz. Lower frequencies are not recommended because of its mechanical aggressiveness.

For materials, the capillary and gold wires play an important role in allowing trouble free and repeatable bond process.

Capillary Tip Geometry is key in achieving consistent ball centering and shape and, most important, the robustness of the second bond or stitch bond. The biggest issue in fine-pitch bonding is the second bond consistency. Gaiser has developed the ideal combination between geometric features and ceramic material. This combination helps control and manipulate the various stresses (compressive, radial, and tangential) occurring during the bonding cycle so that a trouble free and repeatable wire termination process is possible.

It is also important not to ignore the effect of gold wire. As the pitch becomes smaller, the wire diameter becomes smaller and more sensitive to stresses during the loop formation and other bending stresses that might take place during bond cycle. The gold alloy must be tailored to minimize ball neck cracking, maintain loop shape, provide a strong welded area on the stitch, and a repeatable, straight-tail length for consistent free air ball (FAB) size.

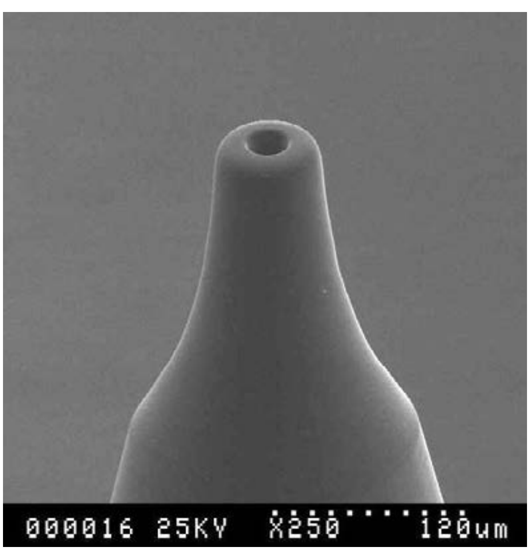


Figure 78 – 50μm pitch capillary

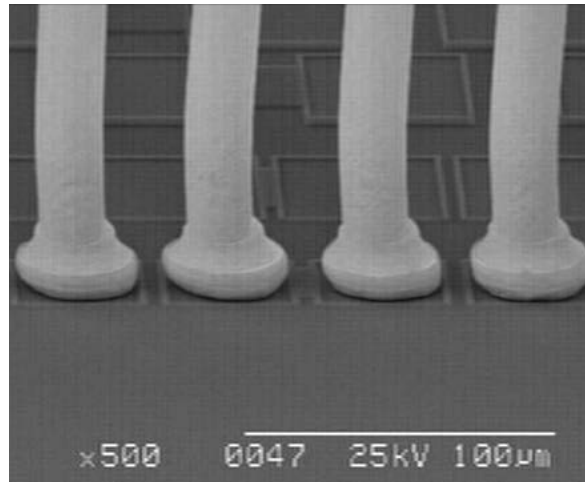


Figure 79 – 50μm pitch ball bonds

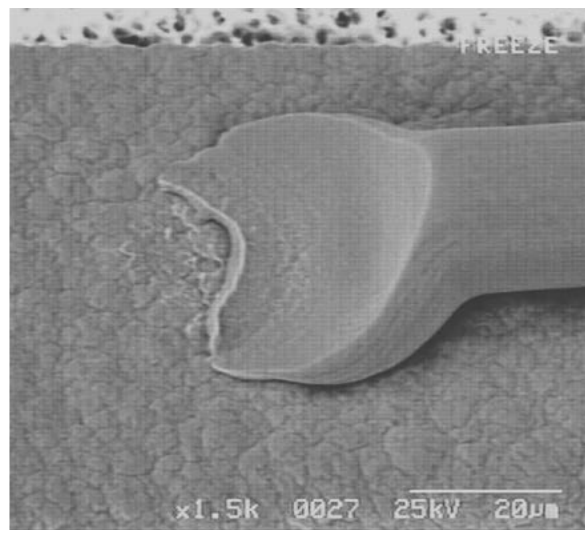


Figure 80 – 50μm pitch stitch bond

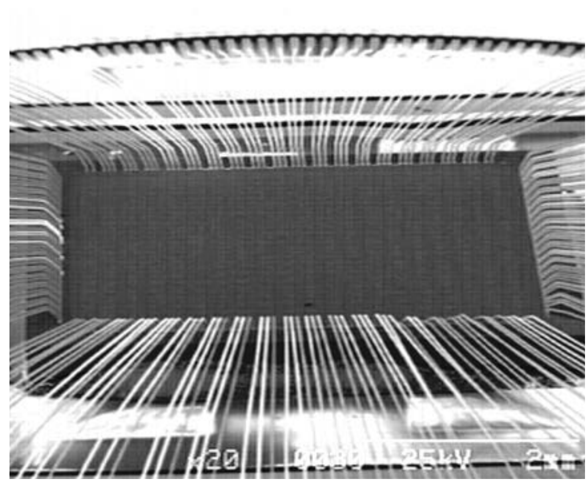


Figure 81 – 50μm pitch package using
0.0009 in./23μm gold wire

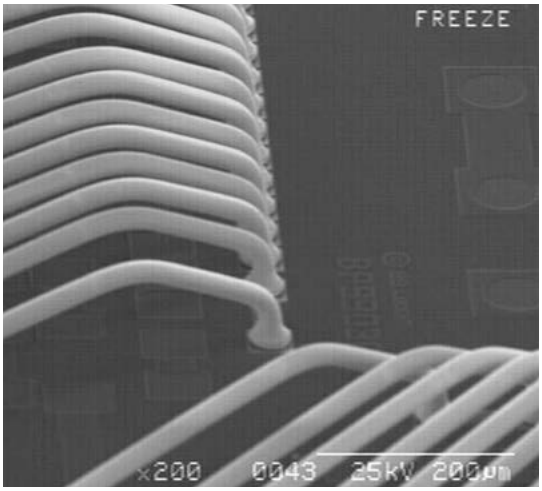


Figure 82 – Ball bonds in a 50µm pitch package using 0.0009 in./23µm gold wire

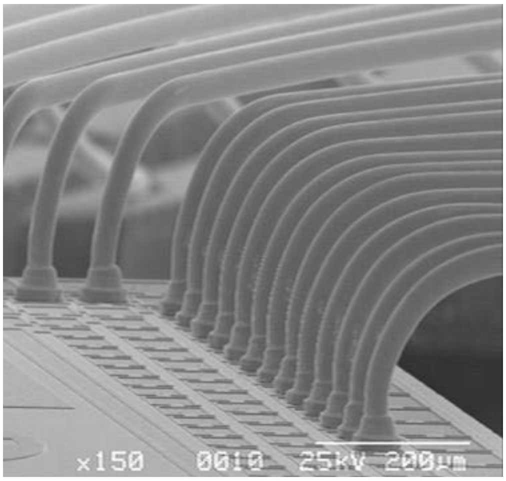


Figure 85 – Ball bonds made with 0.0012 in./30µm gold wire for 80µm pitch package

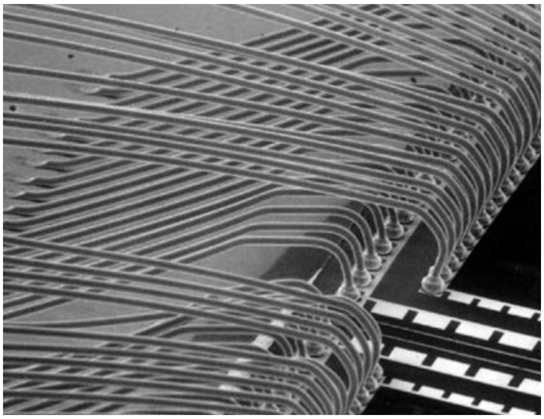


Figure 83 – Package with complex looping profile incorporating a two-tier lead design

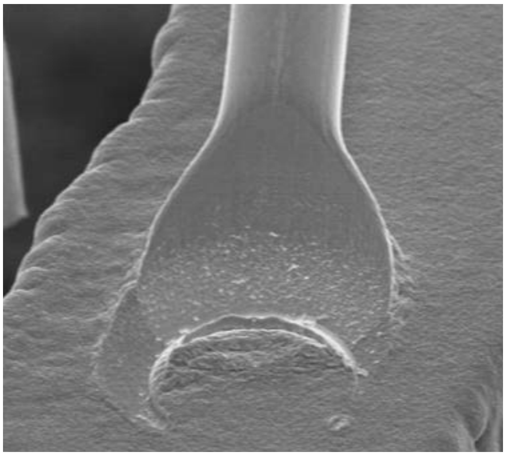


Figure 86 – Stitch bond width is equal to twice the wire diameter

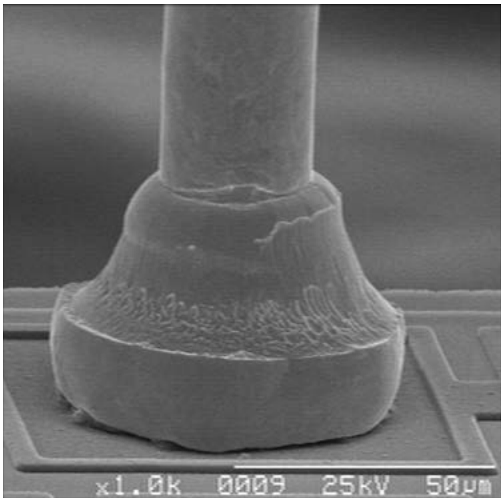


Figure 84 – Ball bond made with 0.0012 in./30µm gold wire for 100µm pitch package
Smashed ball = 0.0027 in./68µm

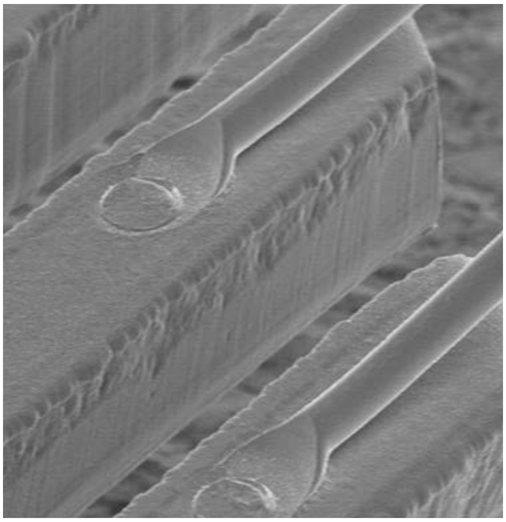


Figure 87 – Stich bonds made with 0.0012 in./30µm gold wire

Future Fine-Pitch Packages

Current users are beginning to make internal studies of 50µm pitch capablities in efforts to stabilize and optimize processes for mass production. As the challenge to reach the finer pitches of 45µm and 40µm begins, 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.

The Gaiser Products group of CoorsTek is working in partnership with several bonder and wire manufacturers by providing the necessary capillary designs to meet these new challenges.

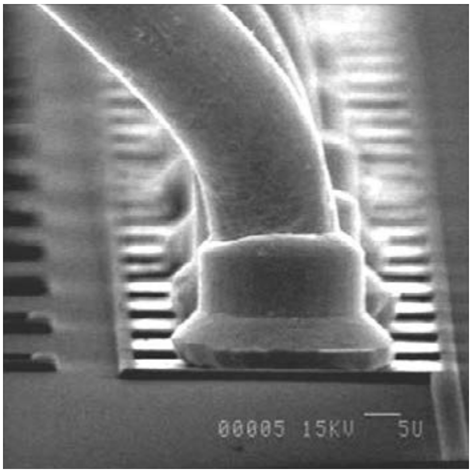


Figure 88 – A 45µm pitch ball bond made with 0.0007 in./18µm wire. Squashed ball = 0.00125 in./32µm

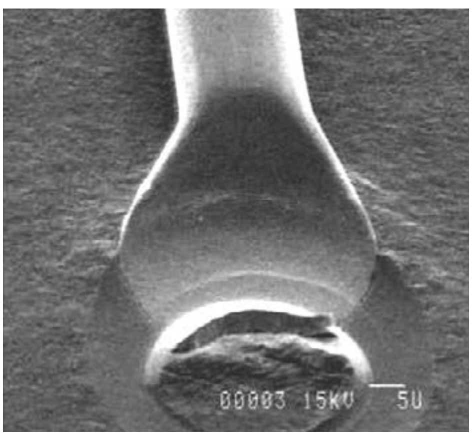


Figure 89 – A 45µm pitch stitch bond made with 0.0007 in./18µm wire.

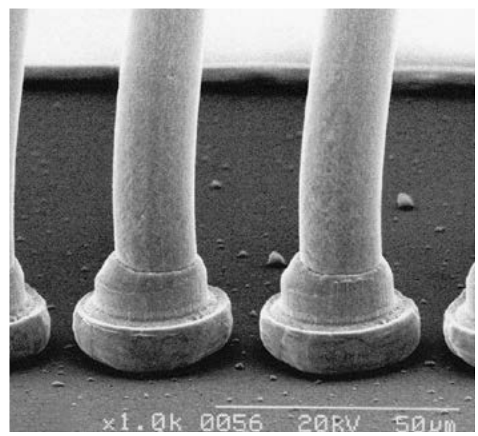


Figure 91 – Ball bonds made at 35µm pitch with ultra-fine-pitch capillary

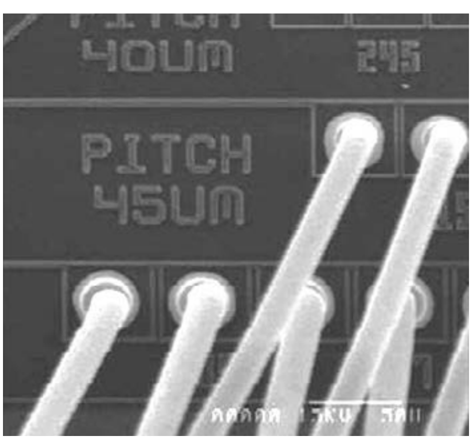


Figure 90 – Ball bonds in a 45µm pitch package using 0.0007 in./18µm wire.

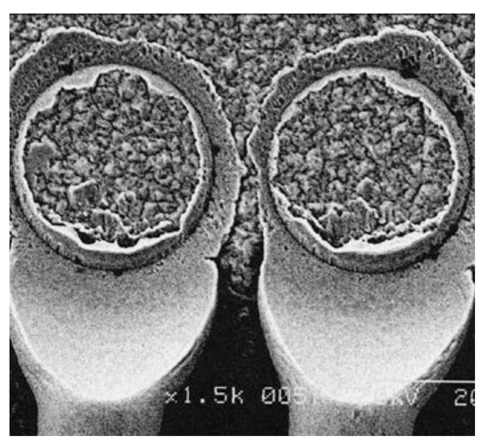
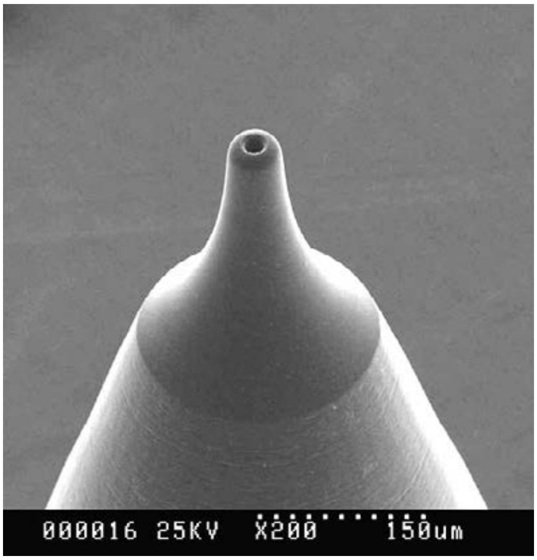


Figure 92 – Stitch bonds made with a 35µm ultra-fine-pitch capillary



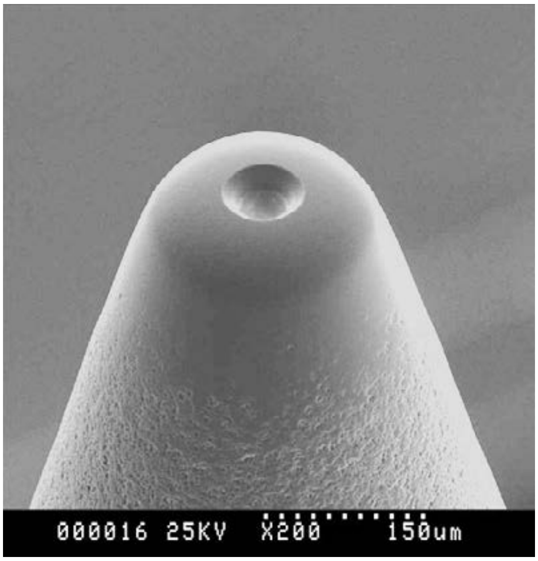


Figure 93 & 94 – Ultra-fine-pitch (35µm) capillary vs. standard pitch (175µm-225µm) capillary. The tip diameter (0.0018in./46µm) of the ultra fine pitch tool (left) will fit into the same hole diameter as that of the standard capillary (right).

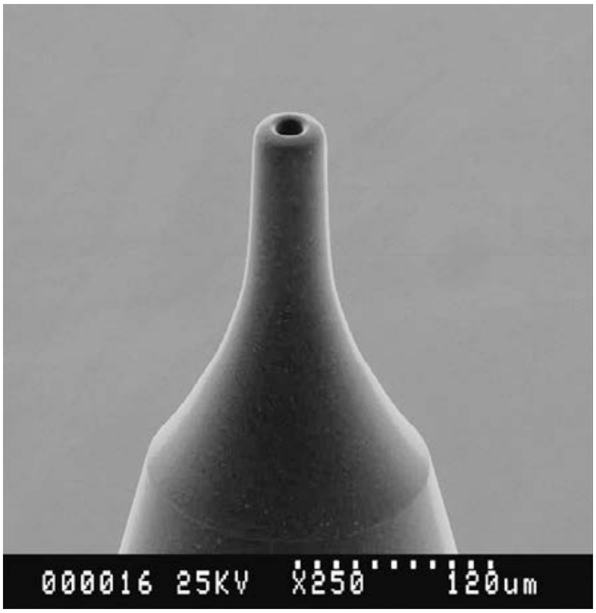
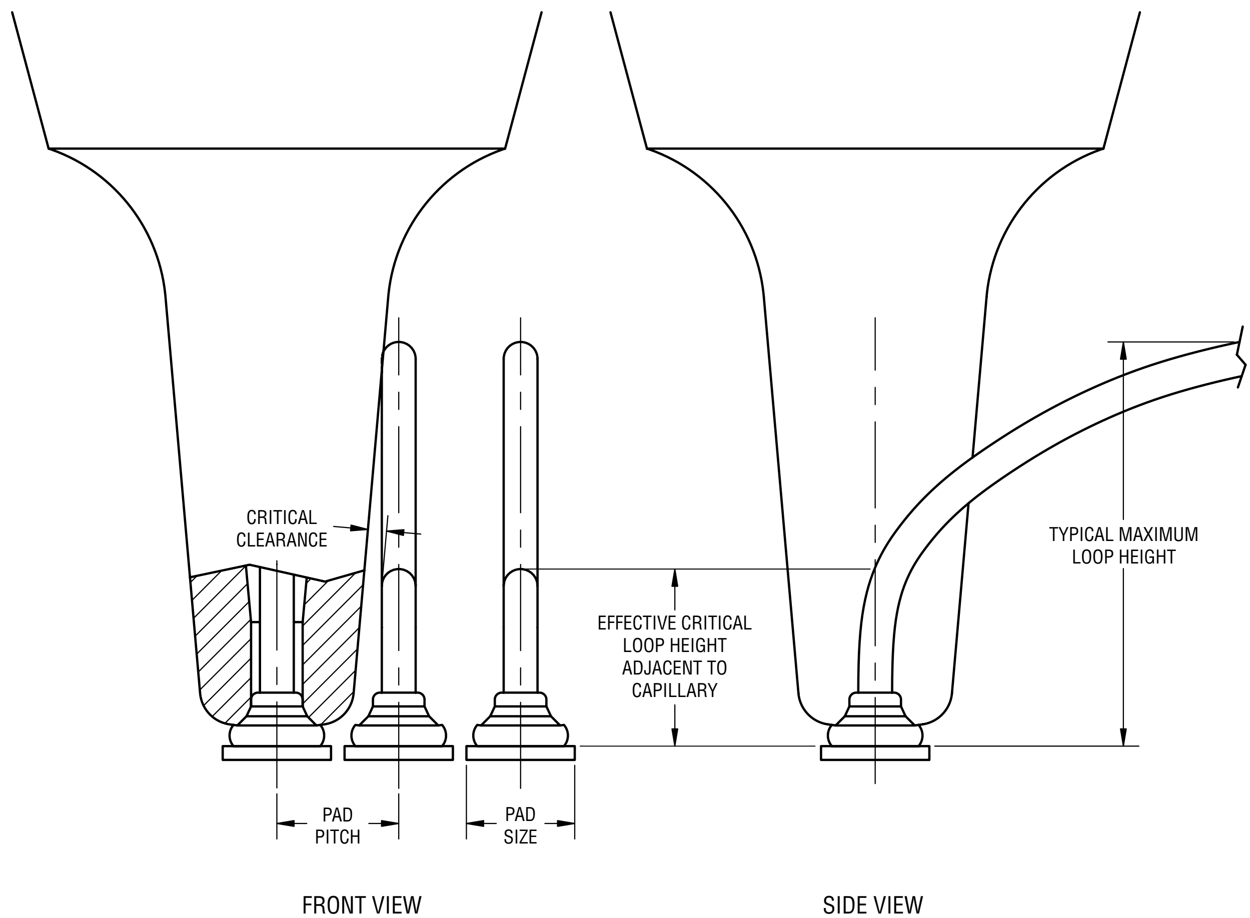


Figure 95 – Gaiser 30µm ultra-fine-pitch capillary
T = 0.00165 in./42µm
H = 0.00075 in./19µm



Important Elements for Determining the Proper Tools in Fine-Pitch Wire Bonding Applications

Bond Pad Pitch: The distance between the centers of the bond pads.

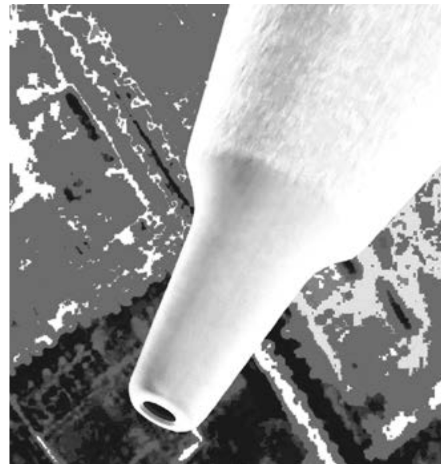
Bond Pad Size: May be square, rectangular, or round. The most important dimension is the size along the pad pitch, as shown above.

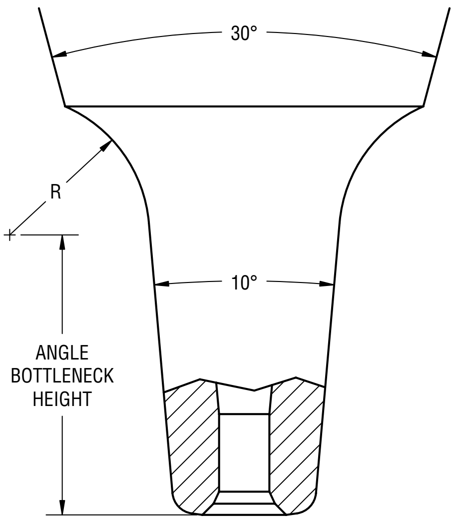
Loop Height: The most important aspect of wire loop height is the effective critical loop height directly adjacent to the capillary. If the capillary is designed to clear only the maximum loop height, which occurs away from the capillary, then the "T" dimension will be less than required, resulting in a less than ideal second bond.

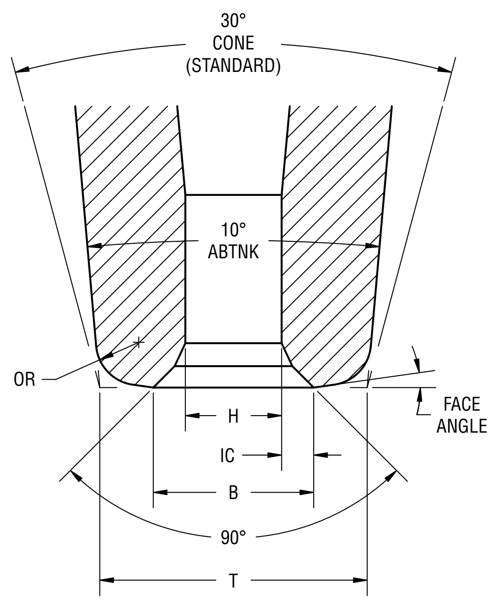
Critical Clearance: The design clearance between the capillary angle bottleneck, capillary manufacturing tolerances, loop control, and desired quality standards all influence the designed clearance.

The 1851 angle bottleneck capillary represents Gaiser's answer to fine-pitch and ultra-fine-pitch wire bonding tool design. Our proprietary Process 1800 imparts a mirror smooth finish to the angle bottleneck portion of the capillary. This increases the shear strength and rigidity which results in superior ultrasonic energy transmission and a wider tuning window – ideal for high frequency transducers.

Process 1800 also provides substantially improved dimensional tolerances and improved CPKs.







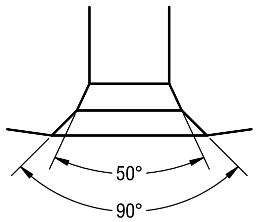
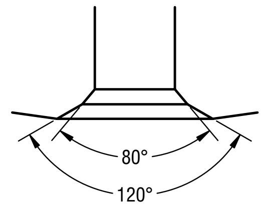
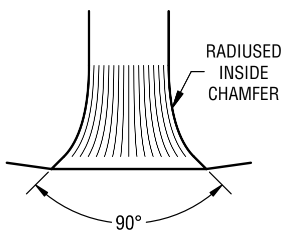
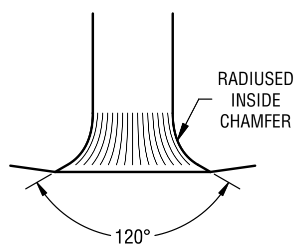
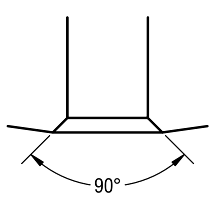
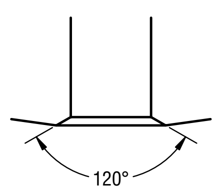
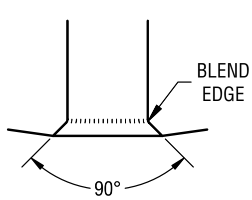
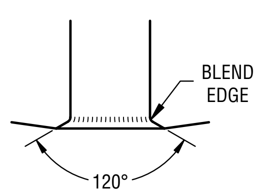
Specify:
Series - H - Length+Finish - T(IC - Face Angle - OR) Options

Example:
1851-18-437GM-40(3-8D-10)20D-AB10x12
1851-18-437GM-50(4x120D-8D-12)AB10x12
1820-18-437GM-36(4-11D-8)AB10x10
1853-15-375P-32(2-8D-5)20D-AB5x8-CZ1

For 120° IC angle, specify "x120D" in part number. Other angles may be specified.

For single IC angle, specify as "1853" series. Standard angle is 90° unless otherwise specified. See page 56 for more about the "1853" and "1854" series.

Note: For T dimensions less than or equal to 0.0035/89µm, must specify CZ series material.
For T dimensions less than or equal to 0.0029/74µm, contact Gaiser or your representative for part number.
For IC dimensions equal to 0.00015/3.8µm, do not specify with radiused inside chamfer.
For IC dimensions equal to 0.0001/2.5µm, do not specify with radiused inside chamfer and must have polished tip finish.
If a radiused inside chamfer is desired in a 120° IC, use the 1820 series.
For the 1853 series, a radiused inside chamfer is not available, see page 56.

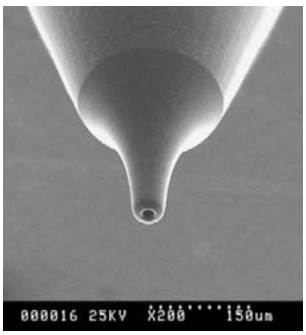
SERIES	90° ARCHITECTURE	120° ARCHITECTURE	DEFINITIONS
1851 Double IC Architecture	90°/50° Standard 	120°/80° and other IC angles optional 	The 1851 Series utilizes the Gaiser Double IC architecture. The 90°/50° Double IC is standard unless otherwise specified.
1851 With BLIC (Blended Inside Chamfer)	1851 with BLIC 90° unless otherwise specified 	N/A (see 1820)	The BLIC adds a Radiused/Blended Inside Chamfer to 90° Double IC and other 1851 capillaries. For 120° BLIC, use the 1820 Series.
1820 Full Radius Series (120° Blended Inside Chamfer)	N/A (see 1851 with BLIC)	120° Double IC architecture with BLIC 	The 1820 Series utilizes the 120° Gaiser Double IC architecture with Radiused/Blended Inside Chamfer. For angle other than 120°, use the BLIC.
1853 Single IC Architecture			The 1853 Series utilizes the basic Single IC angle design. Consider specifying when IC size is too small for Double IC.
1854 Single IC Architecture with Blend Edge			The 1854 Series is the same as the 1853 Single IC Series except that a very tiny edge break is applied to the transition from IC angle to the Hole.

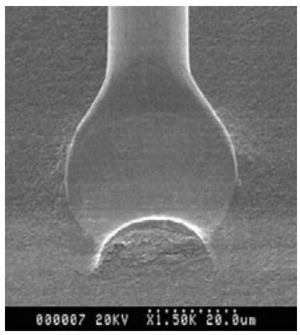
Troubleshooting Guide for Fine-Pitch Applications and Bonding Problems Related to Capillary Wire Bonding		
Symptom	Possible Cause	Possible Remedy
Broken wire above ball	Insufficient wire for loop height	Increase loop parameters in order to increase loop length
	Ball security height too low	Increase ball security height, kink height, or reverse motion
Sagging Loops	Too much wire in loops causing loops to sag downward	Decrease loop factor
		Increase reverse length
		Check/clean wire tensioner
	Wedge bond placement too close to the tip of the lead	"Re-teach" wedge position to increase the surface level of the wedge bond
	Bond height incorrectly set	"Re-teach" bond height
Non-sticking ball	Poor or contaminated pad materials may have caused bond to fail after non-stick detector sampling	Check if the non-stick detector timing and current signals are correct
	Bond force too low	Increase bond force
	Ultrasonic power too low	Increase ultrasonic power
	Free air ball size too small	Increase EFO time or current
No ball size	EFO solenoid malfunction	Replace EFO solenoid
	Free air ball size too small	Increase EFO time or current
Non-sticking wedge	Finger not clamped	Adjust work holder clamp and improve set-up
	Leadframe contaminated or poor plating on leadframe	Change bond parameters Inspect material and check quality of incoming leadframe
Wire open	Wire feed problem	Adjust wire feed sensor
	Dirty wire clamp	Clean wire clamp jaws
	Excessive force on wedge	Reduce force on wedge
	Excessive power on wedge	Reduce ultrasonic power on wedge
Wire short	Tail too long	Carry out wire clamp force check and adjustment
	Electrode to wire distance is too small	Carry out EFO height check and adjustment
Malformed ball	Excessive ultrasonic power	Reduce ultrasonic power
	Inconsistent FAB	Check floating lead
	Excessive power/force with poor set-up	Reduce bond lead
Golf club bond	Gold wire contacts the torch electrode	Reduce the torch level or the tail length
	Torch electrode is dirty	Clean electrode with alchohol
	Torch electrode wiring is broken	Repair or replace with new torch electrode

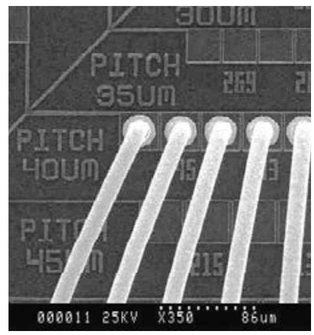
Ultra-Fine-Pitch Angle Bottleneck
UFAB Series Capillaries

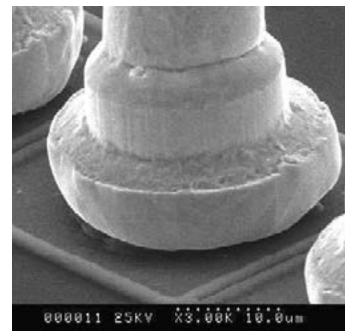
Gaiser's UFAB (Ultra-Fine-Pitch Angle Bottleneck) series is designed for ultra-fine-pitch ball bonding. The UFAB series utilizes our exclusive Process 1800 method of manufacturing combined with high-strength CZ-series materials. Process 1800 produces a maximum strength angle bottleneck geometry that is neither ground nor injection molded.

The UFAB-series is equipped with inside chamfer geometries that provide consistent small squashed ball formation size with high shear strengths and excellent wire looping characteristics. Tip sizes are available for 55µm, 50µm, 45µm, and 35µm pitch as indicated in the tables. Part numbers proven in the Gaiser Applications Technology Lab are indicated on the adjacent page.







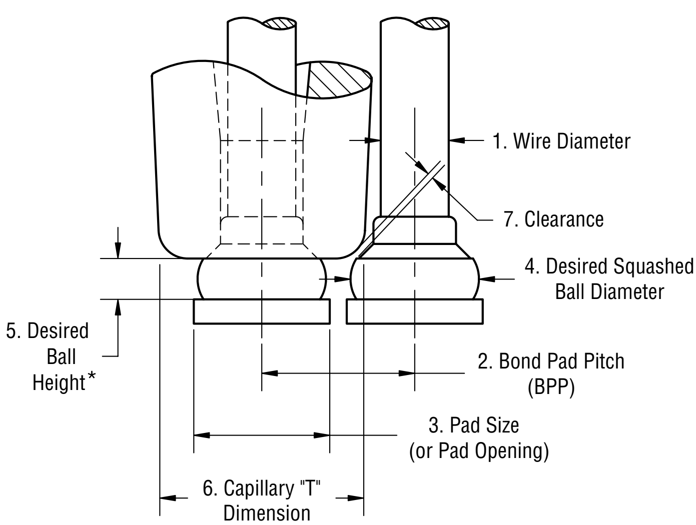


Key Elements of Ultra-Fine-Pitch Ball Bonding

Basic Application Requirements:
1. Wire diameter
2. Bond pad pitch (BPP)
3. Pad size or pad opening
4. Desired squashed ball diameter
5. Desired ball height*

Resultant Dimensions:

6. Capillary "T" dimension
7. Clearance



*Ball Height Typically = 1/3 Wire Diameter

Face Angle Table	
Series	Face Angle
180FX	0°, Flat Face
1804X	4°
1808X	8°
1811X	11°

IC Type Table	
Series	IC Type
18XXB	70°
18XXH	90°
18XXL	100°
18XXS	120°
18XXC	70°, w/ Blend Edge
18XXJ	90°, w/ Blend Edge
18XXM	100°, w/ Blend Edge
18XXT	120°, w/ Blend Edge
18XXY	SBIC
18XXZ	SPECIAL

Pitch (BPP)	Wire Dia. (mils)	*Series	*Dash Number	H in. / µm	B in. / µm	IC in. / µm	T in. / µm	OR in. / µm	AB 30° Cone	AB 20° Cone
50µ	0.9	180FH	- 10WRE	0.0010 / 25	0.0014 / 36	0.0002 / 5.1	0.0025 / 64	0.0003 / 7.6	AB10x8	AB10x8
50µ	0.8	180FH	- 9.5XRE	0.00095 / 24	0.0014 / 36	0.000225 / 5.7	0.0025 / 64	0.0003 / 7.6	AB10x8	AB10x8
45µ	0.7	180FH	- 8.5WME	0.00085 / 22	0.00125 / 32	0.0002 / 5.1	0.0023 / 58	0.0003 / 7.6	AB10x8	AB10x8
40µ	0.7	180FH	- 8.5SIE	0.00085 / 22	0.00115 / 29	0.00015 / 3.8	0.0021 / 53	0.0003 / 7.6	AB5x8	AB5x8
35µ	0.6	180FH	- 7.5LDD	0.00075 / 19	0.00095 / 24	0.0001 / 2.5	0.00185 / 47	0.0002 / 5.1	AB5x6	AB5x6

*The above series and dash numbers were validated in the Gaiser Applications Technology Lab and employ flat face, 90° single IC design. Other configurations are available using the UFAB series part number system.

Example Part Number: 1808H–10PSE–437P–20D–AB5x8–CZ3

Part Number Format Explained: 18 XX X – XXX XX – XXXX – XXX...

- Gaiser Process 1800
- Face Angle (see Face Angle Table)
- IC Type (see IC Type Table)
- Hole Size & IC Size (see Hole & IC Size Tables)
- T Size & OR Size (see T Size & OR Size Tables)
- Length & Finish
- Options (20° cone, angle bottleneck configuration, material, etc)

Hole Size Table

Dash No.	Hole Size in. / µm
- 7.5	0.00075 / 19
- 8	0.0008 / 20
- 8.5	0.00085 / 22
- 9	0.0009 / 23
- 9.5	0.00095 / 24
- 10	0.0010 / 25
- 10.5	0.00105 / 27
- 11	0.0011 / 28
- 11.5	0.00115 / 29
- 12	0.0012 / 30

IC Size Table

Designation	IC Size in. / µm
F	0.000075 / 1.9
L	0.0001 / 2.5
P	0.000125 / 3.2
S	0.00015 / 3.8
V	0.000175 / 4.4
W	0.0002 / 5.1
X	0.000225 / 5.7
Y	0.00025 / 6.4
Z	SPECIAL

T Size Table

Designation	T Size in. / µm
D	0.00185 / 47
E	0.0019 / 48
F	0.00195 / 50
G	0.0020 / 51
H	0.00205 / 52
I	0.0021 / 53
J	0.00215 / 55
K	0.0022 / 56
L	0.00225 / 57
M	0.0023 / 58
N	0.00235 / 60
P	0.0024 / 61
Q	0.00245 / 62
R	0.0025 / 64
S	0.00255 / 65
T	0.0026 / 66
U	0.00265 / 67
V	0.0027 / 69
W	0.00275 / 70
X	0.0028 / 71
Y	0.0029 / 74
Z	SPECIAL

OR Size Table

Designation	OR Size in. / µm
D	0.0002 / 5
E	0.0003 / 8
F	0.0004 / 10
G	0.0005 / 13
H	0.0006 / 15
Z	SPECIAL

Available Angle Bottlenecks

30° Cone	20° Cone
AB5x6	AB5x6
AB5x8	AB5x8
AB5x10	AB5x10
AB10x6	AB10x6
AB10x8	AB10x8
AB10x10	AB10x10

Wedge-Wedge Ultrasonic Bonding

Wedge-wedge wire bonding is the oldest semiconductor assembly process dependent solely on acoustic energy. There are a few exceptions where thermal energy (heat) is combined to further improve the welding action.

The dominant ultrasonic frequency has been for many years 60kHz. It is even lower on some applications where larger diameter wire (>38µm) is used. This was until the early 1990's when Japanese researchers, following the development and publications of Texas-based researchers, learned about the process improvements when higher ultrasonic frequencies (>60kHz) are used to bond gold wire to aluminum bond pads. Their investigation confirmed the improvements in weld reactivity (less open bond) and faster bond cycles. The major discovery was the fact that welding begins as soon as the wire contacts the surface to be bonded, creating a new welding pattern characterized by a series of parallel welding lines.

The new welding pattern does not follow the traditional low frequency pattern where the center of the bond is voided and surrounded by a welded ring. It has been published that during the welding process, lower ultrasonic frequencies begin utilizing some of the energy on wire deformation, followed by the actual welding process therefore the voided center.

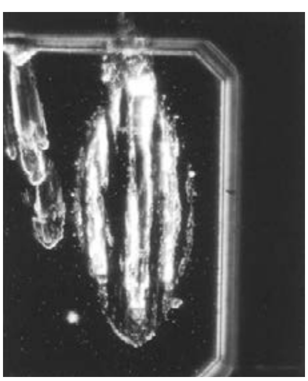


Figure 1 – After C. Alfaro 1992 – High Frequency Weld Pattern

Figure 2 – After V.H. Winchell IEEE Proceedings 1978 – Low Frequency Weld Pattern

Higher frequencies have lower vibratory amplitude, but a much higher speed of vibration that allows a great deal of energy to concentrate at the interface of the bond. The lower mechanical amplitude as reported by the Japanese researcher and confirmed by the Texas-based researchers, produce lower deformation of the weld with reduced stresses providing a much larger cross-section area that reduces heal cracks, and improves bond pull values and overall weld strength.

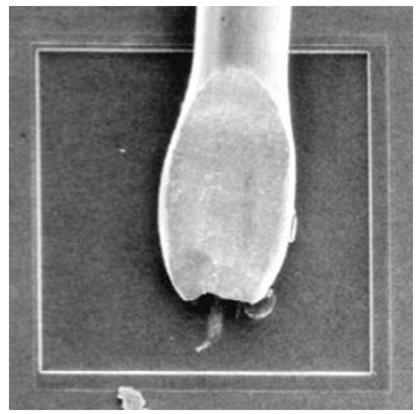


Figure 3 – High-frequency bond

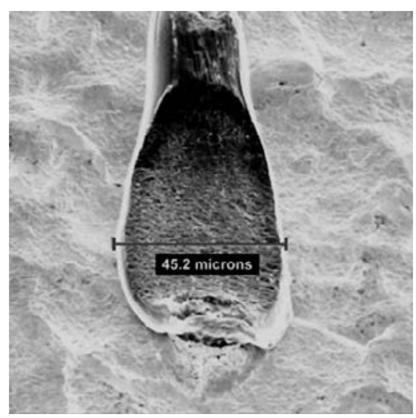


Figure 4 – Low-frequency bond

Gaiser Products Group has taken this knowledge a step further by improving its materials and geometrical design to maximize acoustical efficiency so that any of our tools can either be used by standard low ultrasonic frequencies or by higher frequencies. We recommend you contact the factory for suggested information that might help improve tool setup for those dealing with higher ultrasonic frequencies for the first time.

Small Wire Wedge Bonding

In wedge bonding, both aluminum and gold wire may be bonded. Historically, the disadvantages of wedge bonding vs. ball bonding have been speed (wires per second) and the need to rotate the work due to wedge bonders being unidirectional. Modern wedge bonders have made significant improvements in both areas. Semi-automatic and fully automatic wedge bonders have substantially increased the speed and versatility of the bonders. The "rotating head" wedge bonder has enabled 360° omni-directional bonding, similar to ball bonding.

With capillary ball bonding, time, force, ultrasonic energy, and heat are the primary components used to form a wire bond. With wedge bonding, however, both gold and aluminum wire may be bonded and no electronic flame off (EFO) is employed. The minimum requirement for gold wire wedge bonding is force to make a compression bond. For aluminum wire, both force and ultrasonic energy are necessary. Additionally, the component of heat may be available in the form of a heated stage or tool heat. Wedge bonding is generally referred to as Ultrasonic Bonding.

Ultrasonic Bonding: Ultrasonic energy is applied to the wedge tool through an ultrasonic transducer. The ultrasonic energy provides a mechanical scrubbing action which breaks through the surface oxide film and also generates frictional heat. Heat in the form of a heated tool or device may or may not be available.

Wedge bonding is commonly used for aluminum wire chip-on-board (COB) applications, and gold wire for microwave and hybrid devices. In addition to gold wire, gold ribbon is becoming increasingly more popular for high frequency devices.

Aluminum wire wedge bonding offers better cost benefits than that of gold wire. In general, wedge bonding allows bonds to be placed on small, narrow pads at fine pitches in a cost-effective manner.

For microwave devices, wedge bonding offers a low, flat, short loop for maximum high-frequency electrical performance. Additionally, the wire loop shape may be controlled to a specific profile to "tune" a microwave device. Ribbon bonding makes use of the "skin-effect" observed in high- frequency telecommunications, microelectronics, and antenna technology.

Wedge Design

Wedge tip designs for many years have been limited to two types, the V-notch and the Maxiguide(or pocket type). The V-notch was developed first and had largely been obsoleted by the Maxiguide, which provides superior wire centering. The V-notch however, allows for a minimum "W" dimension for access into small recessed pads and a complete back radius (BR) which provides good 1st bond heels and 2nd bond tailing. Gaiser's new patent pending MaxiBond™ design actually provides the positive aspects of both the V-notch and the Maxiguide in one new architecture, the MaxiBond.

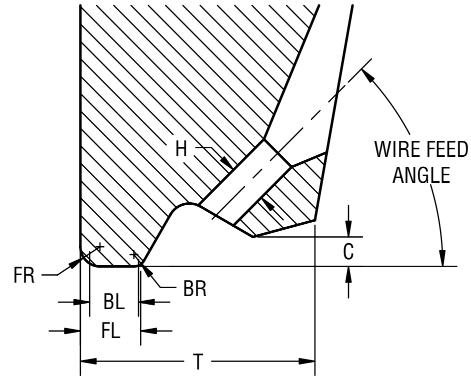


Figure 5 – Cross-sectional view of a V-notch wedge with standard dimensions identified

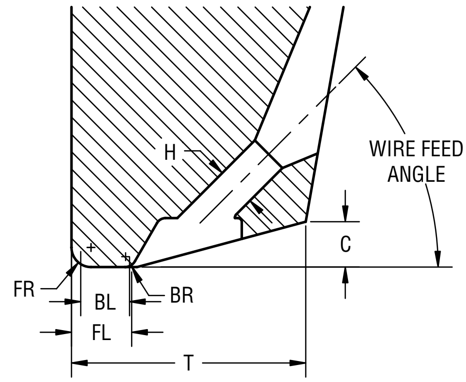


Figure 6 – Cross-sectional view of a Maxiguide wedge with standard dimensions identified

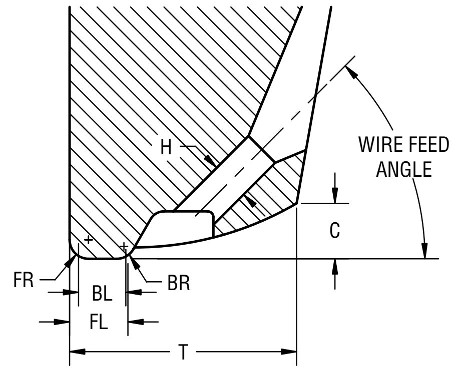


Figure 7 – Cross-sectional view of a MaxiBond wedge with standard dimensions identified

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www.gaisertool.com

The wedge shank is generally 1/16 inch diameter (1.58mm) with a shank flat secured by a set screw. Lengths are available in industry standard sizes up to 1.078 in./27.38mm and longer (by special order).

In addition to being longer than a capillary, a significant advancement in wedge design has been the vertical feed, deep access wedge. Most wedge bonders feed wire into the tool at 30°, 38°, 45°, or 60° wire feed angles (relative to the horizon). Deep access, vertical feed wedge bonders are able to initially feed the wire vertically, like a capillary. The wire either passes vertically through a hollow (tubular construction) wedge, or through the transducer via a double shank flat design. Such vertical feed designs allow access into packages where a conventional 30° or 45° wire feed angle may have an interference problem.

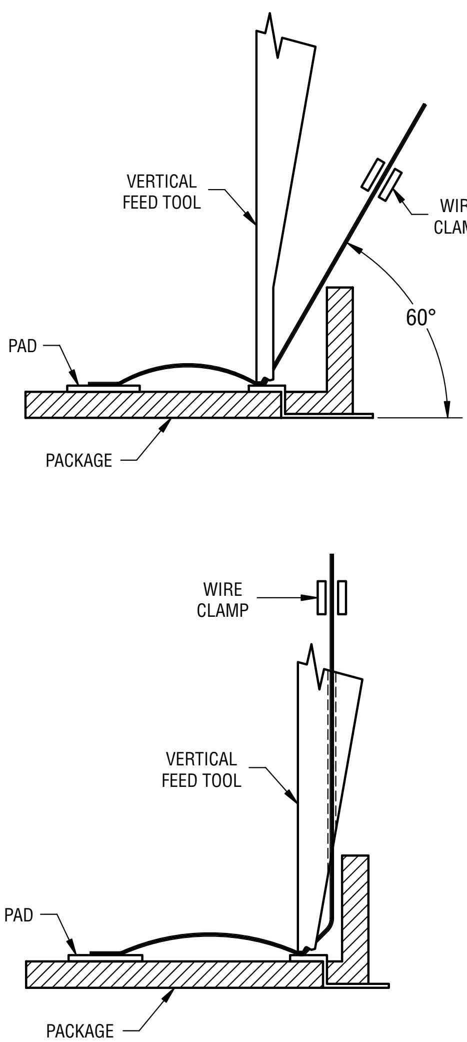


Figure 8 & 9 – Conventional and deep access bonding

The Bond Foot (comprised of FR, BL, & BR)

The "bond foot" is the portion of the wedge that makes the impression in the bonded wire. The entire feature is comprised of the front radius (FR), the bond length (BL), and the back radius (BR). These indiviual features have tolerances and therefore potential tolerance stack.

To prevent the individual FR, BL, & BR tolerances from accumulating to form a too small or too large overall condition, Gaiser employs a control dimension called the foot length (FL) dimesion. The FL has an individual tolerance that prevents tolerance stack of the FR, BL, & BR.

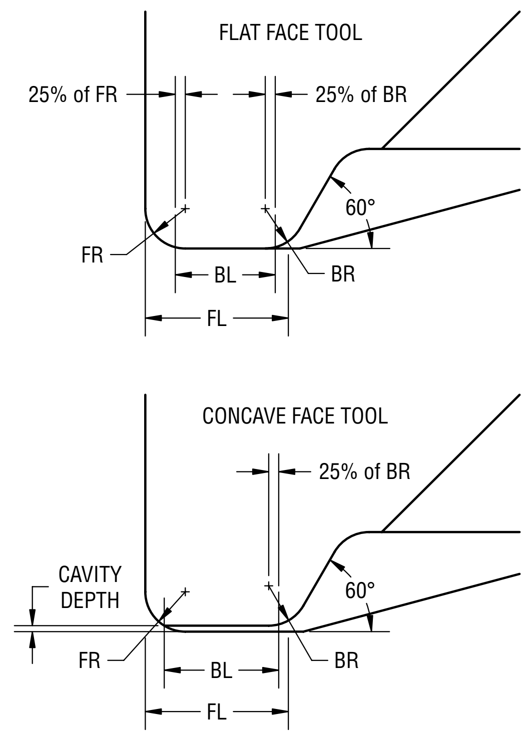


Figure 10 & 11 – Bond foot dimensions of a flat face and concave wedge

The FL dimension is measured from the FR to the theoretical intersection of the back radius angle and the plane of the bond foot, as shown above. The bond flat (BF) is the flat portion of the bond foot. On a flat face tool, the BF is the distance between the FR and the BR.

Bond Length (BL)

The bond length (BL) for a flat-face wedge (see Figure 10) includes 25% of the BR, 25% of the FR, and the BF. For a concave wedge (see Figure 11), the BL begins where the concavity depth truncates the FR in the center of the BF and includes 25% of the BR.

Choosing the BL is driven by the wire diameter and the size of the bond pad. Typical bond lengths are 1.5 to 2.5 times the wire diameter. Occasionally, the bond pad may be so small that it forces the use of a very small bond length. Bond lengths as small as 0.0010 in./25μm to 0.0007 in./18μm or 0.0005 in./13μm are used on small components and microwave devices.

Bond Pad Size in. / μm	Bond Length in. / μm
0.0030 / 76	0.0020 / 51
0.0035 / 89	0.0020 / 51 to 0.0022 / 56
0.0040 / 102	0.0025 / 64
0.0050 / 127	0.0030 / 76

Front Radius (FR)

The front radius (FR) provides the transition from the wire to the second bond. This transition, commonly referred to as the toe of the second bond, varies in size depending on the size of the FR. Most of the standard series of wedges, designed for aluminum wire, have an FR of 0.0010 in./25μm or larger to minimize second bond toe cracks. Gaiser designs the aluminum wire wedge FR to be the same size or larger than the wire diameter to be bonded.

For gold wire applications, particularly when the wire diameters are 0.0010 in./25μm or smaller, the FR can be smaller than the wire diameter. A 0.0004 in./10μm FR is available in the microwave wedge series.

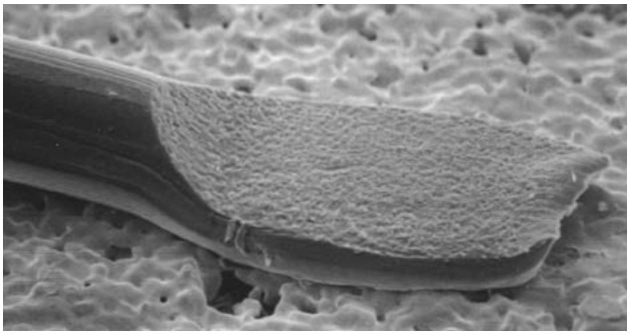


Figure 12 – 2nd bond formed from wedge with an FR of 0.0010 in./25μm

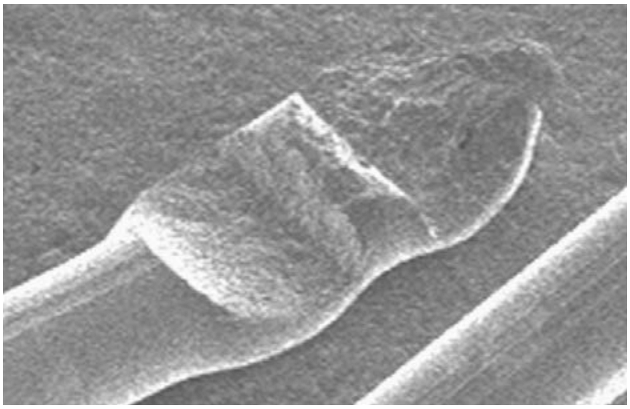


Figure 13 – Gold wire lead bond formed with a wedge having a 0.0004 in./10μm FR

Gaiser has specified the appropriate front radius values for various aluminum and gold wire wedge series that are available in our catalog for numerous applications. Modifications to the existing FR values is seldom necessary.

Back Radius (BR)

The back radius (BR) has two functions:

1. To provide the transition between the wire and the first bond or die bond
2. To provide the area on the wedge where the wire will terminate on the lead bond

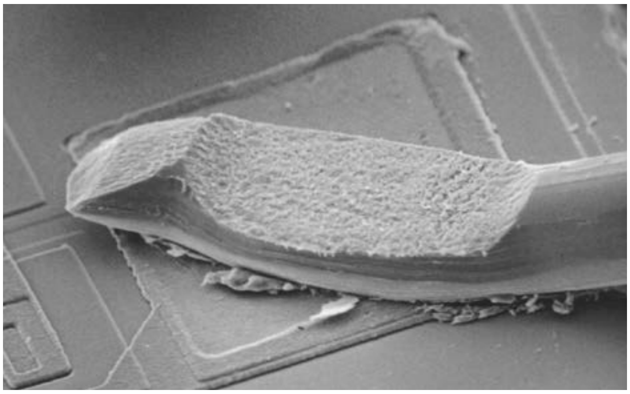


Figure 14 – Die bond made with part number 2130-2525-L with a standard BR. The length of wire not bonded on the left side is referred to as the tail. The tail length should not extend beyond the pad due to shorting problems. The standard BR helps provide for very consistent tailing.

Heel crack problems are more commonly associated with aluminum wire than with gold. They are also more frequent with 30° wire feed angle bonding than with steeper wire feed angles. This is due to the wire being worked more during looping. The wire starts out at a 30° angle, is flexed to 90° during the beginning of the loop, and is then returned to approximately 30° after the lead bond is made.

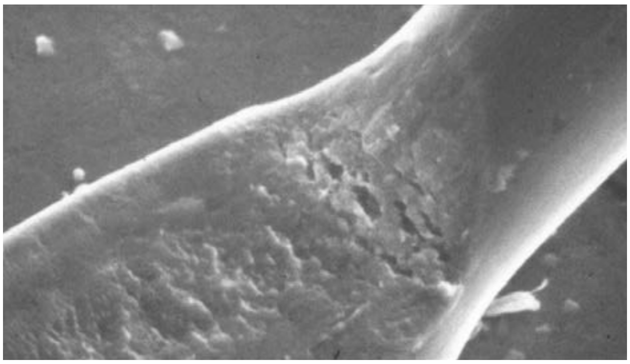


Figure 15 – Example of a minor heel crack

The amount of heel cracking allowed depends on the quality standards of the end customer. In some cases, minor heel cracking is acceptable. BR shape and size may help to eliminate or reduce heel cracking.

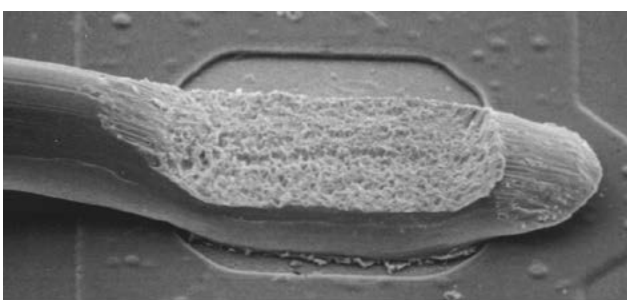


Figure 16 – Bond made with part number 2131-2525-L, standard with elliptical back radius

The elliptical back radius (ELBR) provides a stronger bond by increasing the amount of cross-sectional area of the heel but may cause inconsistent tailing as it creates a stronger heel area. This helps to reduce heel cracks often associated with standard wedges. The ELBR, generally used for aluminum wire, is standard for the 2131 series and available as an option on other Gaiser wedges.

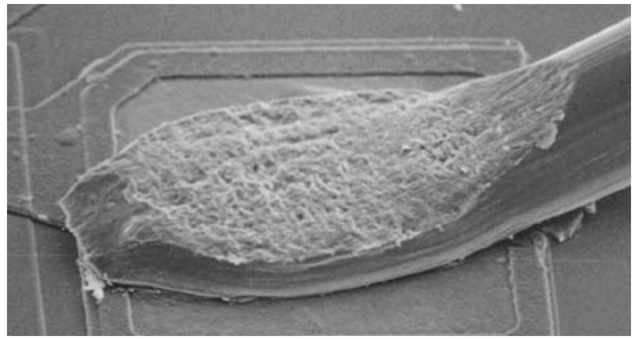


Figure 17 – Bond made with part number 2130-2525-L-CBR, a maxiguide style wedge with a chamfered back radius

A chamfer back radius (CBR) produces an angled transition as opposed to a radiused BR and helps to reduce heel cracks. As with the ELBR, the CBR is generally used with aluminum wire and may cause inconsistent tailing due to the stronger heel area.

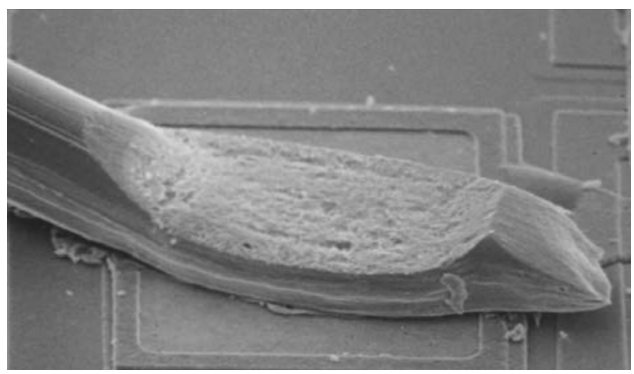


Figure 18 – Example of die bond made by the wedge part number 2160-2525-L-PBR-PFR, a polished front and back radius wedge

The polished back radius (PBR) and polished front radius (PFR) help reduce the amount of aluminum build-up on the bond foot but may reduce the ultrasonic energy transmission from the tool to the wire. These options produce a smooth appearance at the heel of the first bond and the toe of the second bond. The PBR may also help to reduce heel cracks.

Figure 19 – Typical wedge lead bond. Tail length is minimal because the wire is terminated at this bond.

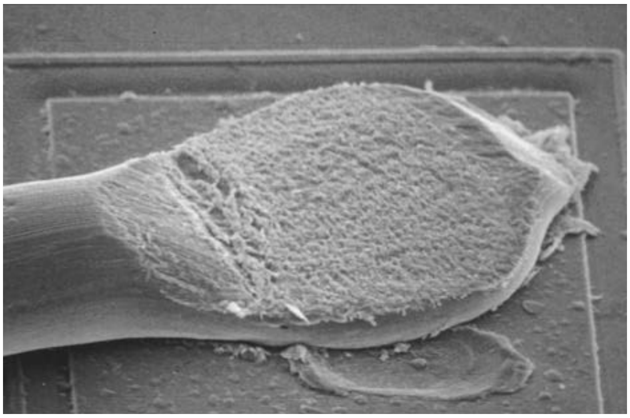


Figure 20 – Example of a smashed wedge bond

A smashed bond may occur if there is insufficient tail length under the bond. This is often caused when the BR does not break the wire correctly. There must be enough wire under the FR and the BR to equalize the extrusion forces during bonding or overbonding and/or a weak heel may result.

Hole Diameter (H)

The general design rule for the wedge hole diameter (H) is that the hole size should be 1.5-2 times the wire diameter. A tighter wire to hole size relationship will improve bond placement accuracy. If the hole is too small, wire scratch may result.

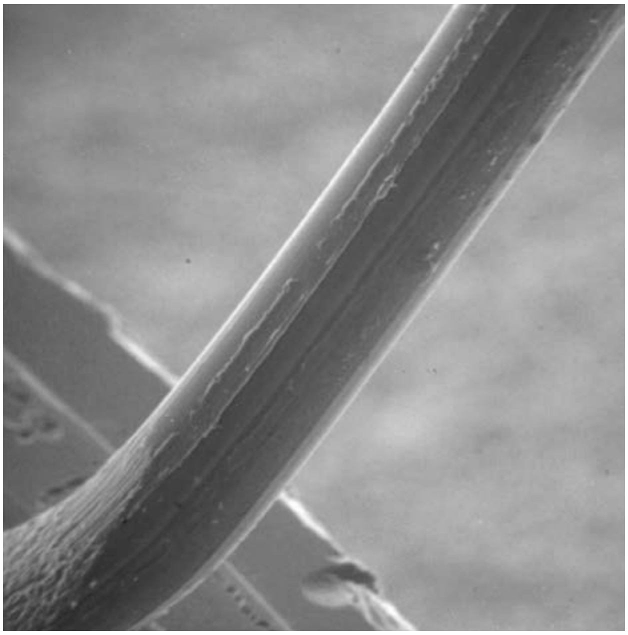


Figure 21 – Example of a scratched wire

Possible causes for a scratched wire:

1. Wire is being fed into the hole of the wedge at an incorrect angle
2. Wire is already scratched as it comes off the spool
3. Wire clamp system not adjusted correctly
4. Foreign material is present inside the wedge due to the bonding conditions
5. Wedge has wire build-up and needs to be replaced
6. Rough edge exists in the hole
7. Hole is too small for the wire diameter

Gaiser polishes the wedge wire feed hole as a standard manufacturing operation on all wedges.

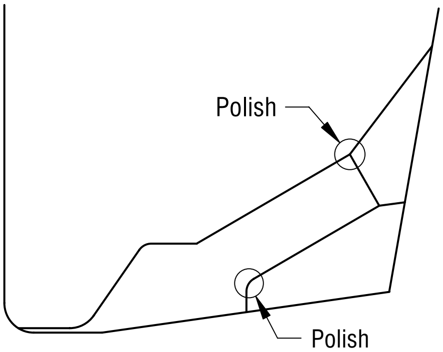


Figure 22 – Hole polish detail of a 30° wire feed angle wedge

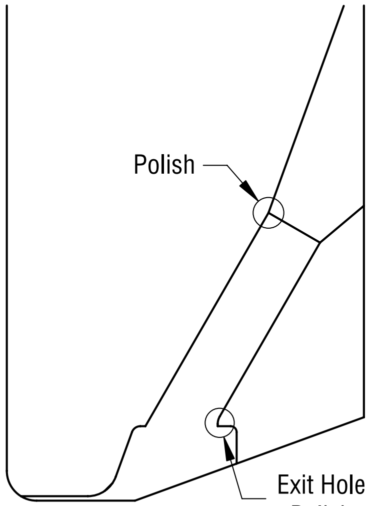


Figure 23 – Hole polish and exit hole relief of 60° wire feed angle wedge

Also available, and primarily used in fine pitch applications, is an oval hole design. The oval hole provides the lateral (side to side) bond placement accuracy of a smaller hole relative to the wire diameter while maintaining the wire feed and looping characteristics of a larger hole diameter.

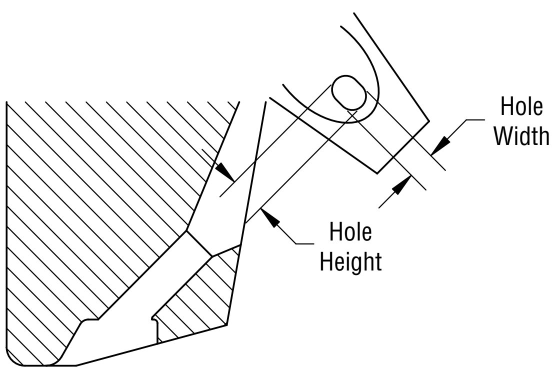


Figure 24 – Oval Hole design

Table-Tear & Clamp-Tear

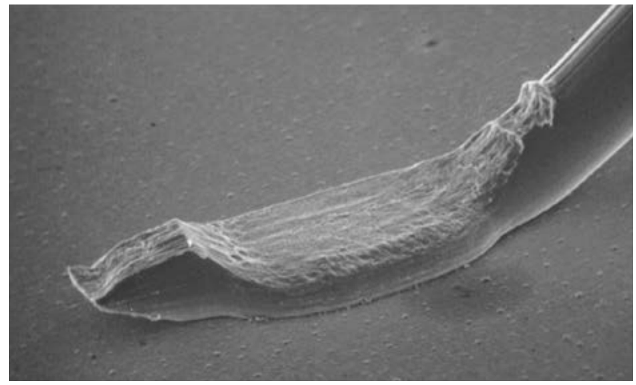
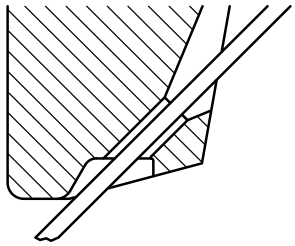


Figure 25 – Table-tear bond - The clamp is closed shortly after the second bond. The tool then moves upward and back to break the tail. Note: Nick in wire caused by BR during termination.

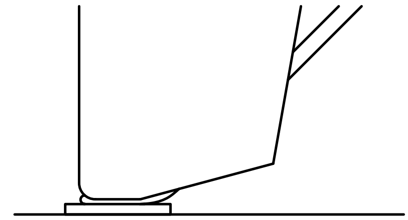
There are two methods used to terminate the wire after the second bond. These methods are bonding machine dependent and are commonly called, "table-tear" and "clamp-tear." Most deep access bonders and some conventional bonders utilize the table-tear method.

The clamp-tear method is the standard method of termination for conventional bonding. In this method, the clamp remains open during completion of the lead bond. While the wedge is still on the wire, the clamp closes and pulls back away from the wedge. This motion causes the wire to terminate at the BR. The wedge then rises and the clamp system moves down. This forces the wire to feed out leaving the tail under the bond foot for the next bond.

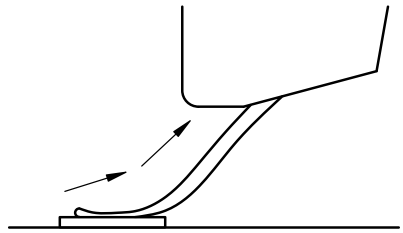
One benefit of the clamp-tear method is that the bond is not stressed (lifted) when terminating the wire. Another benefit is that there is no nick in the wire above the heel which may be present when using the table-tear method. The biggest disadvantage of the clamp-tear method is that the clamp system can interfere with the package wall or other devices thereby restricting deep-access use.



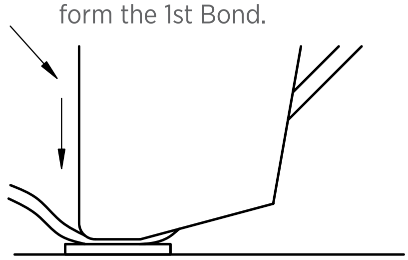
1. The bonding process begins with a threaded wedge.



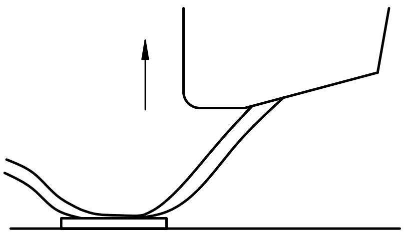
2. Force and Ultrasonic Energy are applied to form the 1st Bond.



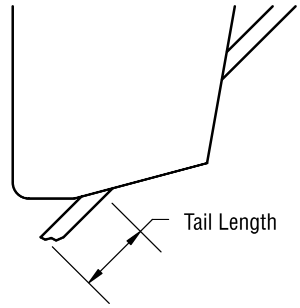
3. The Looping Sequence



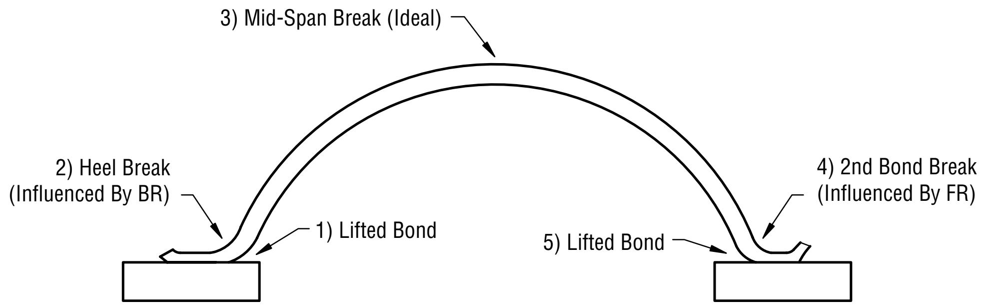
4. Force and Ultrasonic Energy are applied to form the 2nd Bond.



5. The wedge rises before the tear method is engaged.



6. The Clamp-Tear or Table-Tear methods are used to break the wire and the cycle begins again.



Preferred Failure Modes

- Mid-Span Break (Bond Strength exceeds Wire Tensile Strength)
- 2nd Bond Break
- Heel Break

Undesirable Failure Modes

- Low-Strength Heel Breaks
- Lifted Bond

Materials & Tip Configurations

The wire material (gold or aluminum) being bonded generally determines the material specified for the wedge and the bond foot configuration. Tungsten Carbide (WC) combined with a concave bond foot is the industry standard for small aluminum wire. For gold wire, Titanium Carbide (TiC) or a "Cermet" material combined with a flat face and possibly a cross groove, are the standards.

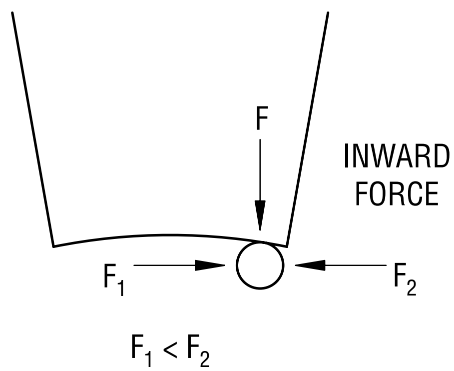


Figure 26 – Inward force created by concave foot

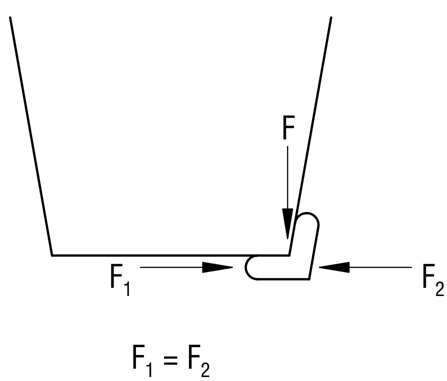


Figure 27 – Outward bond extrusion with flat face

Cermet is a ceramic-metal alloy that exhibits a very rough and aggressive surface finish. This rough finish provides a mechanical coupling with the wire and effectively transmits ultrasonic energy at reduced power settings. Additionally, cermet material generally provides a longer tool life than carbide materials.

The cross groove feature also provides a mechanical coupling for ultrasonic energy transmission between the wedge and the wire. As the wire is extruded up into the cross groove, it is "gripped" during bonding. A bond length of at least 0.0015 in./38µm is necessary to allow for enough space for a cross groove. The cross groove and cermet combination have proven to be highly effective for gold wire bonding.

In addition to the traditional gold color cermet (CER), Gaiser has introduced black cermet. Black cermet (BKCER) exhibits improved dimensional stability and smoother holes for reduced wire scratch while still providing a rough, aggressive finish on the bond foot. When compared to a competitor's standard gold cermet, Gaiser black cermet has demonstrated improved pull strengths. Additionally, the visual contrast between the black cermet and gold wire is helpful to operators during set-up and operation.

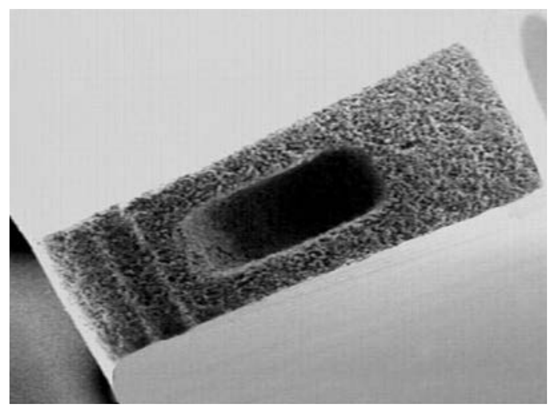


Figure 28 – Cermet-tipped, cross groove wedge

The photos above and below are the same wedge part number. The top is a cermet material and the bottom is a tungsten carbide material.

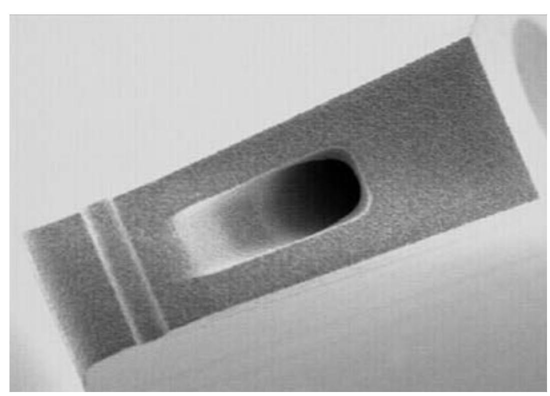


Figure 29 – Tungsten carbide (WC), cross groove wedge

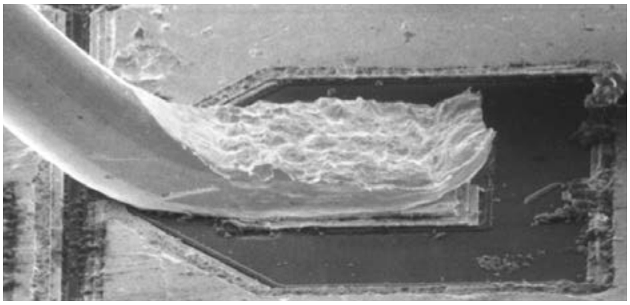


Figure 30 – Bond formed with a cermet-tipped wedge

Gaiser wedges typically default to tungsten carbide (WC) material and a concave face which is best suited for aluminum wire. Titanium carbide (TiC), cermet (CER), a flat face (F), and a cross groove (CG) are all options that must be specified in the part number and are generally affiliated with gold wire bonding. The 2MXX and 2GXX series wedges are standard with flat faces (both) and cross grooves (2GXX only) as they are designed for small geometry microwave and/or gold wire applications.

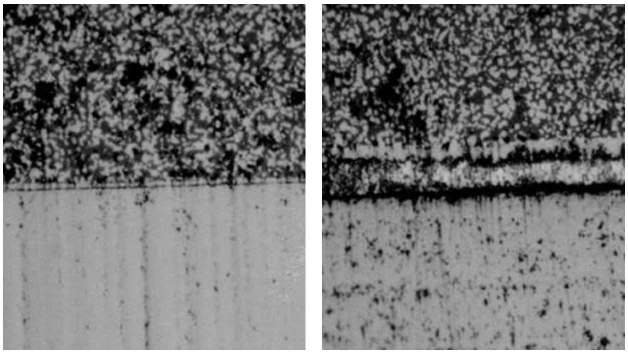


Figure 31 & 32 – Gaiser cermet wedges (left) exhibit a near-zero thickness material junction. The competitor's wedge (right) exhibits a large braze/solder joint.

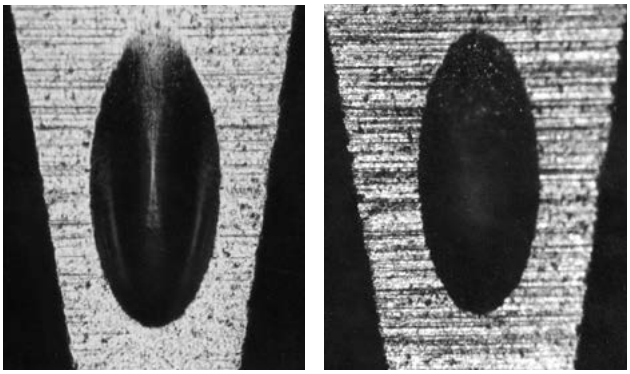


Figure 33 & 34 – Gaiser cermet wedges (left) are polished at the countersink exit. The competitor's cermet wedge (right) exhibits an "as EDM'ed" finish and coarse grinding marks.

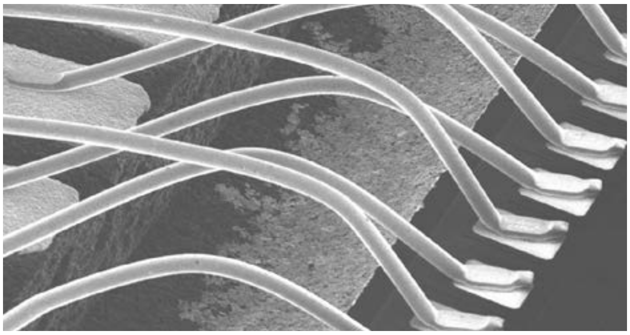


Figure 35 – Typical IC wedge bonded aluminum wire

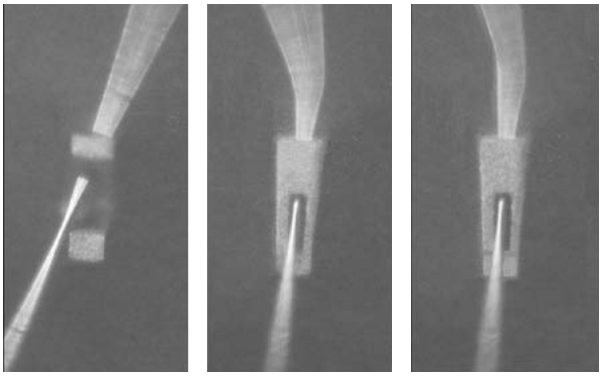
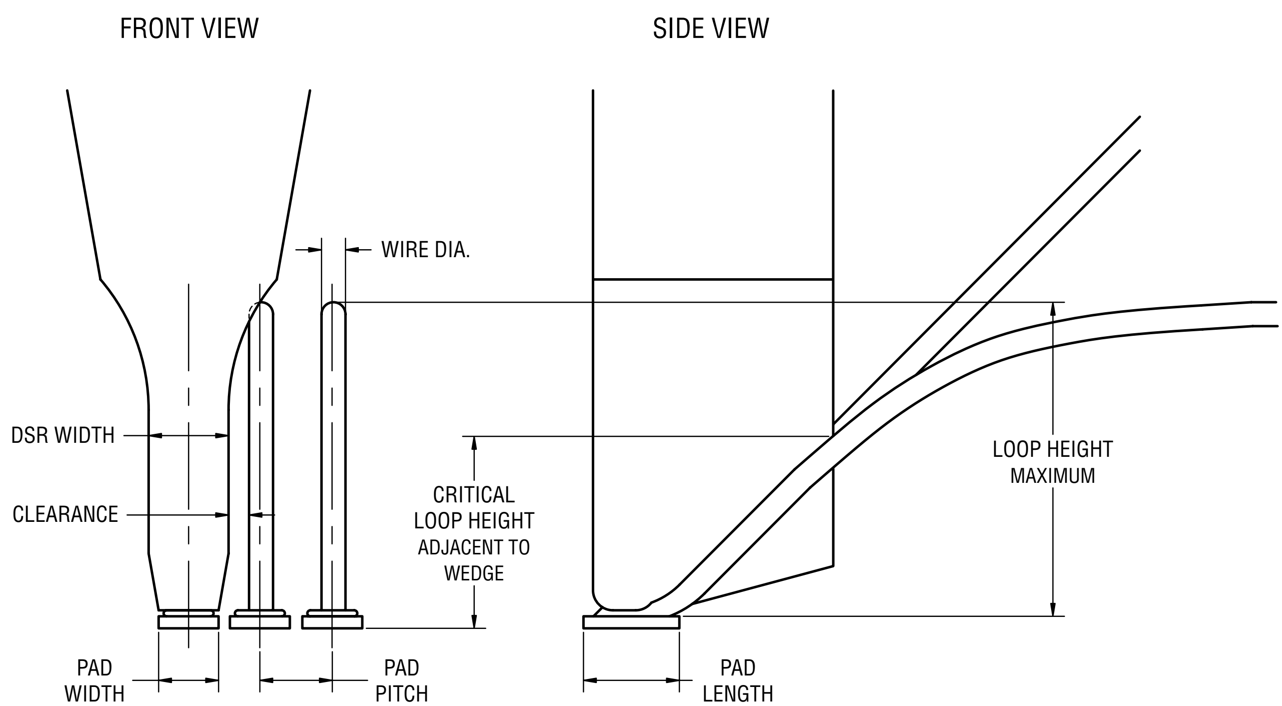


Figure 36, 37, & 38 – Comparison of the wire being guided through V-notch (left) and Maxiguide (middle) and MaxiBond (right) style wedges.

Chip On Board Bonding (COB)

The majority of chip on board (COB) products require a 30° wire feed. Gaiser 2130 series wedge has gained the most acceptance in the industry for these applications by offering low cost, accurate wire placement, and consistently small tails.

For standard applications using 0.0010 in./25µm to 0.00125 in./32µm diameter aluminum wire, Gaiser part number 2130-2025-L has proven to be an effective, easy to tune, and long lasting wedge. At 100µm pitch, the 2130-2020-L-W=003 has become a commonly used part number. For below 100µm pitch, the 2130-2020-L-DSR(004x010)-ELBR-W=003 has gained popularity. This wedge features the double side relief (DSR) and a narrower foot width (W) for the close bond pad pitch requirements. The elliptical back radius (ELBR) feature is also added to this wedge to aid in directing the wire to the center of the bond pad for superior wire placement.



Important Elements for Determining the Proper Tools in Fine-Pitch Wedge Bonding Applications

Bond Pad Pitch: The distance between the centers of the bond pads.

Bond Pad Width: Affects the selection of the tool "W" dimension.

Bond Pad Length: Affects the selection of the tool Bond Length (BL).

Loop Height: The most important height is the critical loop height directly adjacent to the side of the wedge.

Clearance: This is determined by bonder accuracy, pad pitch, tool selection, and customer preference. The most common minimum clearance is 0.0005 in./13μm.

$$\text{CLEARANCE} = \text{PITCH} - \frac{\text{DSR WIDTH} - \text{WIRE DIAMETER}}{2}$$

Fine-Pitch Wedge Bonding

The key to achieving fine-pitch wedge bonding is to provide clearance between the already bonded wire's adjacent critical loop height and the wedge itself as it performs the next bond. Reducing the tip width (the "W" dimension) will allow bonding at a smaller pitch with a given part number. However, to truly achieve very fine pitch wedge bonding, a double side relief (DSR) is necessary.

General Fine-Pitch Wedge Bonding Guide 30° to 45° Wire Feed Angles			
Pitch µm	Wire Diameter in. / µm	DSR	W
150	0.00125 / 32	N/A	0.004+
125	0.00125 / 32	N/A	0.004
100	0.00125 / 32	N/A to (0.005x0.010)	0.003
80	0.00125 / 32	(0.004x0.010)	0.003
60	0.00125 / 32	(0.003x0.008)	0.0025
50	0.0010 / 25	Special Design	

N/A = not applicable, unnecessary

The previous page shows the relationship between the bond pad pitch, the bond pad size (sometimes called the bond pad opening), the wedge tool with a DSR, the wire (both the critical adjacent and maximum loop heights), and the clearance. The necessary clearance is somewhat arbitrary with the bonder accuracy playing a large role in how small the clearance may be – minimal clearance is desirable because then a maximum DSR width can be used. A maximum DSR width provides the strongest wedge tool and maintains better ultrasonic energy transmission characteristics as well as a larger countersink for easier threading.

Fine-Pitch Wedge - Hole Size (H)

As stated earlier in the wedge bonding section of this catalog, the general design rule is that the hole size should be 1.5-2 times the wire diameter. Fine-pitch wedges may require a tighter hole to wire relationship, such as 1.4-1.8 times the wire diameter. Additionally, the oval hole option may be beneficial in fine-pitch bonding for a very tight lateral (side to side) relationship for bond placement while still maintaining low wire drag for looping and bonder speed (wires per second).

Fine-Pitch Wedge - Bond Length (BL)

The general design rule for bond length (BL) is 2 times the wire diameter. Fine-pitch wedges, however, may require 1.5-1.8 times the wire diameter due to reduced bond pad openings. The expected deformed bonded wire width is 1.3-1.8 times the original wire diameter. Longer bond lengths tend to produce more narrow bond widths.

Fine-Pitch Wedge - Part Number Guide

General Fine-Pitch Wedge Part Number Guide 2130, 2131, 2138, 2145-(H & BL)-"Options"	
Pitch µm	Part Number Guide
150	21XX-(H & BL)
125	21XX-(H & BL)
100	21XX-(H & BL), W=003, Possible DSR(005x010)
80	21XX-(H & BL), DSR(004x010), W=003
60	21XX-(H & BL), DSR(003x008), W=0025
50 and below	Special Design, Consult Factory

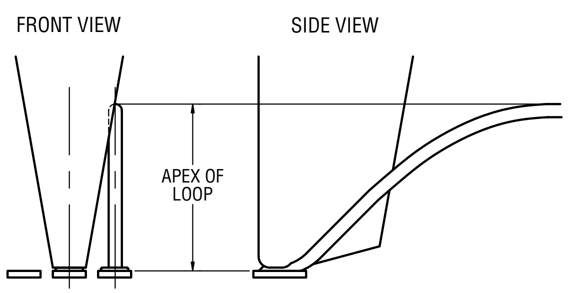


Figure 39 – Typical wire loop profile after the first wire is bonded. Note that the already bonded wire does not collide with the side of the wedge because the apex of the loop is behind the wedge. Since the majority of the looping profiles are at a low angle, the primary fine-pitch problem is clearing the adjacent bond and the critical loop height (see adjacent page for critical loop height).

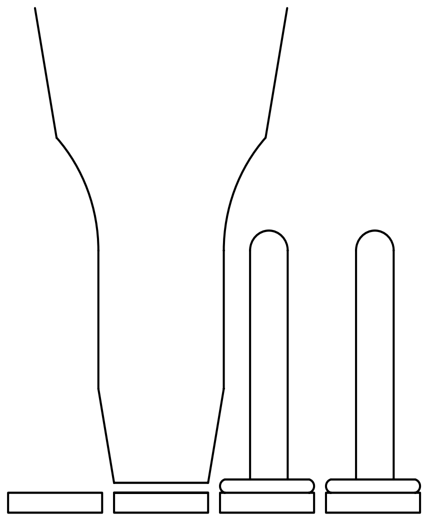


Figure 40 – Drawing showing the double side relief (DSR)

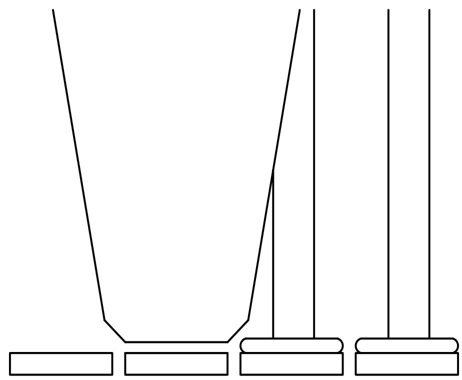


Figure 42 – Drawing showing the advantage of a 45° side chamfer

The double side relief (DSR) option is designed to provide the clearance necessary when bonding down inside a cavity, between an obstruction, package wall, or other device. The DSR modification must be specified in the part number as "DSR (Width x Height)."

The 45° side chamfer modification is beneficial in fine pitch bonding because it allows the wedge to maintain most of its mass resulting in efficient transfer of ultrasonic energy. It allows the use of a larger "W" dimension while still maintaining clearance to the adjacent bond. The 45° side chamfer can be added to the maxiguide style wedge without weakening the guiding slot walls. Specify this option in the part number as "45SC(W=specify)".

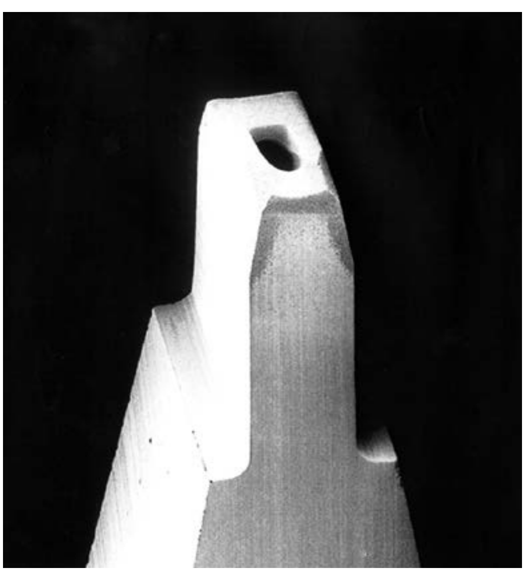


Figure 41 – Photo of tool with a double side relief
Note: Tool also has a 45° side chamfer modification

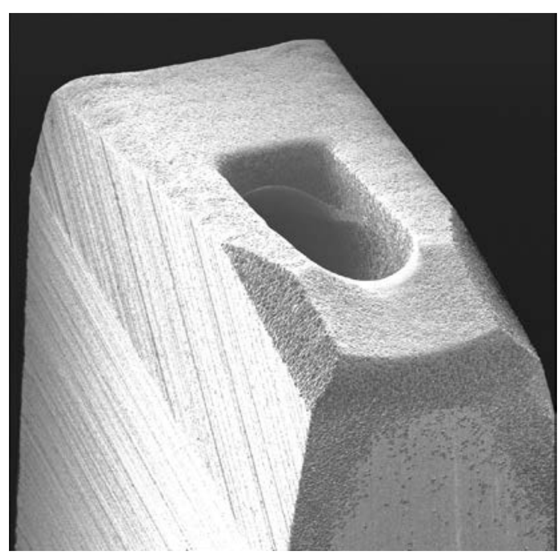


Figure 43 – Photo of a 45° side chamfer modification

Also see MaxiBond™ Series pages 80 and 81

Large Wire Wedge Bonding

"Large wire" wedge bonding generally refers to wire diameters of 0.004 in./100μm to 0.030 in./760μm with 0.005/127μm to 0.015 in./380μm being the most common. Because the range for "small wire" is usually defined from 0.0007 in./18μm to 0.002 in./50μm, this leaves 0.003 in./76μm wire in the middle. This is most likely the reason for so few 0.003 in./76μm wire applications. Virtually all large wire wedge applications utilize aluminum wire for cost reasons with the exception of certain "exotic" applications.

Most large wire wedge bonders use a single groove wedge tool and a separate cutter blade while some bonders utilize a wire feed hole at the tip with the same configuration as a small wire wedge. A patented design by Orthodyne Electronics incorporates a cutter blade at the tip in a groove parallel to the groove used for making the wire bond (see Figure 45).

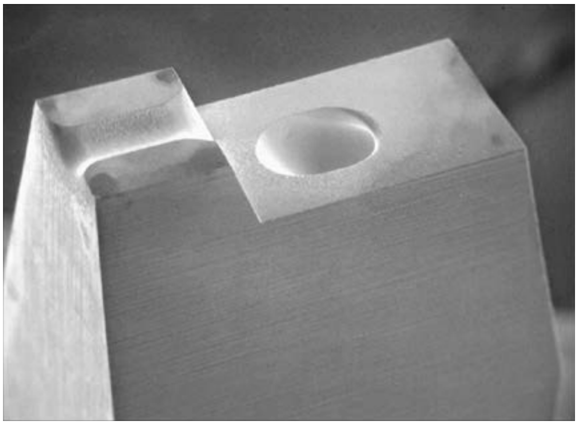


Figure 44 – Wire feed hole style large wire wedge

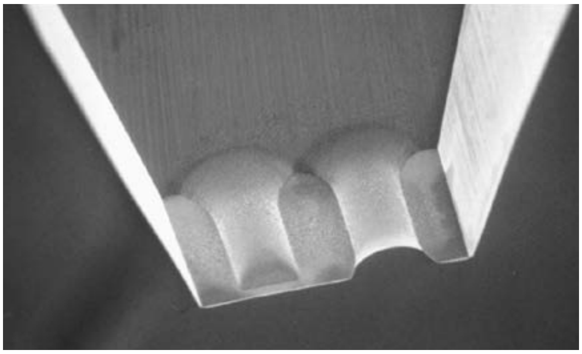


Figure 45 – Patented Orthodyne cut-off ridge design

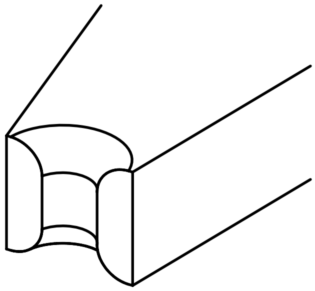


Figure 46 – Drawing shows a typical U-groove style wedge

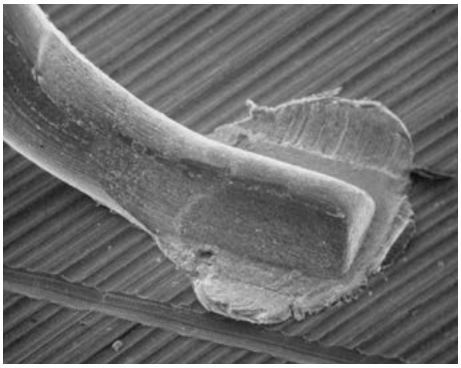


Figure 47 – Bonds made with a U-groove wedge may exhibit surrounding wire smash-out. Also called "wings" or "ears"

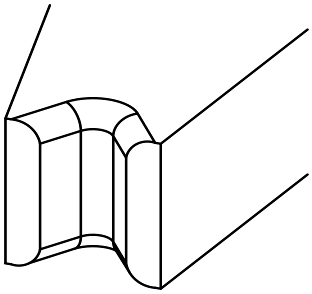


Figure 48 – Drawing shows a typical V-groove style wedge

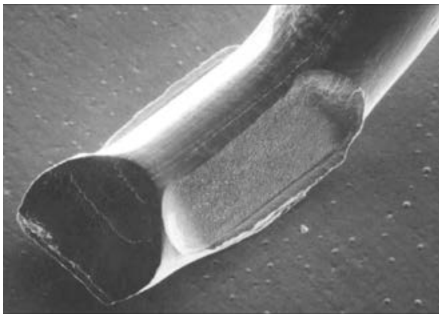


Figure 49 – Bonds made with a V-groove wedge exhibit minimum smash-out

Ribbon Wedge Bonding

Ribbon bonding is accomplished using a wedge-style tool that is designed essentially the same as a small wire wedge except the wire feed hole is a horizontal slot, not a round hole. This is needed to facilitate the feeding of a flat ribbon as opposed to conventional wire. Many high-frequency devices utilize ribbon bonding due to the "skin affect" of a high-frequency signal.

Gaiser offers ribbon bonding version of wedge tools for virtually all wire bonders, both standard and deep access.

Ribbon wedges are available in all standard wedge materials for both gold and aluminum ribbon (WC, TiC, and cermet).

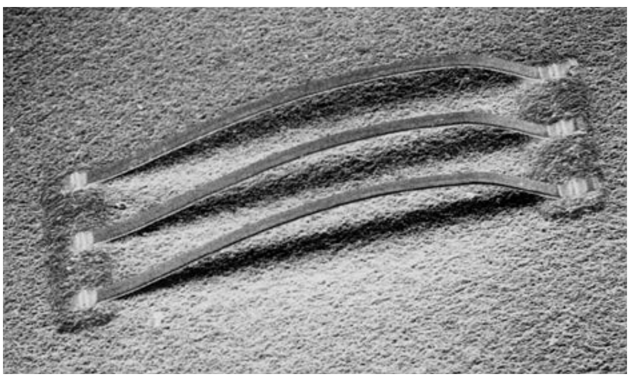


Figure 50 – Example of aluminum ribbon bonds. Note the cross groove impressions in the bonds.

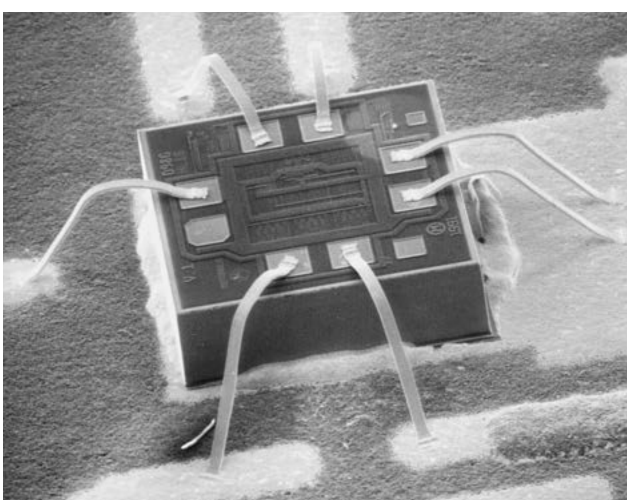


Figure 51 – Device bonded with gold ribbon

Wedge Finish

All of the Gaiser wedges come standard with an EDM matte finish. The standard EDM matte finish is commonly used for both aluminum and gold wire.

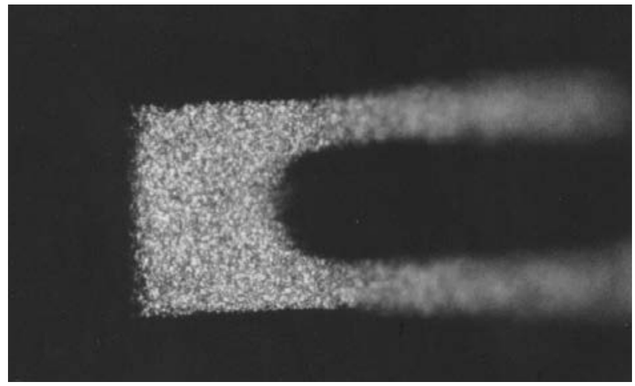


Figure 52 – Standard EDM matte finish

In some cases, the entire bond foot is polished (PBF) in an attempt to minimize build-up on the wedge. As the polishing of the bond foot inhibits good transfer of ultrasonic energy, the polished bond foot is not recommended, unless other options fail to provide the desired results. The PBF may also be called out if having shiny bonds instead of matte finish bonds is required.

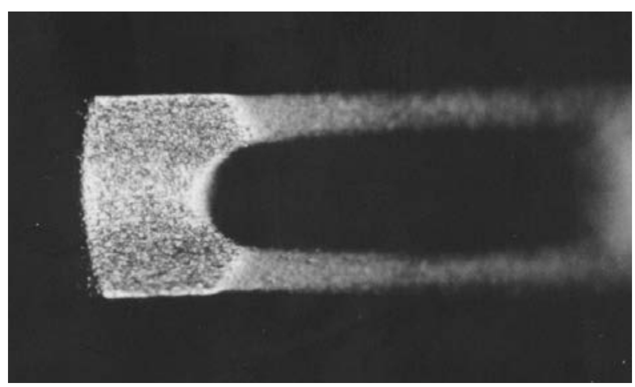


Figure 53 – Example of a polished bond foot

Aluminum Wedge Cleaning

Aluminum build-up occurs on the bonding foot of the wedge after a period of usage. Polishing the FR and BR, using a fine matte finish (FMF), or changing styles of wedge can aid in reducing the quickness of this build-up.

Eventually, the aluminum deposits left on the surfaces of the wedge will require the wedge to be cleaned or replaced.

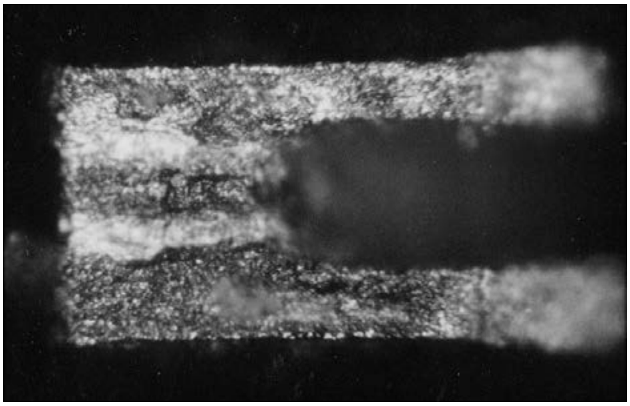


Figure 54 – MaxiGuide™ wedge with aluminum build-up accumulated after 100,000 bonds.

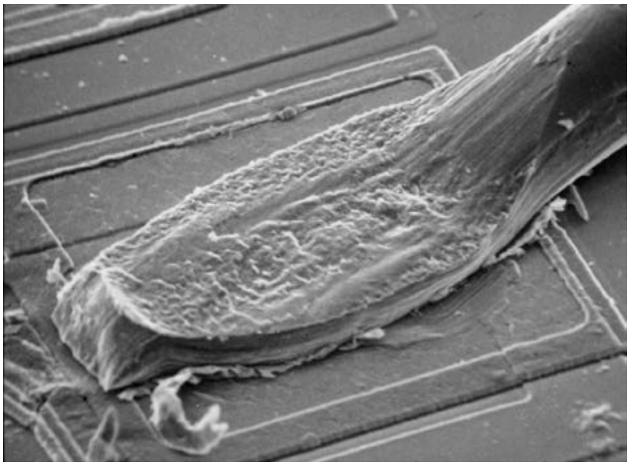


Figure 55 – Slightly deformed bond surface caused by using a wedge with aluminum build-up. A similar appearance may be caused by a worn wedge.

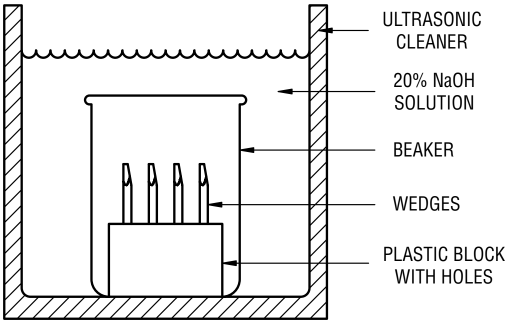


Figure 56 – Aluminum cleaning set-up

Aluminum can be etched away from the bond foot of the wedge by using a 20% by weight solution of sodium hydroxide (NaOH). An ultrasonic cleaner should be used, if available, to speed up the etching process. Using an ultrasonic cleaner, the process takes about 10 minutes. Without the aid of an ultrasonic cleaner, the process may take up to two hours. A plastic block with holes drilled to hold the wedges is necessary to keep the tool tips from vibrating together in the ultrasonic cleaner as shown above.

After the wedges are removed from the solution of NaOH, they should be rinsed in deionized water and blown dry for at least two cycles. Each wedge cleaned should then be inspected for cleanliness and wear. For stubborn aluminum deposits, this process can be repeated. In addition to the above cleaning procedure, if the wedge has aluminum build-up in the hole, a piece of tungsten wire or an unplugging probe can be used. If a wire or probe is used, the NaOH cleaning procedure should be repeated. This will assure that no flakes of metal are lodged in the hole, countersink, or maxiguide slot area that could cause wire feeding problems or device contamination.

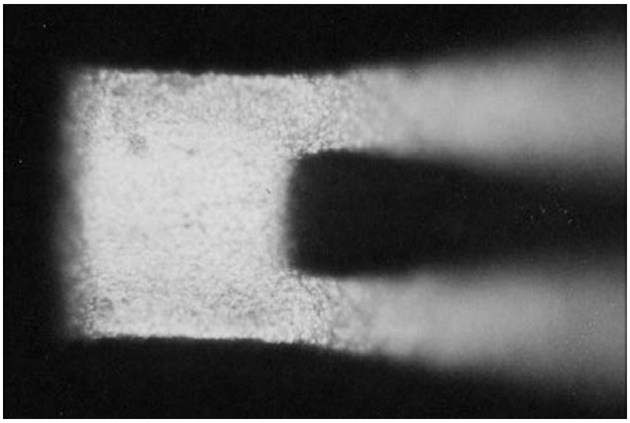


Figure 57 – The same MaxiGuide wedge as seen in Figure 54 after the sodium hydroxide cleaning. Note the small amount of wear.

CoorsTek

Wedge Part Number System
How To Order

Example part Number:
Aluminum Wire

2130-2025-L

- **A.** Series
- **B.** Wire Feed Angle*
- **C.** Hole Size
- **D.** Bond Length
- **E.** Tool Length

Example Part Number:
Gold Wire

2130-2025-L-CG-F-TiC

- **F.** Optional Cross Groove
- Optional Flat Face (standard on some series)
- **G.** Optional Material

A. & B. Series & Wire Feed Angle:

See the following catalog pages for various styles of wedges for aluminum and gold wire.
*Except the 2131 series where the 31 designates a 38° wire feed angle wedge with an elliptical back radius.

C. Hole Size:

Specify based on wire size and wire feed angle.
See the tables for each series for recommended wire diameters.
XX = 0.00XX
20 = 0.0020 in./51µm

D. Bond Length:

Specify based on bond pad size and wire diameter.
XX = 0.00XX
15 = 0.0015 in./38µm

E. Tool Length:

Specify based on bonder requirement. See following page for industry standard lengths.

F. Options:

Specify in alphabetical order in part number after the length designation.

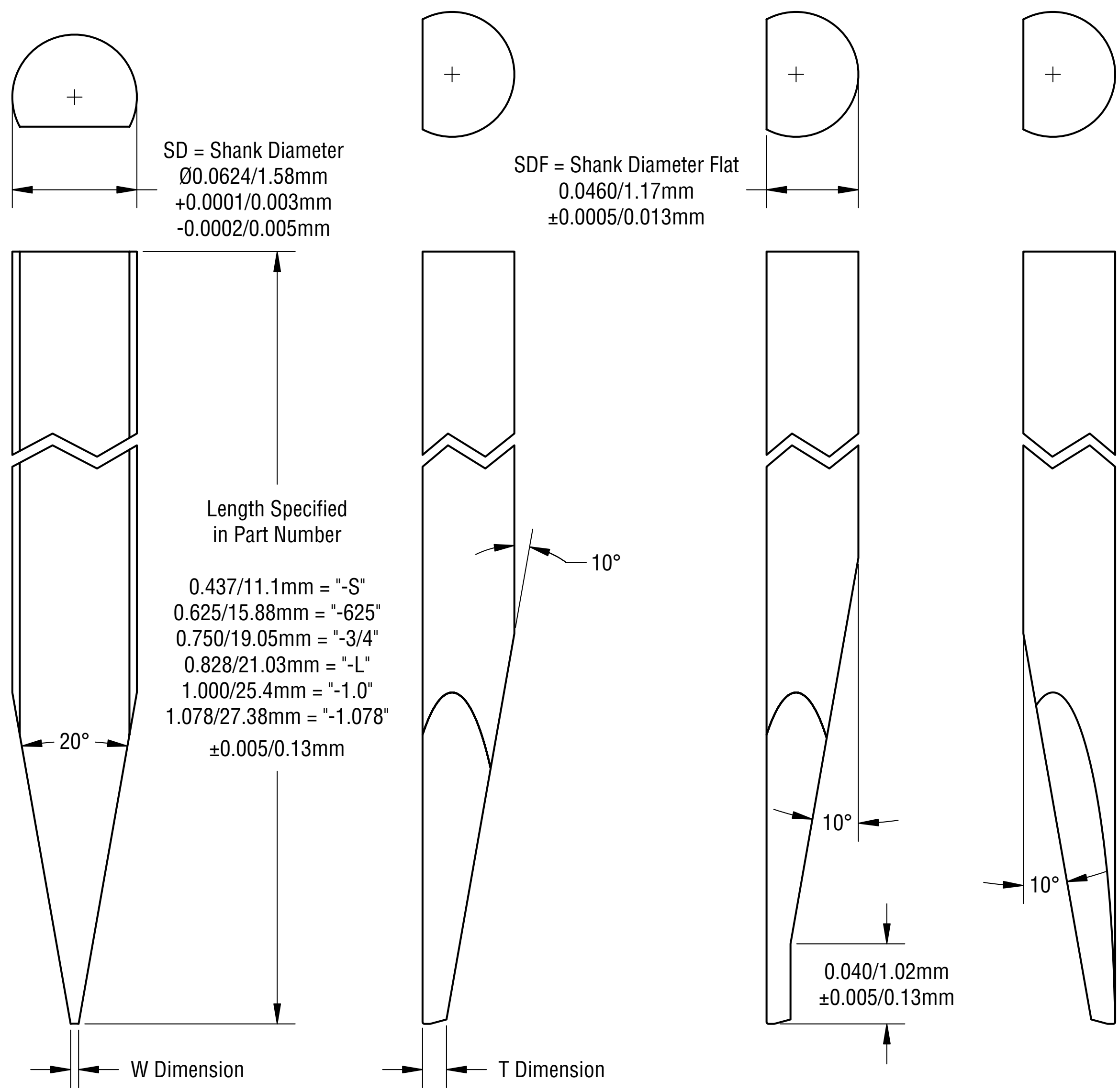
"-F" = Flat Face
"-CG-F" = Cross Groove & Flat Face
"-CC-CG" = Concave Face & Cross Groove
"-LG" = Longitudinal Groove
"-PBR" = Polished Back Radius**
"-PFR" = Polished Front Radius**
"-PBF" = Polished Front & Back Radius & Bond Length**
"-PCS" = Polished Countersink
"-V" = Vertical Back Grind
"-10DBA" = 10° Back Angle
"-20DBA" = 20° Back Angle
"-CSF" = Concave Side Flats
"-45SC(W=Specify)" = 45° Side Chamfers
"-ELBR" = Elliptical Back Radius
"-CBR(Specify)" = Chamfered Back Radius
"-MOD C" = Maximized C Clearance
"-180 REV" = 180° Reverse Shank

**Not available with Cermet material option
See the Modifications page for illustrations and more options.
Some of the above features are standard on some series and do not need to be specified.

G. Material:

Tungsten Carbide: Recommended for Aluminum wire. Standard, do not specify in part number.
Titanium Carbide: Recommended for Gold wire. Specify "-TiC" at the end of the part number.
Cermet-Tipped: Recommended for Gold wire. Specify "-BKCER" at the end of the part number.

Standard 1/16 inch Diameter Shank Designs



Standard 10° Back Grind Shank

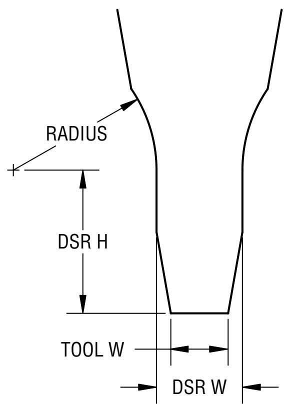
Optional Vertical Grind Shank

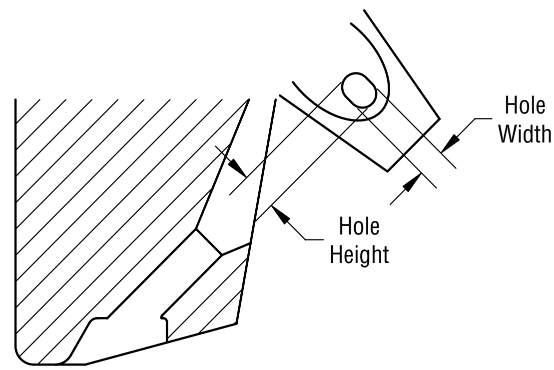
180° Reverse Shank* (Not available Vertical Feed Style Tools)

Note: Small wire wedge shank styles vary slightly based on intended use and wire bonder design.
For other shank characteristics, if any, see the catalog page for each series.

*Dias Bonder Models US1800A & US1900A and K&S Bonder Models #8060 & #8090

Dimensions in inches unless otherwise specified.





Optional Double Side Relief

Specified in part number

-DSR("W"x"H")

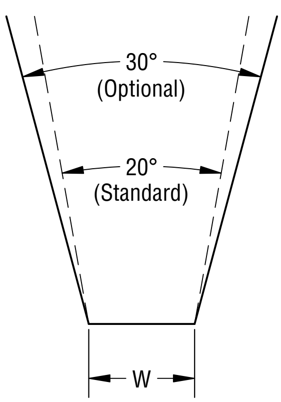
Example:
For a double side relief 0.004 inch wide x 0.010 inch high, specify "-DSR(004x010)"

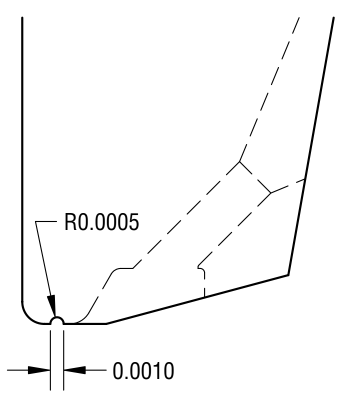
Optional Oval Hole

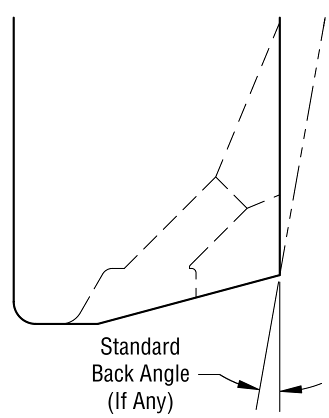
Specified in part number

Width x Height

Example:
For an oval hole 0.0015 inch wide x 0.0020 inch high, specify "15x20" for hole size in part number (e.g. 2145-15x2015-L-F-CER)







Optional 30° W Angle

Specified in part number

-30DG

Optional Cross Groove

Specified in part number

-CG

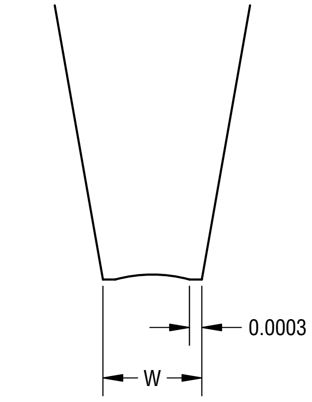
Standard in some series
Enhances the transfer of ultrasonic energy in situations of poor bondability
Recommended for flat face gold wire tools

Optional Vertical Back Grind

Specified in part number

-V

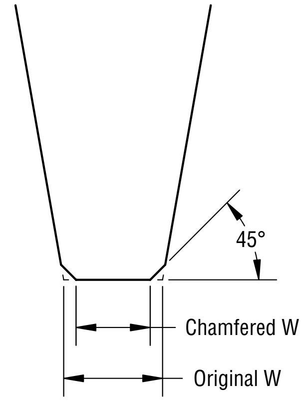
Standard in some series
The vertical back grind is 0.040 inch high



Optional Concave Side Flats

Specified in part number

-CSF

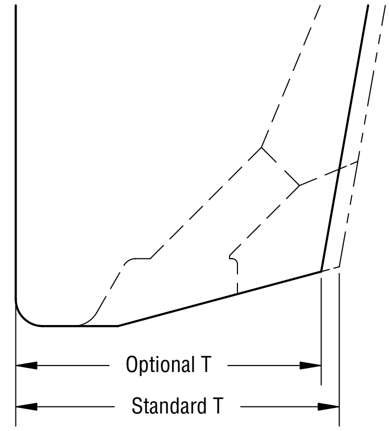


Optional 45° Side Chamfers

Specified in part number

-45SC(W="Chamfered W")

For fine-pitch wire bonding
Example part number:
2145-2020-3/4-F-45SC(W=003)-TiC

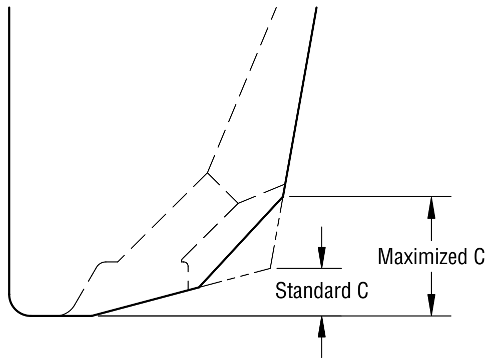


Optional T Size

Specified in part number

-T="Optional T"

For a T=0.010 inch, specify "-T=010"

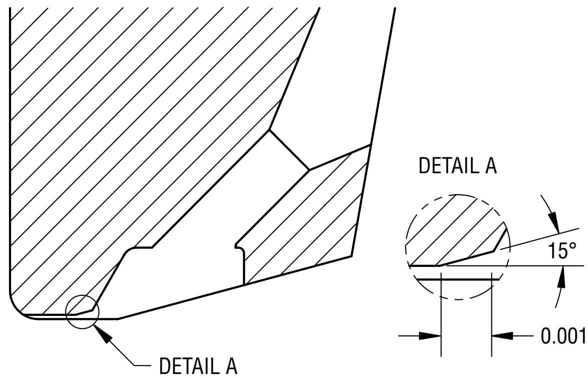


Optional Modified C Dimension

Specified in part number

-MOD C

For maximum rear clearance



Optional Chamfered Back Radius

Specified in part number

-CBR

Note: The CBR option defaults to 0.0010 in./25µm, CBR(001), unless otherwise specified. For other CBR sizes, specify CBR(0008), CBR(0012), etc.

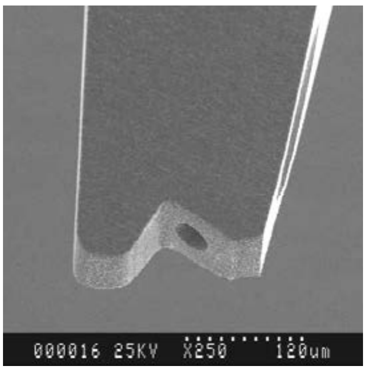
CoorsTek

MaxiBond™ Wedges

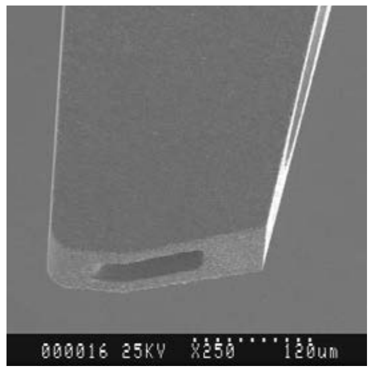
V-notch vs. MaxiGuide™/Pocket-type vs. MaxiBond

The *patent pending* MaxiBond represents the next step in the design evolution of small wire wedges. As package features and pad sizes become increasingly smaller, the limitations of the venerable MaxiGuide or pocket-type design become evident, forcing the return to the use of the old V-notch style wedge.

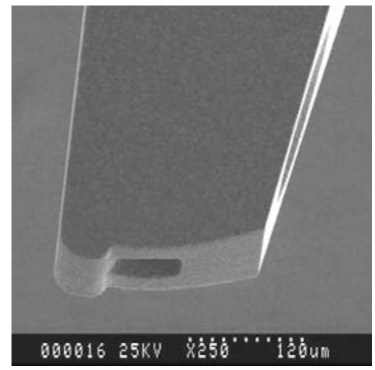
The MaxiBond design overcomes the limitations of the MaxiGuide with none of the disadvantages of the V-notch – the advantages of both, the disadvantages of neither in one patent pending design architecture, the MaxiBond.



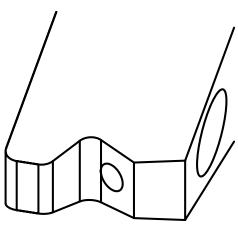
V-Notch
Circa 1960's

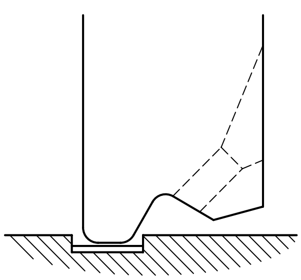


MaxiGuide or Pocket Type
Circa 1979

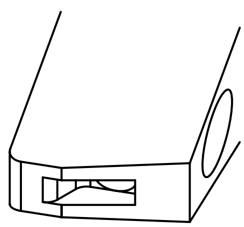


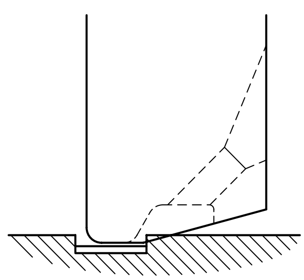
The MaxiBond
Patent Pending 2005



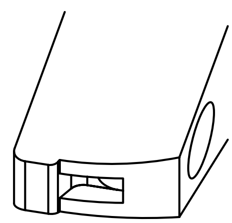


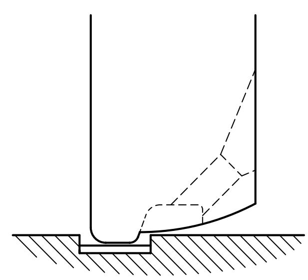
V-Notch
Gives access into small recessed pad without damage to surrounding passivation or protective overcoat



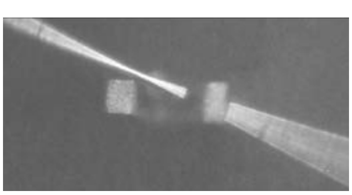


MaxiGuide
Possible interference problem with recessed pad with surrounding passivation or protective overcoat

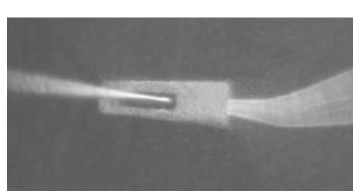




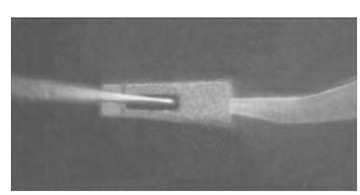
MaxiBond
Gives access into small recessed pad without damage to surrounding passivation or protective overcoat



V-Notch
Possible missing wire under bond foot



MaxiGuide
Contains wire, guides wire under bond foot



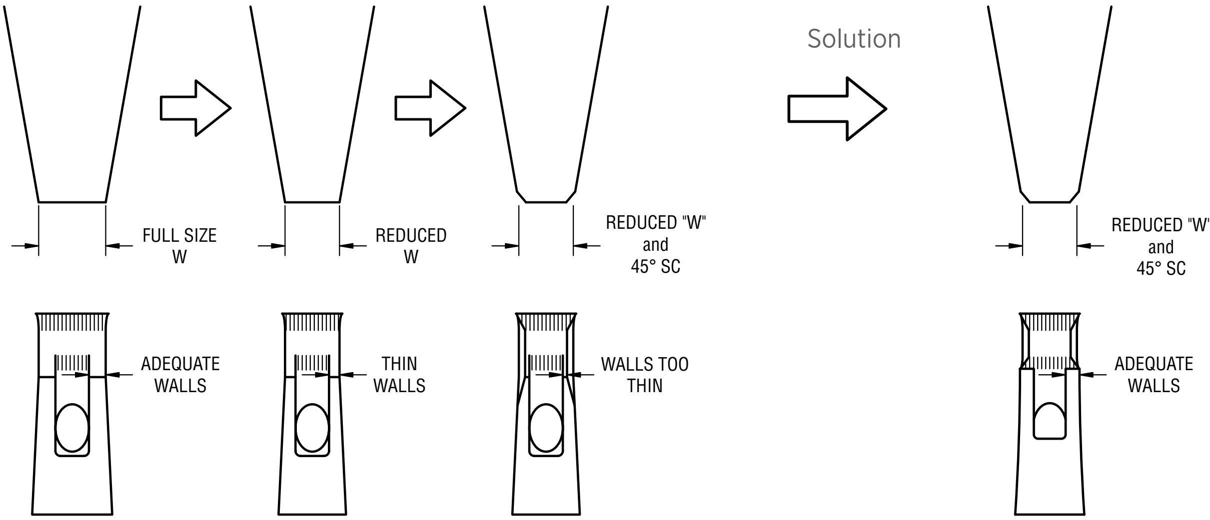
MaxiBond
Contains wire, guides wire under bond foot

MaxiBond™ Wedges

V-notch vs. MaxiGuide™/Pocket-type vs. MaxiBond

Maxiguide
Problem with smaller "W" dimension

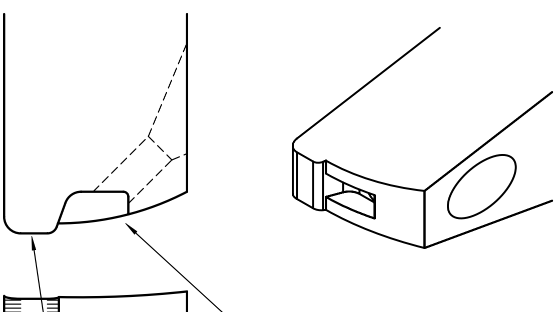
MaxiBond
Allows smaller "W"



MaxiBond

Advanced Architecture

- Small "W" capability
- Access into small recessed pads without cracking surrounding passivation or protective overcoat
- Complete BR provides best 1st bond heel and 2nd bond termination
- Maintains wire guiding and centering on pad
- Eliminates bond smash-out
- Ideal for fine pitch

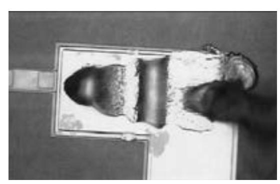


Raised Pocket, Swept Back Design
- Centers wire on pad like Maxiguide
- Provides thick side walls for minimized "W" and no sharp edges in wire path

Dropped Bond Foot Architecture
- Provides complete back radius geometry for access into small pads, best 1st bond, heel and 2nd bond tailing, and no smash-out

The MaxiBond

Eliminates bond smash-out
Superior 1st bond heel and 2nd bond termination



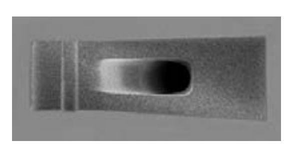
1st bond smash-out
possible with MaxiGuide

2nd bond smash-out
possible with MaxiGuide

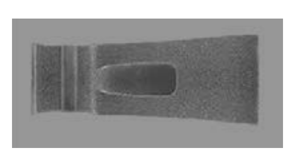
MaxiBond, no smash-out
excellent 1st bond heel

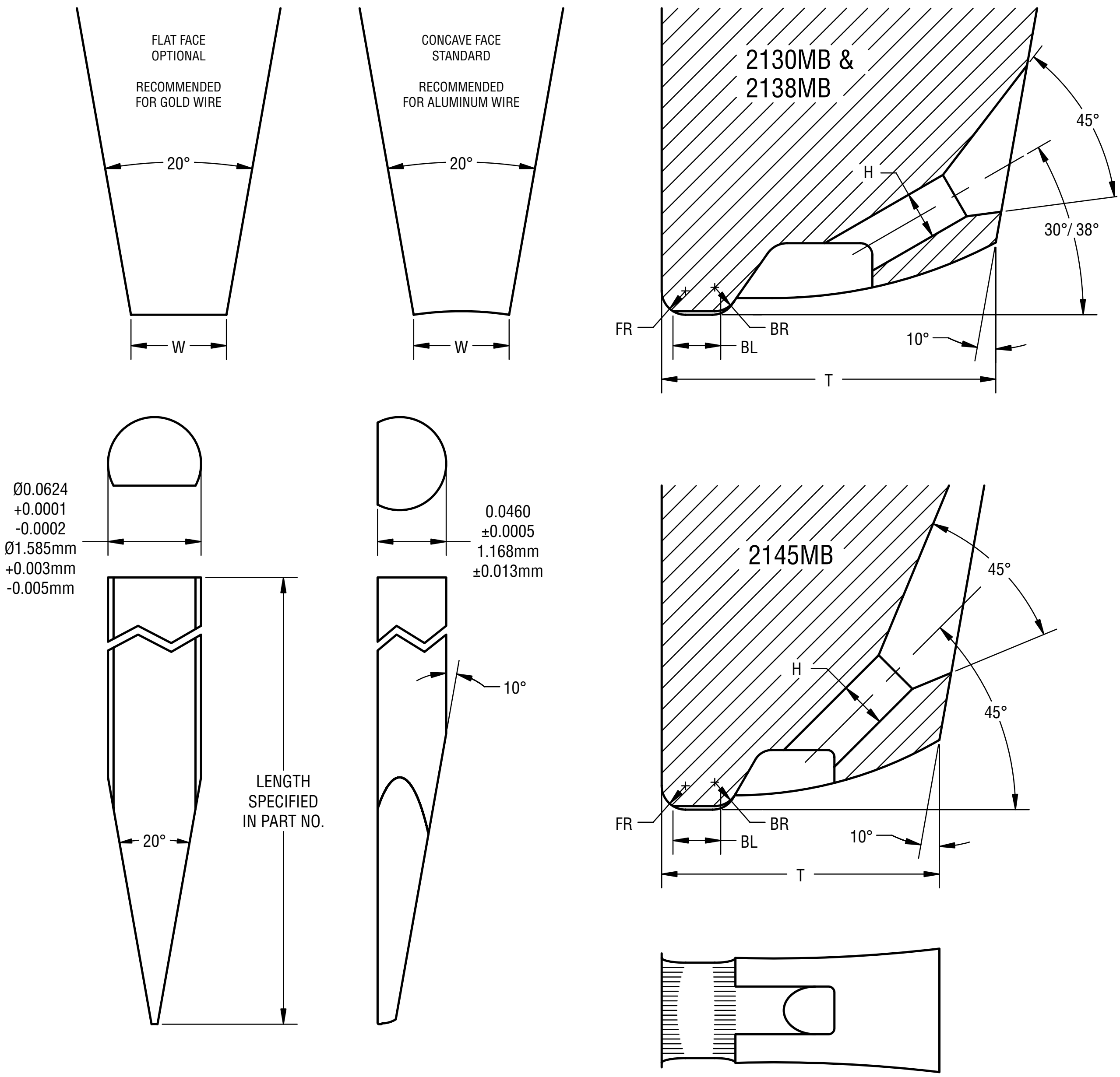
MaxiBond, no smash-out
excellent 2nd bond termination

MaxiGuide
incomplete compromised BR and adjacent pocket walls create area for smash-out



MaxiBond
complete BR and raised pocket, dropped-foot architecture eliminate smash-out





Specify:
Series/Wire Feed Angle-Hole Size/Bond Length-Length-Options

Example:
2130MB-2020-S
2145MB-1510-3/4-F-TiC
2145MB-1520-3/4-CG-F-BKCER

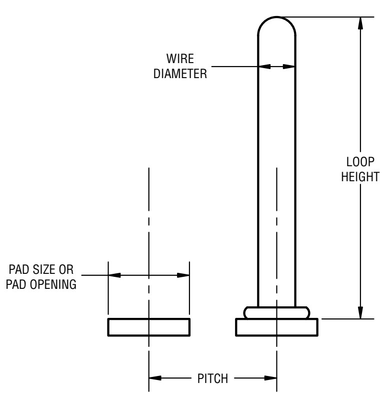
Material:
Tungsten Carbide Standard
Titanium Carbide Optional
(Specify "-TiC" in part no.)
Cermet Tip Optional
(Specify "-BKCER" in part no.)

Patent Pending

DASH NUMBER	H in. / µm ±0.0002 / 5	BL in. / µm ±0.0002 / 5	W in. / µm ±0.0002 / 5	FR in. / µm ±0.0002 / 5	BR in. / µm ±0.0002 / 5	T 30° & 38° in. / µm ±0.0005 / 13	T 45° in. / µm ±0.0005 / 13	SUGGESTED WIRE DIAMETER in. / µm
0.0013 hole uses the same specifications as the 0.0015 hole except for the hole dimension								0.0007 / 18 to 0.0010 / 25
*1505	0.0015 / 38	0.0005 / 13	0.0025 / 64	0.0005 / 13	0.0005 / 13	0.0100 / 254	0.0080 / 203	
*1507	0.0015 / 38	0.0007 / 18	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0100 / 254	0.0090 / 229	
*1510	0.0015 / 38	0.0010 / 25	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0110 / 279	0.0090 / 229	
1515	0.0015 / 38	0.0015 / 38	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0110 / 279	0.0090 / 229	
1520	0.0015 / 38	0.0020 / 51	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0120 / 305	0.0100 / 254	
1525	0.0015 / 38	0.0025 / 64	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0120 / 305	0.0100 / 254	
0.0017 hole uses the same specifications as the 0.0015 hole except for the hole dimension								0.0010 / 25 to 0.0013 / 33
0.0018 hole uses the same specifications as the 0.0020 hole except for the hole dimension								
*2010	0.0020 / 51	0.0010 / 25	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0130 / 330	0.0110 / 279	
2015	0.0020 / 51	0.0015 / 38	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0140 / 356	0.0120 / 305	
2020	0.0020 / 51	0.0020 / 51	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0140 / 356	0.0120 / 305	
2022	0.0020 / 51	0.0022 / 56	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0140 / 356	0.0120 / 305	
2025	0.0020 / 51	0.0025 / 64	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0150 / 381	0.0130 / 330	
2030	0.0020 / 51	0.0030 / 76	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0150 / 381	0.0130 / 330	
0.0023 hole uses the same specifications as the 0.0025 hole except for the hole dimension								0.0010 / 25 to 0.0015 / 38
2515	0.0025 / 64	0.0015 / 38	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0140 / 356	0.0130 / 330	
2520	0.0025 / 64	0.0020 / 51	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0150 / 381	0.0130 / 330	
2522	0.0025 / 64	0.0022 / 56	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0150 / 381	0.0130 / 330	
2525	0.0025 / 64	0.0025 / 64	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0150 / 381	0.0140 / 356	
2530	0.0025 / 64	0.0030 / 76	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0150 / 381	0.0140 / 356	
2535	0.0025 / 64	0.0035 / 89	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0160 / 406	0.0150 / 381	
3020	0.0030 / 76	0.0020 / 51	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0170 / 432	0.0170 / 432	0.0015 / 38 to 0.0020 / 51
3025	0.0030 / 76	0.0025 / 64	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0180 / 457	0.0180 / 457	
3030	0.0030 / 76	0.0030 / 76	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0180 / 457	0.0180 / 457	
3035	0.0030 / 76	0.0035 / 89	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0190 / 483	0.0190 / 483	
3040	0.0030 / 76	0.0040 / 102	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0190 / 483	0.0190 / 483	

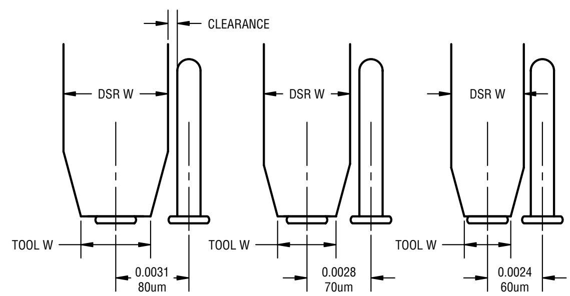
*Flat Face Only. Other part numbers are available. Dimensions in inches unless otherwise specified.

Fine-Pitch MaxiBond Solutions Special DSR & W Designs



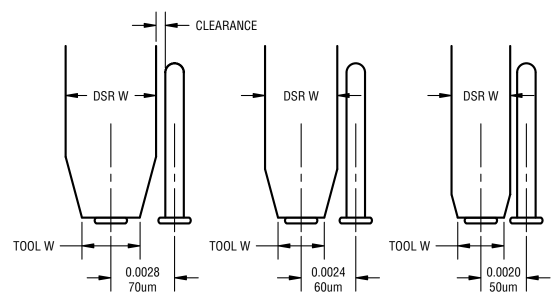
Fine Pitch Wedge-Bonding Criteria

1.0 mil Wire

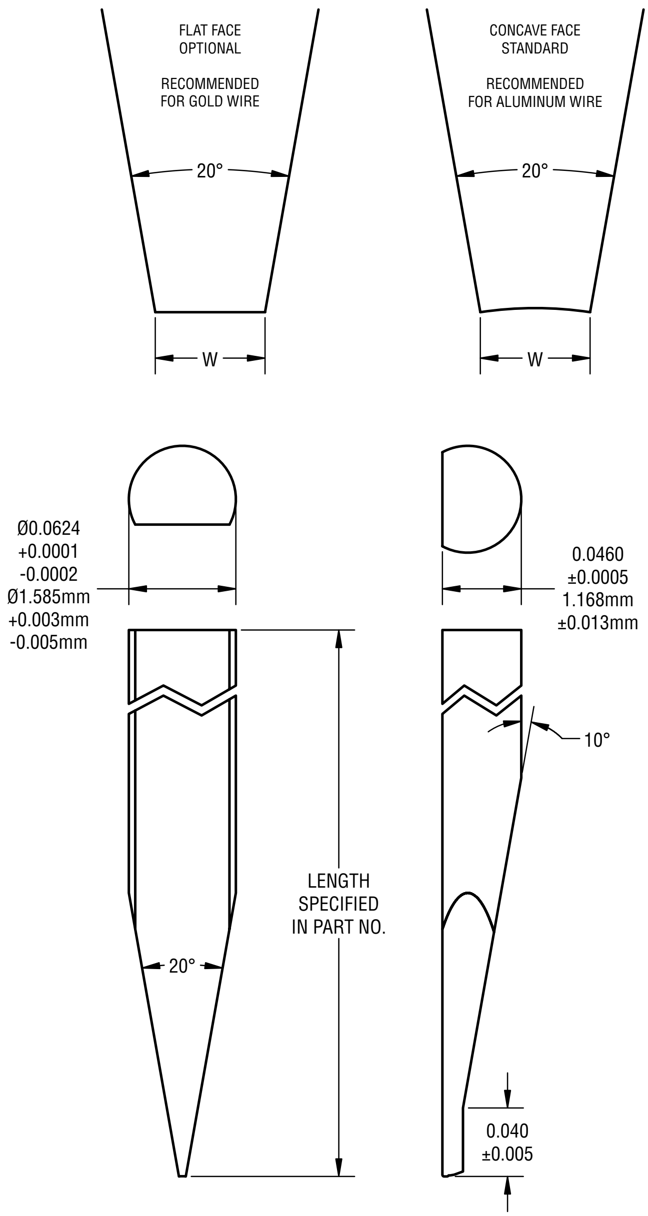


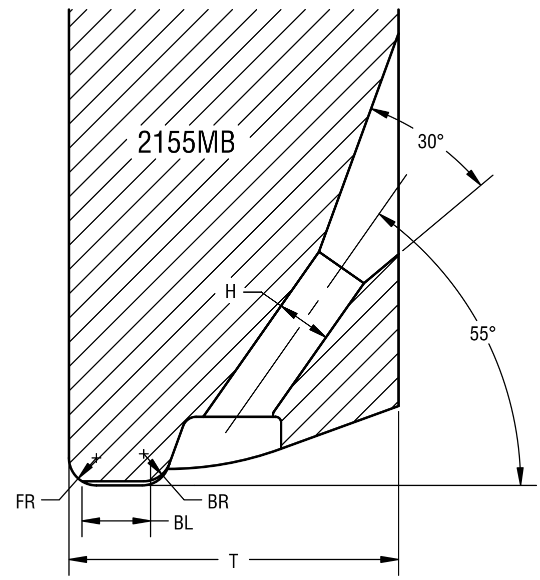
80µ Pitch | 70µ Pitch | 60µ Pitch

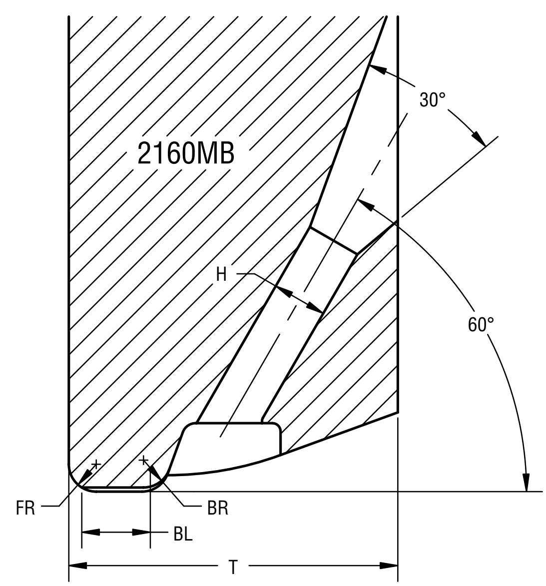
0.8 mil Wire

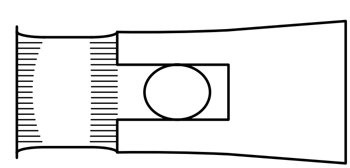


70µ Pitch | 60µ Pitch | 50µ Pitch









Specify:
Series/Wire Feed Angle-Hole Size/Bond Length-Length-Options

Example:
2160MB-2020-S
2155MB-1510-3/4-F-TiC
2160MB-1520-3/4-CG-F-BKCER

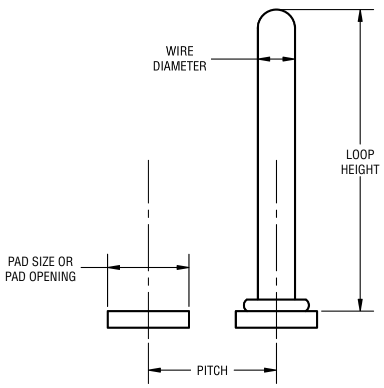
Material:
Tungsten Carbide Standard
Titanium Carbide Optional
(Specify “-TiC” in part no.)
Cermet Tip Optional
(Specify “-BKCER” in part no.)

Patent Pending

DASH NUMBER	H in. / µm ±0.0002 / 5	BL in. / µm ±0.0002 / 5	W in. / µm ±0.0002 / 5	FR in. / µm ±0.0002 / 5	BR in. / µm ±0.0002 / 5	T 55° & 60° in. / µm ±0.0005 / 13	SUGGESTED WIRE DIAMETER in. / µm
0.0013 hole uses the same specifications as the 0.0015 hole except for the hole dimension							0.0007 / 18 to 0.0010 / 25
*1505	0.0015 / 38	0.0005 / 13	0.0030 / 76	0.0005 / 13	0.0005 / 13	0.0080 / 203	
*1507	0.0015 / 38	0.0007 / 18	0.0030 / 76	0.0005 / 13	0.0005 / 13	0.0080 / 203	
*1508	0.0015 / 38	0.0008 / 20	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0080 / 203	
*1510	0.0015 / 38	0.0010 / 25	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0080 / 203	
1515	0.0015 / 38	0.0015 / 38	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0080 / 203	
1520	0.0015 / 38	0.0020 / 51	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0090 / 229	
1525	0.0015 / 38	0.0025 / 64	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0090 / 229	
0.0017 hole uses the same specifications as the 0.0015 hole except for the hole dimension							0.0010 / 25 to 0.0013 / 33
0.0018 hole uses the same specifications as the 0.0020 hole except for the hole dimension							
*2010	0.0020 / 51	0.0010 / 25	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0110 / 279	
2015	0.0020 / 51	0.0015 / 38	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0110 / 279	
2018	0.0020 / 51	0.0018 / 46	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0120 / 305	
2020	0.0020 / 51	0.0020 / 51	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0120 / 305	
2025	0.0020 / 51	0.0025 / 64	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0120 / 305	
2030	0.0020 / 51	0.0030 / 76	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0120 / 305	
2515	0.0025 / 64	0.0015 / 38	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0110 / 279	0.0010 / 25 to 0.0015 / 38
2520	0.0025 / 64	0.0020 / 51	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0120 / 305	
2522	0.0025 / 64	0.0022 / 56	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0120 / 305	
2525	0.0025 / 64	0.0025 / 64	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0120 / 305	
2527	0.0025 / 64	0.0027 / 69	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0130 / 330	
2530	0.0025 / 64	0.0030 / 76	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0130 / 330	
2535	0.0025 / 64	0.0035 / 89	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0130 / 330	
3025	0.0030 / 76	0.0025 / 64	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0140 / 356	0.0015 / 38 to 0.0020 / 51
3030	0.0030 / 76	0.0030 / 76	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0150 / 381	
3035	0.0030 / 76	0.0035 / 89	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0150 / 381	
3040	0.0030 / 76	0.0040 / 102	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0150 / 381	

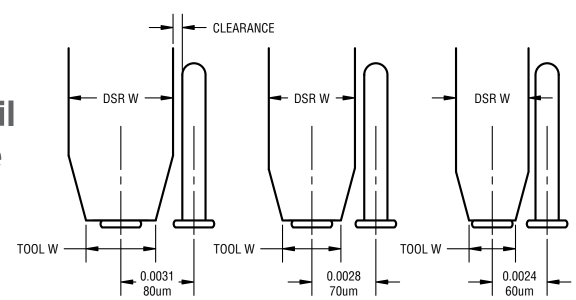
*Flat Face Only. Other part numbers are available. Dimensions in inches unless otherwise specified.

Fine-Pitch MaxiBond Solutions Special DSR & W Designs



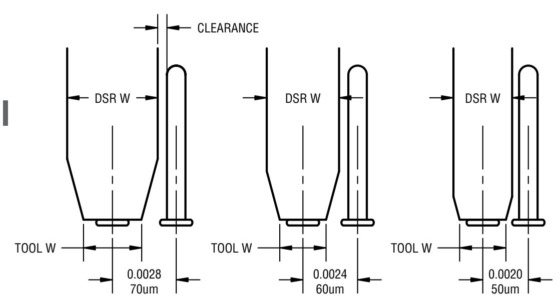
Fine-Pitch Wedge Bonding Criteria

1.0 mil Wire



80μ Pitch **70μ Pitch** **60μ Pitch**

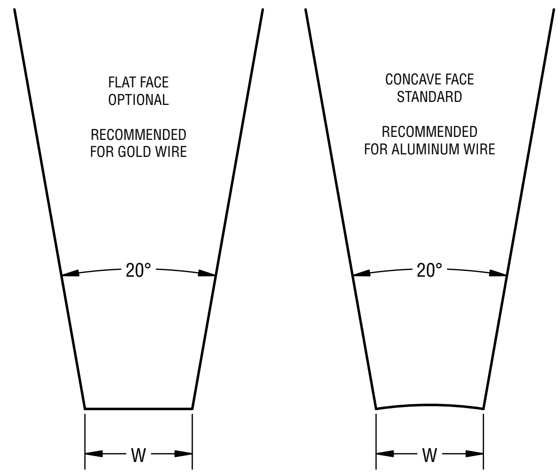
0.8 mil Wire

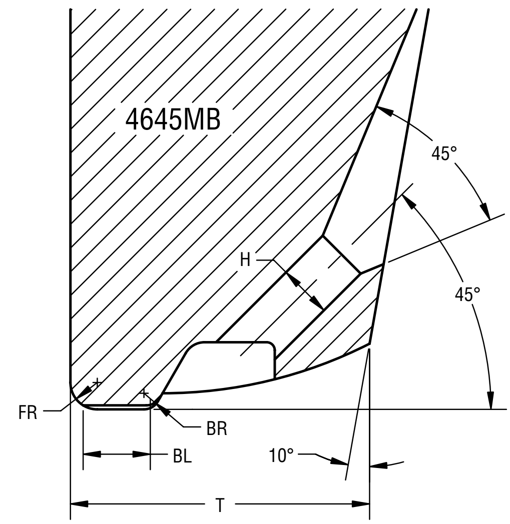


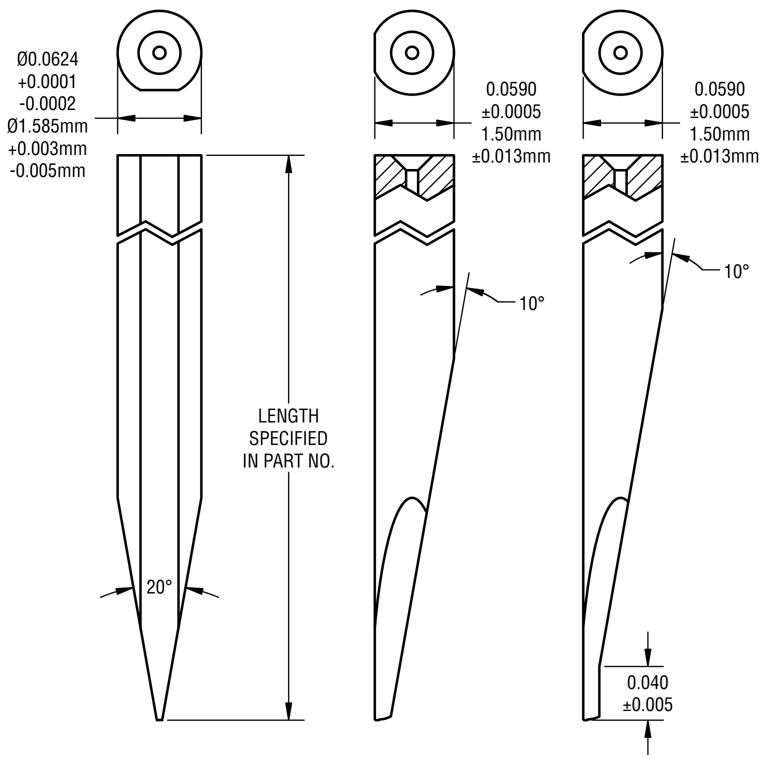
70μ Pitch **60μ Pitch** **50μ Pitch**

Deep Access MaxiBond™ Wedges

Vertical Feed, Standard Shank
4645MB & 4660MB Series

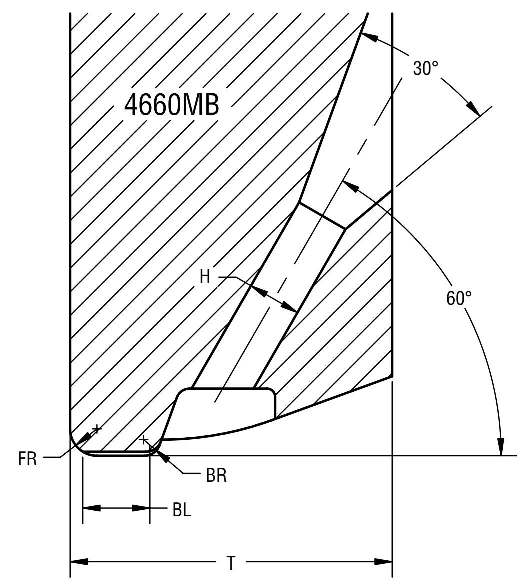






4645MB Standard Shank Design

4660MB Standard Shank Design



Specify:
Series/Wire Feed Angle-Hole Size/Bond Length-Length-Options

Example:
4645MB-2020-L
4660MB-1510-3/4-F-BKCER
4645MB-2020-3/4-CG-F-V-BKCER

*Specify "-V" when ordering with Cermet tip if 45°

Material:
Tungsten Carbide Standard
Titanium Carbide Optional
(Specify "-TiC" in part number)
Cermet Tip Optional
(Specify "-BKCER" in part no.)

Patent Pending

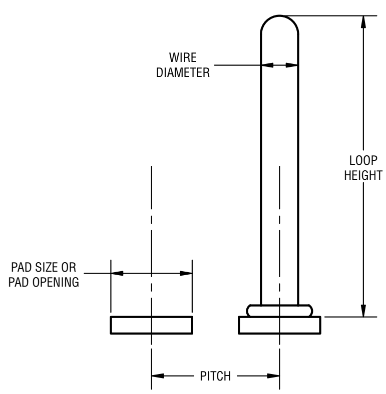
Deep Access MaxiBond™ Wedges
Vertical Feed, Standard Shank
4645MB & 4660MB Series

capillaries
wedges
tab tools
die attach
other

DASH NUMBER	H in. / µm ±0.0002 / 5	BL in. / µm ±0.0002 / 5	W in. / µm ±0.0002 / 5	FR in. / µm ±0.0002 / 5	BR in. / µm ±0.0002 / 5	T 45° in. / µm ±0.0005 / 13	T 55° & 60° in. / µm ±0.0005 / 13	SUGGESTED WIRE DIAMETER in. / µm
*1505	0.0015 / 38	0.0005 / 13	0.0025 / 64	0.0005 / 13	0.0005 / 13	0.0080 / 203	0.0090 / 229	
*1510	0.0015 / 38	0.0010 / 25	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0090 / 229	0.0090 / 229	
1515	0.0015 / 38	0.0015 / 38	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0090 / 229	0.0100 / 254	0.0007 / 18 to 0.0010 / 25
1520	0.0015 / 38	0.0020 / 51	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0100 / 254	0.0100 / 254	
1525	0.0015 / 38	0.0025 / 64	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0100 / 254	0.0110 / 279	
0.0018 hole uses the same specifications as the 0.0020 hole except for the hole dimension								
*2010	0.0020 / 51	0.0010 / 25	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0100 / 254	0.0120 / 305	
2015	0.0020 / 51	0.0015 / 38	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0110 / 279	0.0120 / 305	
2020	0.0020 / 51	0.0020 / 51	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0110 / 279	0.0120 / 305	0.0010 / 25 to 0.0013 / 33
2025	0.0020 / 51	0.0025 / 64	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0120 / 305	0.0120 / 305	
2030	0.0020 / 51	0.0030 / 76	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0120 / 305	0.0120 / 305	
2520	0.0025 / 64	0.0020 / 51	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0130 / 330	0.0120 / 305	
2525	0.0025 / 64	0.0025 / 64	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0140 / 356	0.0120 / 305	0.0010 / 25 to 0.0015 / 38
2530	0.0025 / 64	0.0030 / 76	0.0040 / 102	**0.0015 / 38	0.0006 / 15	0.0140 / 356	0.0120 / 305	
2535	0.0025 / 64	0.0035 / 89	0.0040 / 102	0.0015 / 38	0.0006 / 15	0.0150 / 381	0.0130 / 330	
3020	0.0030 / 76	0.0020 / 51	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0170 / 432	0.0140 / 356	
3025	0.0030 / 76	0.0025 / 64	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0180 / 457	0.0140 / 356	
3030	0.0030 / 76	0.0030 / 76	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0180 / 457	0.0150 / 381	0.0015 / 38 to 0.0020 / 51
3035	0.0030 / 76	0.0035 / 89	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0190 / 483	0.0150 / 381	
3040	0.0030 / 76	0.0040 / 102	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0190 / 483	0.0150 / 381	

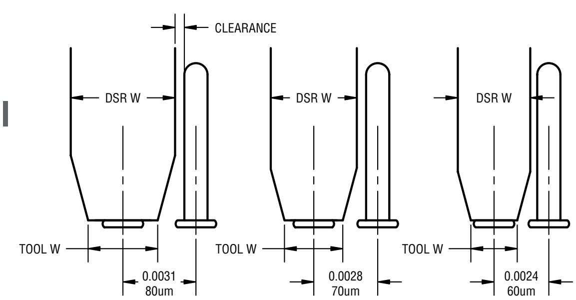
*Flat Face Only
** for 45° FR=0.0010; for 55° & 60° FR=0.0015
Other part numbers are available.
Dimensions in inches unless otherwise specified.

Fine-Pitch MaxiBond Solutions
Special DSR & W Designs



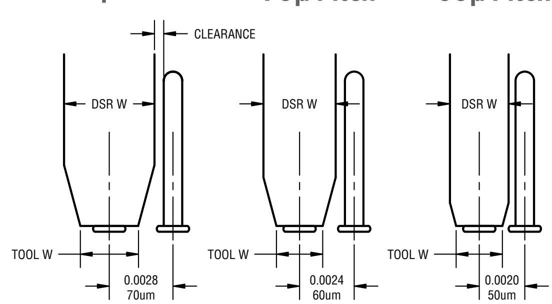
Fine-Pitch Wedge Bonding Criteria

1.0 mil Wire



80µ Pitch **70µ Pitch** **60µ Pitch**

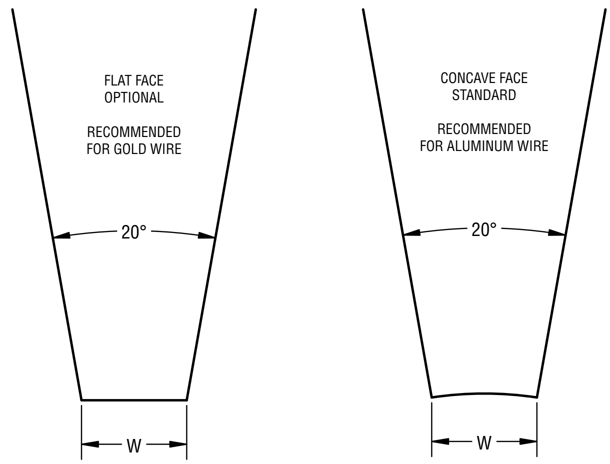
0.8 mil Wire

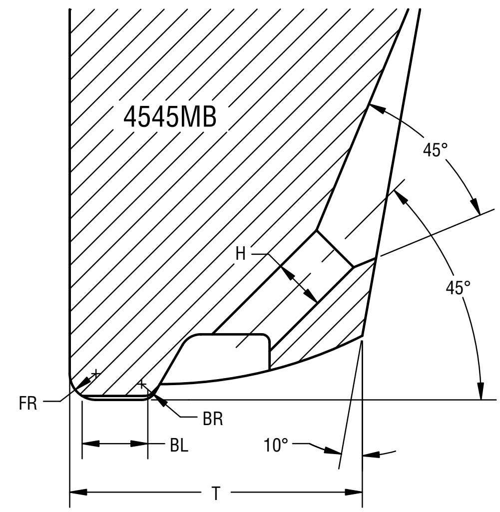


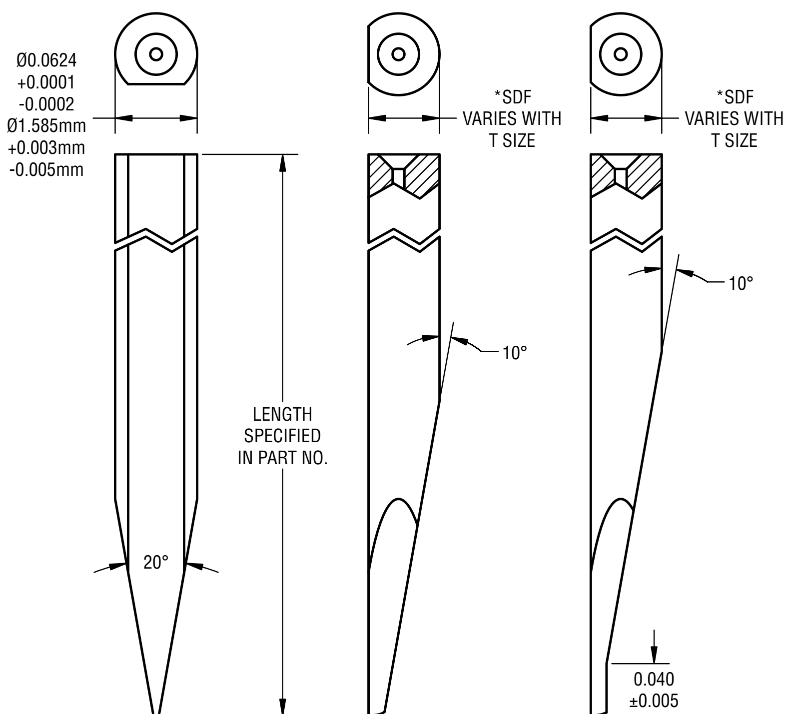
70µ Pitch **60µ Pitch** **50µ Pitch**

CoorsTek

Deep Access MaxiBond™ Wedges
Vertical Feed, Close Guide Shank
4545MB & 4560MB Series

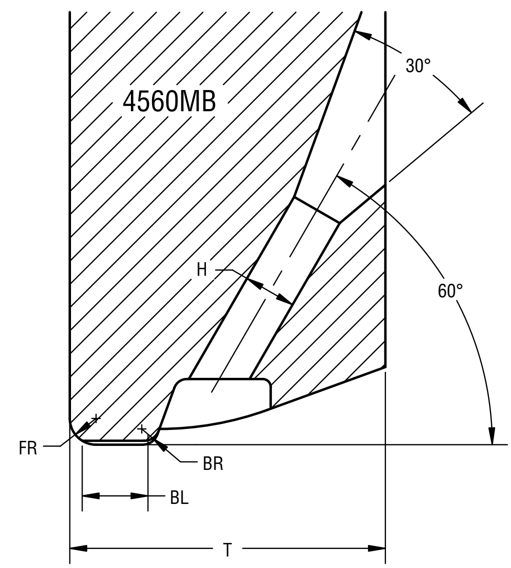






4545MB Close Guide Shank Design

4560MB Close Guide Shank Design



Specify:
Series/Wire Feed Angle-Hole Size/Bond Length-Length-Options

Example:
4545MB-2020-L
4560MB-1510-3/4-F-BKCER
4545MB-2020-3/4-CG-F-V-BKCER

*Specify "-V" when ordering with Cermet tip if 45°

Material:
Tungsten Carbide Standard
Titanium Carbide Optional
(Specify "-TiC" in part number)
Cermet Tip Optional
(Specify "-BKCER" in part no.)

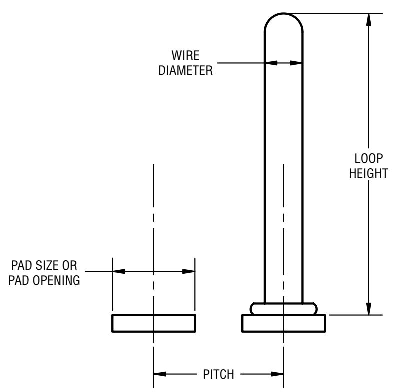
Patent Pending

Deep Access MaxiBond™ Wedges
Vertical Feed, Close Guide Shank
4545MB & 4560MB Series

DASH NUMBER	H in. / µm ±0.0002 / 5	BL in. / µm ±0.0002 / 5	W in. / µm ±0.0002 / 5	FR in. / µm ±0.0002 / 5	BR in. / µm ±0.0002 / 5	T 45° in. / µm ±0.0005 / 13	T 55° & 60° in. / µm ±0.0005 / 13	SUGGESTED WIRE DIAMETER in. / µm
*1505	0.0015 / 38	0.0005 / 13	0.0025 / 64	0.0005 / 13	0.0005 / 13	0.0080 / 203	0.0090 / 229	
*1510	0.0015 / 38	0.0010 / 25	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0090 / 229	0.0090 / 229	
1515	0.0015 / 38	0.0015 / 38	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0090 / 229	0.0100 / 254	0.0007 / 18 to 0.0010 / 25
1520	0.0015 / 38	0.0020 / 51	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0100 / 254	0.0100 / 254	
1525	0.0015 / 38	0.0025 / 64	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0100 / 254	0.0110 / 279	
0.0018 hole uses the same specifications as the 0.0020 hole except for the hole dimension								
*2010	0.0020 / 51	0.0010 / 25	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0100 / 254	0.0120 / 305	
2015	0.0020 / 51	0.0015 / 38	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0110 / 279	0.0120 / 305	
2020	0.0020 / 51	0.0020 / 51	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0110 / 279	0.0120 / 305	0.0010 / 25 to 0.0013 / 33
2025	0.0020 / 51	0.0025 / 64	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0120 / 305	0.0120 / 305	
2030	0.0020 / 51	0.0030 / 76	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0120 / 305	0.0120 / 305	
2520	0.0025 / 64	0.0020 / 51	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0130 / 330	0.0120 / 305	
2525	0.0025 / 64	0.0025 / 64	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0140 / 356	0.0120 / 305	0.0010 / 25 to 0.0015 / 38
2530	0.0025 / 64	0.0030 / 76	0.0040 / 102	**0.0015 / 38	0.0006 / 15	0.0140 / 356	0.0120 / 305	
2535	0.0025 / 64	0.0035 / 89	0.0040 / 102	0.0015 / 38	0.0006 / 15	0.0150 / 381	0.0130 / 330	
3020	0.0030 / 76	0.0020 / 51	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0170 / 432	0.0140 / 356	
3025	0.0030 / 76	0.0025 / 64	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0180 / 457	0.0140 / 356	
3030	0.0030 / 76	0.0030 / 76	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0180 / 457	0.0150 / 381	0.0015 / 38 to 0.0020 / 51
3035	0.0030 / 76	0.0035 / 89	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0190 / 483	0.0150 / 381	
3040	0.0030 / 76	0.0040 / 102	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0190 / 483	0.0150 / 381	

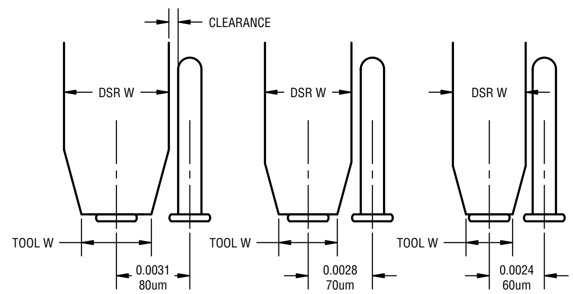
*Flat Face Only
** for 45° FR=0.0010; for 55° & 60° FR=0.0015
Other part numbers are available.
Dimensions in inches unless otherwise specified.

Fine-Pitch MaxiBond Solutions
Special DSR & W Designs



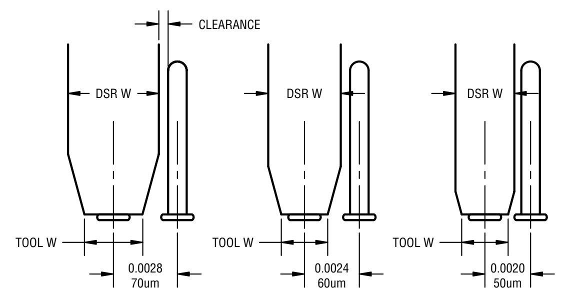
Fine-Pitch Wedge Bonding Criteria

1.0 mil Wire



80µ Pitch **70µ Pitch** **60µ Pitch**

0.8 mil Wire

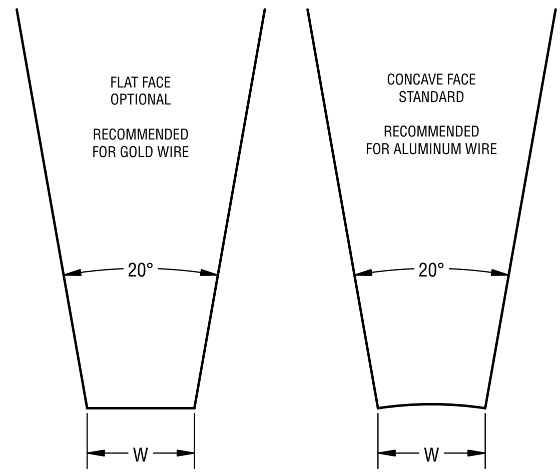


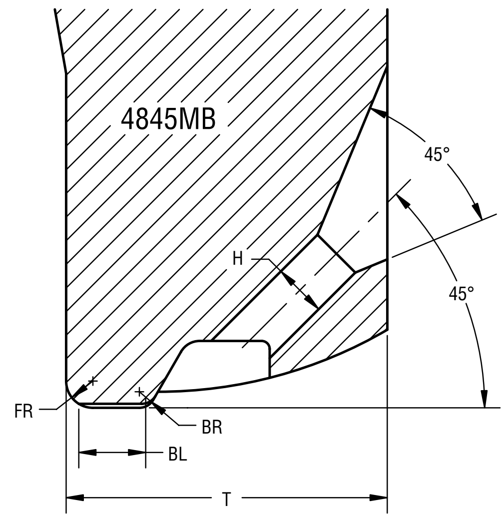
70µ Pitch **60µ Pitch** **50µ Pitch**

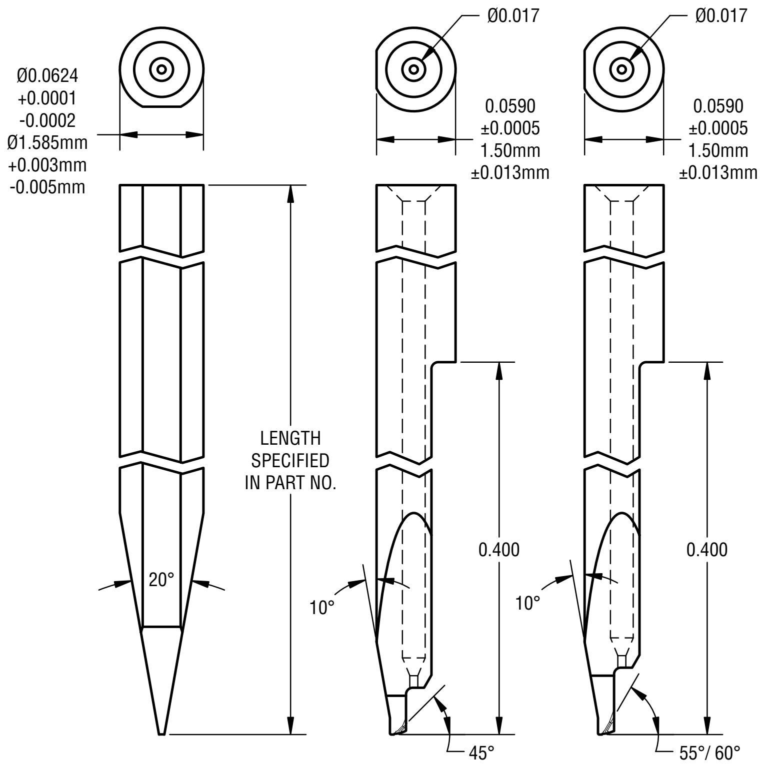
CoorsTek

Deep Access MaxiBond™ Wedges

Vertical Feed Series for Westbond
4845MB, 4855MB, & 4860MB

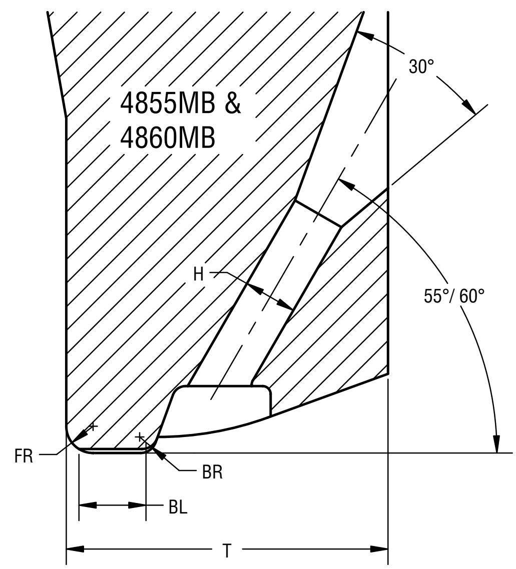






4845MB Shank Design

4855MB 4860MB Shank Design



Features:
Designed for the Westbond Vertical Feed, Deep Access Wire Bonders

Length:
-625=0.625 inch (most common)
-3/4=0.750 inch
-L=0.828 inch

4860MB-1510-3/4-CG-F-BKCER

Specify:
Series/Wire Feed Angle-Hole Size/Bond Length-Length-Options

Example:
4845MB-2020-625

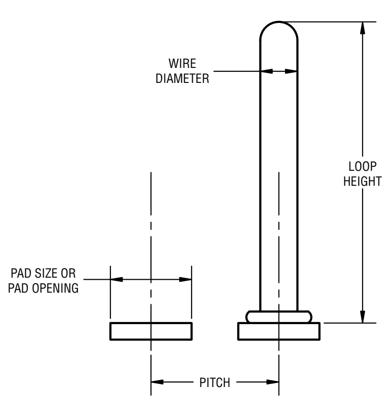
Material:
Tungsten Carbide Standard
Titanium Carbide Optional
(Specify "-TiC" in part no.)
Cermet Tip Optional
(Specify "-BKCER" in part no.)

Patent Pending

DASH NUMBER	H in. / µm ±0.0002 / 5	BL in. / µm ±0.0002 / 5	W in. / µm ±0.0002 / 5	FR in. / µm ±0.0002 / 5	BR in. / µm ±0.0002 / 5	T 45° in. / µm ±0.0005 / 13	T 55° & 60° in. / µm ±0.0005 / 13	SUGGESTED WIRE DIAMETER in. / µm
*1505	0.0015 / 38	0.0005 / 13	0.0025 / 64	0.0005 / 13	0.0005 / 13	0.0080 / 203	0.0090 / 229	0.0007 / 18 to 0.0010 / 25
*1510	0.0015 / 38	0.0010 / 25	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0090 / 229	0.0090 / 229	
1515	0.0015 / 38	0.0015 / 38	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0090 / 229	0.0100 / 254	
1520	0.0015 / 38	0.0020 / 51	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0100 / 254	0.0100 / 254	
1525	0.0015 / 38	0.0025 / 64	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0100 / 254	0.0110 / 279	
0.0018 hole uses the same specifications as the 0.0020 hole except for the hole dimension								0.0010 / 25 to 0.0013 / 33
*2010	0.0020 / 51	0.0010 / 25	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0100 / 254	0.0120 / 305	
2015	0.0020 / 51	0.0015 / 38	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0110 / 279	0.0120 / 305	
2020	0.0020 / 51	0.0020 / 51	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0110 / 279	0.0120 / 305	
2025	0.0020 / 51	0.0025 / 64	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0120 / 305	0.0120 / 305	
2030	0.0020 / 51	0.0030 / 76	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0120 / 305	0.0120 / 305	
2520	0.0025 / 64	0.0020 / 51	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0130 / 330	0.0120 / 305	0.0010 / 25 to 0.0015 / 38
2525	0.0025 / 64	0.0025 / 64	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0140 / 356	0.0120 / 305	
2530	0.0025 / 64	0.0030 / 76	0.0040 / 102	**0.0015 / 38	0.0006 / 15	0.0140 / 356	0.0120 / 305	
2535	0.0025 / 64	0.0035 / 89	0.0040 / 102	0.0015 / 38	0.0006 / 15	0.0150 / 381	0.0130 / 330	
3020	0.0030 / 76	0.0020 / 51	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0170 / 432	0.0140 / 356	0.0015 / 38 to 0.0020 / 51
3025	0.0030 / 76	0.0025 / 64	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0180 / 457	0.0140 / 356	
3030	0.0030 / 76	0.0030 / 76	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0180 / 457	0.0150 / 381	
3035	0.0030 / 76	0.0035 / 89	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0190 / 483	0.0150 / 381	
3040	0.0030 / 76	0.0040 / 102	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0190 / 483	0.0150 / 381	

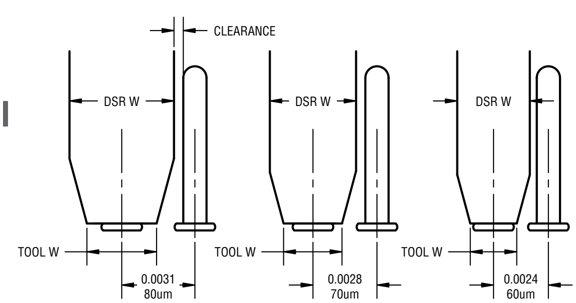
*Flat Face Only
** for 45° FR=0.0010; for 55° & 60° FR=0.0015
Other part numbers are available.
Dimensions in inches unless otherwise specified.

Fine-Pitch MaxiBond Solutions Special DSR & W Designs



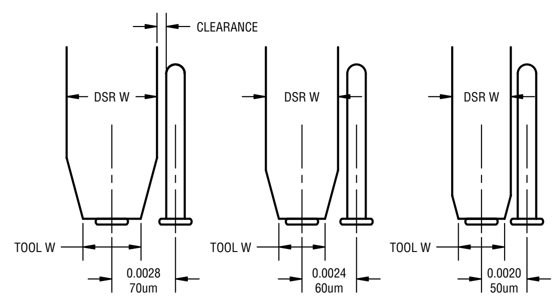
Fine-Pitch Wedge Bonding Criteria

1.0 mil Wire



80µ Pitch **70µ Pitch** **60µ Pitch**

0.8 mil Wire



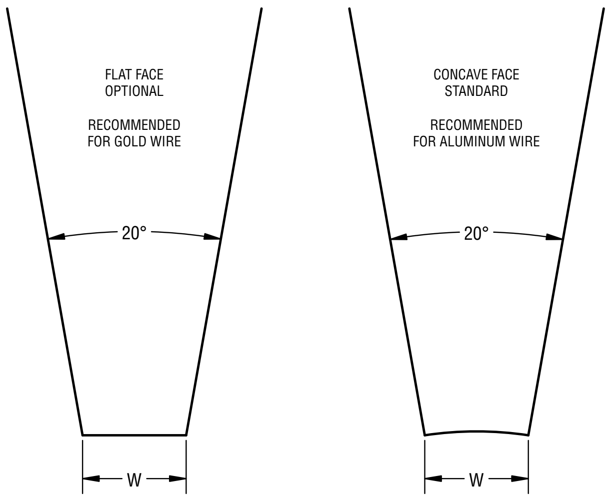
70µ Pitch **60µ Pitch** **50µ Pitch**

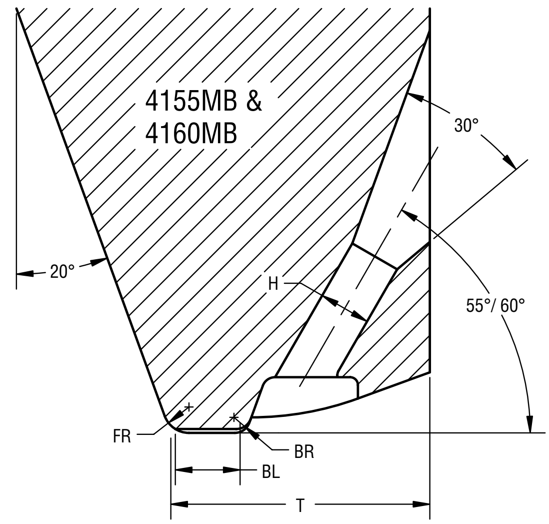
CoorsTek

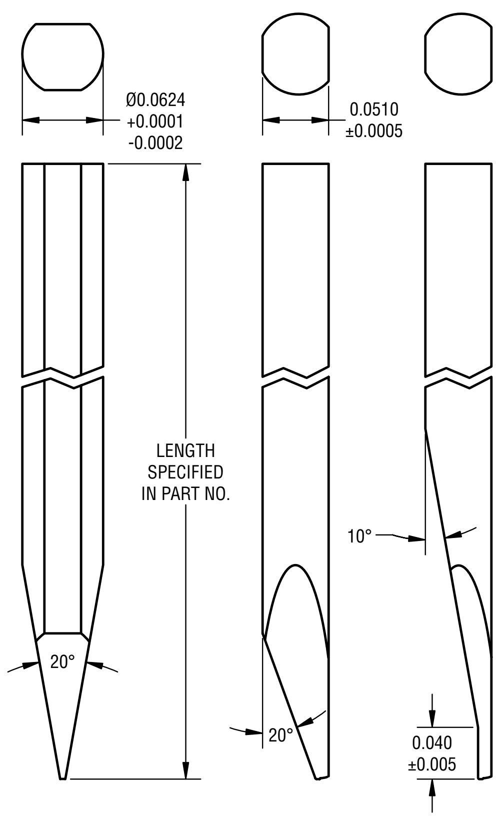
Deep Access MaxiBond™ Wedges

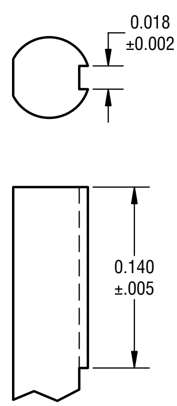
Vertical Feed Series, Double Flat Shank

4155MB, 4160MB & 4155VMB, 4160VMB







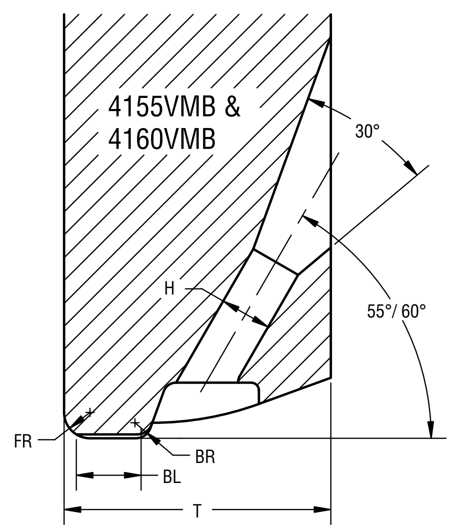


4160MB Style Standard Shank

4160VMB Style Vertical Grind Shank

Modified Shank Option
Acts as Wire Guide

Add "-MS1" to the Part Number.



Specify:
Series/Wire Feed Angle-Hole Size/Bond Length-Length-Options

Example:
4160MB-2020-3/4
4160VMB-1510-3/4-CG-F-BKCER

Features:
Designed for the Palomar 2470 and the Hesse & Knipps Deep Access Wire Bonders

Length:
-3/4=0.750 inch (most common)
-1.0=1.000 inch
-1.078=1.078 inch

Material:
Tungsten Carbide Standard
Titanium Carbide Optional
(Specify "-TiC" in part no.)
Cermet Tip Optional
(Specify "-BKCER" in part no.)

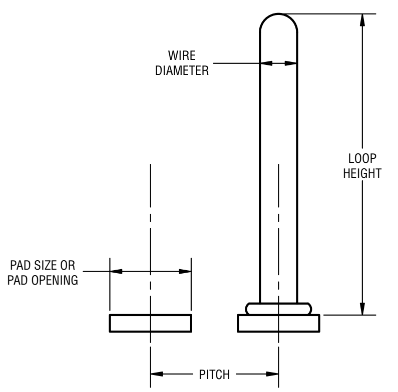
Patent Pending

Deep Access MaxiBond™ Wedges
Vertical Feed Series, Double Flat Shank
4155MB, 4160MB & 4155VMB, 4160VMB

DASH NUMBER	H in. / µm ±0.0002 / 5	BL in. / µm ±0.0002 / 5	W in. / µm ±0.0002 / 5	FR in. / µm ±0.0002 / 5	BR in. / µm ±0.0002 / 5	T in. / µm ±0.0005 / 13	SUGGESTED WIRE DIAMETER in. / µm
0.0013 hole uses the same specifications as the 0.0015 hole except for the hole dimension							
*1505	0.0015 / 38	0.0005 / 13	0.0025 / 64	0.0005 / 13	0.0005 / 13	0.0080 / 203	0.0007 / 18 to 0.0010 / 25
*1510	0.0015 / 38	0.0010 / 25	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0080 / 203	
1515	0.0015 / 38	0.0015 / 38	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0080 / 203	
1520	0.0015 / 38	0.0020 / 51	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0080 / 203	
1525	0.0015 / 38	0.0025 / 64	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0090 / 229	
0.0017 hole uses the same specifications as the 0.0015 hole except for the hole dimension							0.0010 / 25 to 0.0013 / 33
0.0018 hole uses the same specifications as the 0.0020 hole except for the hole dimension							
*2010	0.0020 / 51	0.0010 / 25	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0090 / 229	
2015	0.0020 / 51	0.0015 / 38	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0090 / 229	
2020	0.0020 / 51	0.0020 / 51	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0100 / 254	
2025	0.0020 / 51	0.0025 / 64	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0100 / 254	
2030	0.0020 / 51	0.0030 / 76	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0110 / 279	
2515	0.0025 / 64	0.0015 / 38	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0110 / 279	0.0010 / 25 to 0.0015 / 38
2520	0.0025 / 64	0.0020 / 51	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0110 / 279	
2525	0.0025 / 64	0.0025 / 64	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0120 / 305	
2530	0.0025 / 64	0.0030 / 76	0.0040 / 102	0.0015 / 38	0.0006 / 15	0.0130 / 330	
2535	0.0025 / 64	0.0035 / 89	0.0040 / 102	0.0015 / 38	0.0006 / 15	0.0130 / 330	
3020	0.0030 / 76	0.0020 / 51	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0140 / 356	0.0015 / 38 to 0.0020 / 51
3025	0.0030 / 76	0.0025 / 64	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0140 / 356	
3030	0.0030 / 76	0.0030 / 76	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0150 / 381	
3035	0.0030 / 76	0.0035 / 89	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0150 / 381	
3040	0.0030 / 76	0.0040 / 102	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0160 / 406	

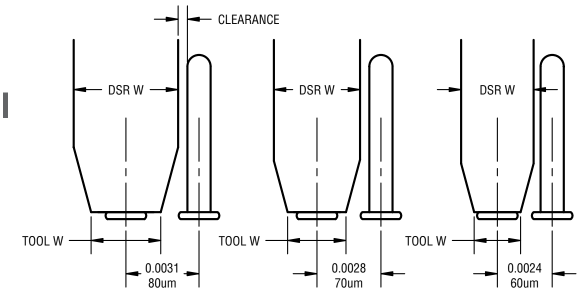
*Flat Face Only
Other part numbers are available.
Dimensions in inches unless otherwise specified

Fine-Pitch MaxiBond Solutions Special DSR & W Designs



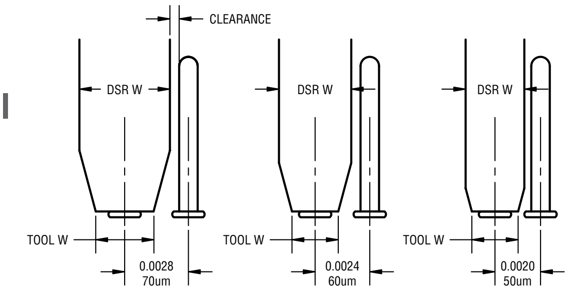
Fine-Pitch Wedge Bonding Criteria

1.0 mil Wire



80µ Pitch | 70µ Pitch | 60µ Pitch

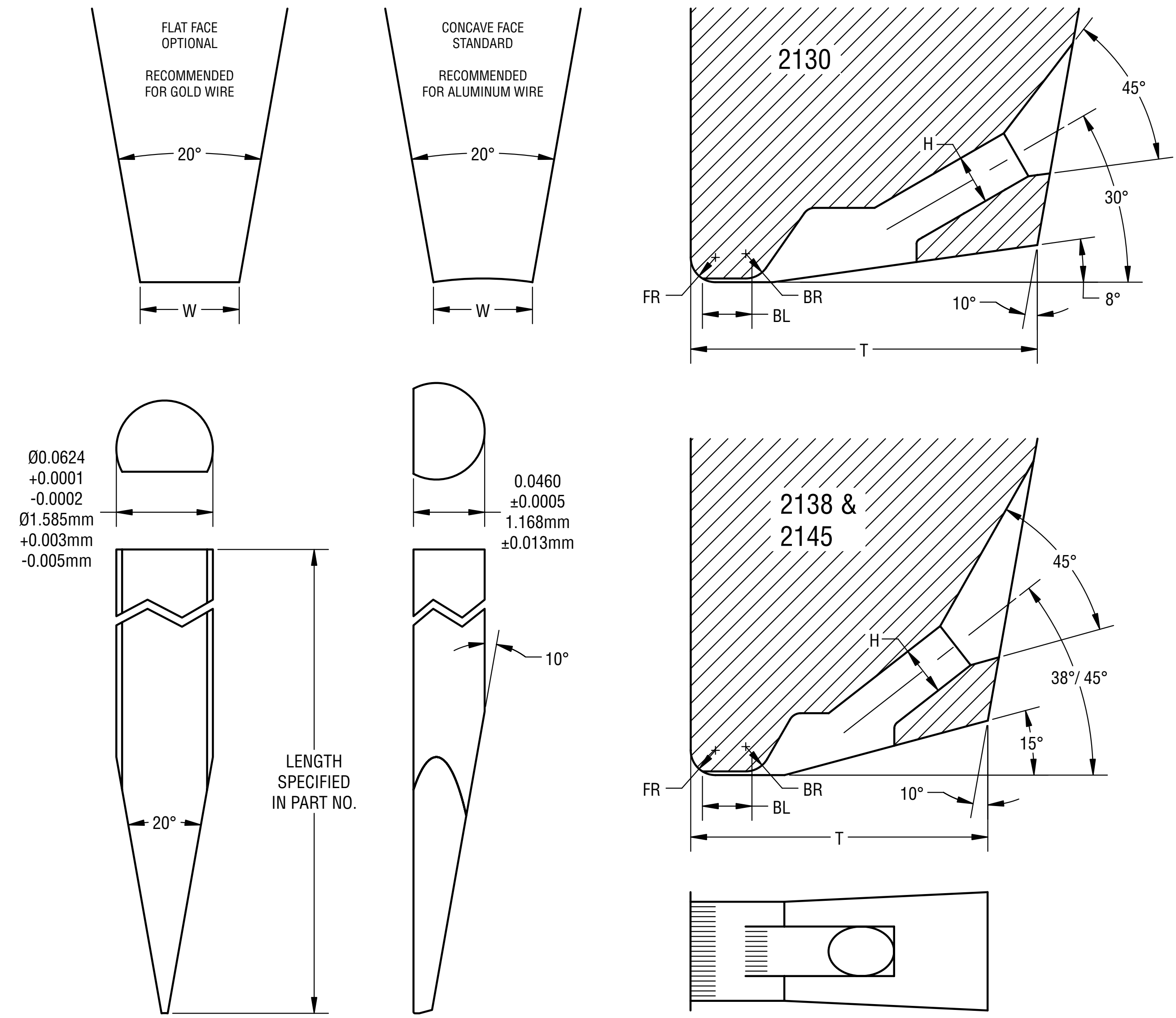
0.8 mil Wire



70µ Pitch | 60µ Pitch | 50µ Pitch

CoorsTek

MaxiGuide™ Wedges
2130, 2138, & 2145 Series



Specify:
Series/Wire Feed Angle-Hole Size/Bond Length-Length-Options

Example:
2145-2020-S
2130-1510-3/4-F-TiC

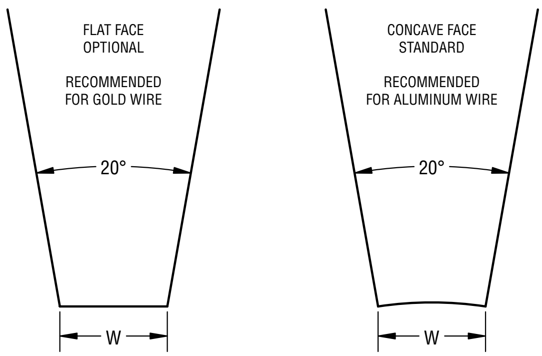
Material:
Tungsten Carbide Standard
Titanium Carbide Optional
(Specify "-TiC" in part no.)
Cermet Tip Optional
(Specify "-BKCER" in part no.)

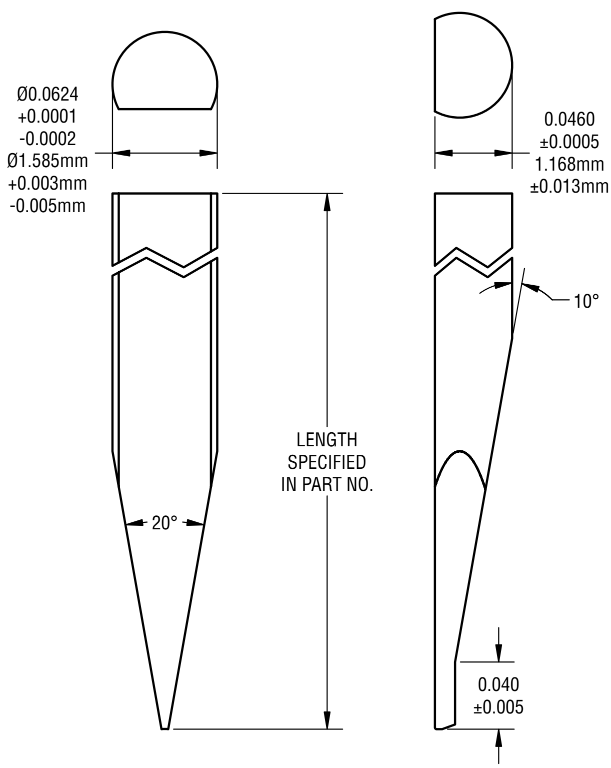
Features:
The MaxiGuide design encloses and guides the wire to the bond foot, thereby enhancing wire control and bond centering.

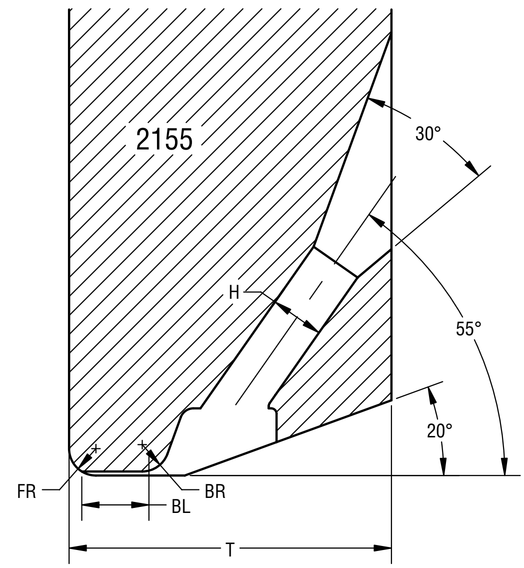
DASH NUMBER	H in. / µm ±0.0002 / 5	BL in. / µm ±0.0002 / 5	W in. / µm ±0.0002 / 5	FR in. / µm ±0.0002 / 5	BR in. / µm ±0.0002 / 5	T 30° in. / µm ±0.0005 / 13	T 38° & 45° in. / µm ±0.0005 / 13	SUGGESTED WIRE DIAMETER in. / µm
0.0013 hole uses the same specifications as the 0.0015 hole except for the hole dimension								0.0007 / 18 to 0.0008 / 20
*1505	0.0015 / 38	0.0005 / 13	0.0025 / 64	0.0005 / 13	0.0005 / 13	0.0100 / 254	0.0080 / 203	
*1507	0.0015 / 38	0.0007 / 18	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0100 / 254	0.0090 / 229	
*1507A	0.0015 / 38	0.0007 / 18	0.0030 / 76	0.0010 / 25	0.0000 / 0	0.0100 / 254	0.0090 / 229	
*1510	0.0015 / 38	0.0010 / 25	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0110 / 279	0.0090 / 229	
*1510A	0.0015 / 38	0.0010 / 25	0.0030 / 76	0.0010 / 25	0.0000 / 0	0.0110 / 279	0.0090 / 229	
1515	0.0015 / 38	0.0015 / 38	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0110 / 279	0.0090 / 229	
1520	0.0015 / 38	0.0020 / 51	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0120 / 305	0.0100 / 254	
1525	0.0015 / 38	0.0025 / 64	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0120 / 305	0.0100 / 254	
1530	0.0015 / 38	0.0030 / 76	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0130 / 330	0.0110 / 279	
0.0017 hole uses the same specifications as the 0.0015 hole except for the hole dimension								0.0008 / 20 to 0.0010 / 25
0.0018 hole uses the same specifications as the 0.0020 hole except for the hole dimension								
*2005	0.0020 / 51	0.0005 / 13	0.0040 / 102	0.0005 / 13	0.0005 / 13	0.0120 / 305	0.0100 / 254	0.0010 / 25
*2007	0.0020 / 51	0.0007 / 18	0.0040 / 102	0.0005 / 13	0.0005 / 13	0.0120 / 305	0.0110 / 279	
*2010	0.0020 / 51	0.0010 / 25	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0130 / 330	0.0110 / 279	
2015	0.0020 / 51	0.0015 / 38	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0140 / 356	0.0120 / 305	
2020	0.0020 / 51	0.0020 / 51	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0140 / 356	0.0120 / 305	
2022	0.0020 / 51	0.0022 / 56	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0140 / 356	0.0120 / 305	
2025	0.0020 / 51	0.0025 / 64	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0150 / 381	0.0130 / 330	
2030	0.0020 / 51	0.0030 / 76	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0150 / 381	0.0130 / 330	
2040	0.0020 / 51	0.0040 / 102	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0160 / 406	0.0140 / 356	
0.0023 hole uses the same specifications as the 0.0025 hole except for the hole dimension								0.0010 / 25 to 0.0013 / 33
*2510	0.0025 / 64	0.0010 / 25	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0140 / 356	0.0120 / 305	
2515	0.0025 / 64	0.0015 / 38	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0140 / 356	0.0130 / 330	
2520	0.0025 / 64	0.0020 / 51	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0150 / 381	0.0130 / 330	
2522	0.0025 / 64	0.0022 / 56	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0150 / 381	0.0130 / 330	
2525	0.0025 / 64	0.0025 / 64	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0150 / 381	0.0140 / 356	
2530	0.0025 / 64	0.0030 / 76	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0150 / 381	0.0140 / 356	
2535	0.0025 / 64	0.0035 / 89	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0160 / 406	0.0150 / 381	
2540	0.0025 / 64	0.0040 / 102	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0160 / 406	0.0150 / 381	
3015	0.0030 / 76	0.0015 / 38	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0170 / 432	0.0170 / 432	0.0015 / 38 to 0.0018 / 46
3020	0.0030 / 76	0.0020 / 51	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0170 / 432	0.0170 / 432	
3025	0.0030 / 76	0.0025 / 64	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0180 / 457	0.0180 / 457	
3030	0.0030 / 76	0.0030 / 76	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0180 / 457	0.0180 / 457	
3035	0.0030 / 76	0.0035 / 89	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0190 / 483	0.0190 / 483	
3040	0.0030 / 76	0.0040 / 102	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0190 / 483	0.0190 / 483	
3525	0.0035 / 89	0.0025 / 64	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0210 / 533	0.0180 / 457	0.0020 / 51
3530	0.0035 / 89	0.0030 / 76	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0210 / 533	0.0190 / 483	
3535	0.0035 / 89	0.0035 / 89	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0220 / 559	0.0190 / 483	
3540	0.0035 / 89	0.0040 / 102	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0220 / 559	0.0200 / 508	
3545	0.0035 / 89	0.0045 / 114	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0230 / 584	0.0200 / 508	
3550	0.0035 / 89	0.0050 / 127	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0230 / 584	0.0210 / 533	
4040	0.0040 / 102	0.0040 / 102	0.0060 / 152	0.0015 / 38	0.0010 / 25	0.0250 / 635	0.0210 / 533	0.0020 / 51 to 0.0025 / 64
4050	0.0040 / 102	0.0050 / 127	0.0060 / 152	0.0015 / 38	0.0010 / 25	0.0260 / 660	0.0220 / 559	
4540	0.0045 / 114	0.0040 / 102	0.0070 / 178	0.0020 / 51	0.0010 / 25	0.0270 / 686	0.0250 / 635	0.0030 / 76
4545	0.0045 / 114	0.0045 / 114	0.0070 / 178	0.0020 / 51	0.0010 / 25	0.0270 / 686	0.0250 / 635	
5050	0.0050 / 127	0.0050 / 127	0.0070 / 178	0.0020 / 51	0.0010 / 25	0.0300 / 762	0.0280 / 711	0.0030 / 76 to 0.0035 / 89

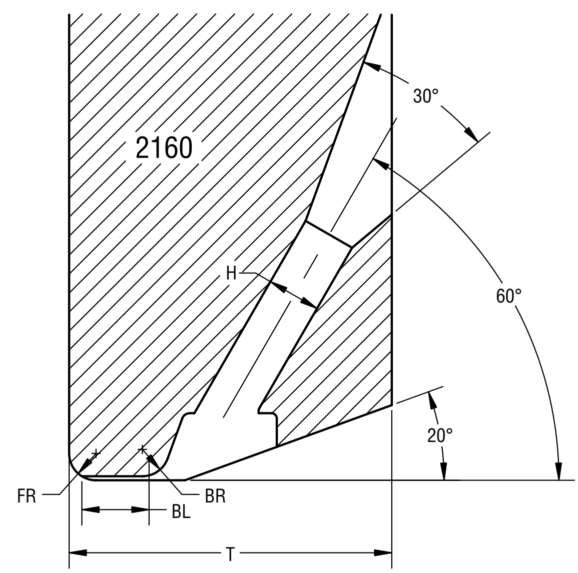
*Flat Face Only. Other part numbers are available. Dimensions in inches unless otherwise specified.

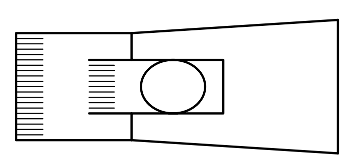
MaxiGuide™ Wedges
2155 & 2160 Series











Specify:
Series/Wire Feed Angle-Hole Size/Bond Length-Length-Options

Example:
2160-2020-S
2155-1510-3/4-F-TiC

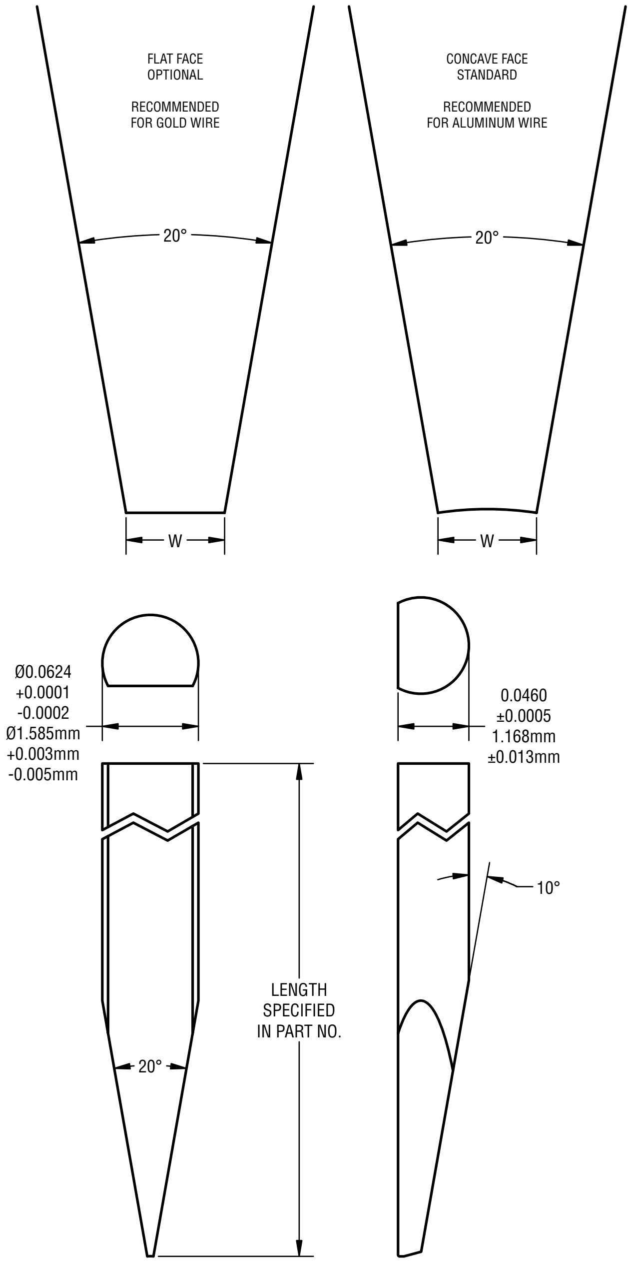
Material:
Tungsten Carbide Standard
Titanium Carbide Optional
(Specify "-TiC" in part no.)
Cermet Tip Optional
(Specify "-BKCER" in part no.)

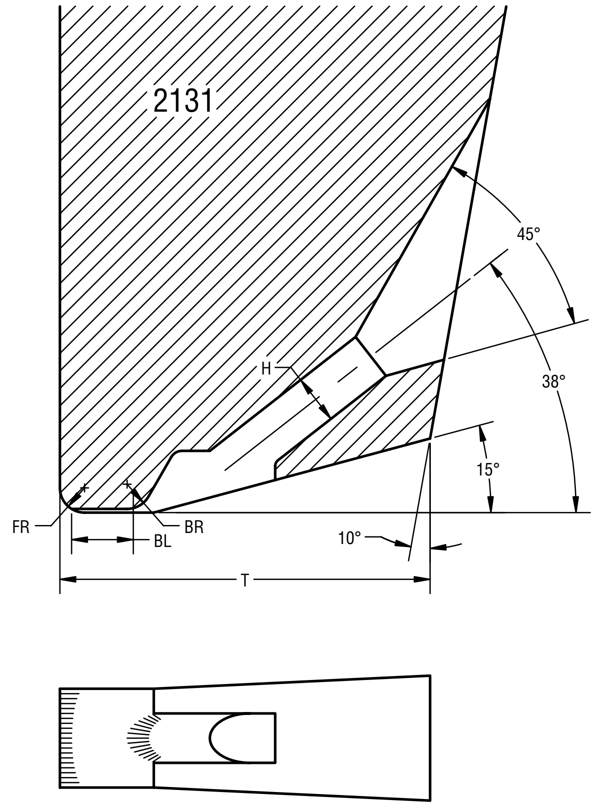
Features:
The MaxiGuide design encloses and guides the wire to the bond foot, thereby enhancing wire control and bond centering.

DASH NUMBER	H in. / µm ±0.0002 / 5	BL in. / µm ±0.0002 / 5	W in. / µm ±0.0002 / 5	FR in. / µm ±0.0002 / 5	BR in. / µm ±0.0002 / 5	T 55° & 60° in. / µm ±0.0005 / 13	SUGGESTED WIRE DIAMETER in. / µm
0.0013 hole uses the same specifications as the 0.0015 hole except for the hole dimension							0.0007 / 18 to 0.0008 / 20
*1505	0.0015 / 38	0.0005 / 13	0.0030 / 76	0.0005 / 13	0.0005 / 13	0.0080 / 203	
*1507	0.0015 / 38	0.0007 / 18	0.0030 / 76	0.0005 / 13	0.0005 / 13	0.0080 / 203	
*1508	0.0015 / 38	0.0008 / 20	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0080 / 203	
*1508A	0.0015 / 38	0.0008 / 20	0.0030 / 76	0.0010 / 25	0.0000 / 0	0.0080 / 203	
*1510	0.0015 / 38	0.0010 / 25	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0080 / 203	
1515	0.0015 / 38	0.0015 / 38	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0080 / 203	
1520	0.0015 / 38	0.0020 / 51	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0090 / 229	
1525	0.0015 / 38	0.0025 / 64	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0090 / 229	
1527	0.0015 / 38	0.0027 / 69	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0090 / 229	
1530	0.0015 / 38	0.0030 / 76	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0100 / 254	
0.0017 hole uses the same specifications as the 0.0015 hole except for the hole dimension							0.0008 / 20 to 0.0010 / 25
0.0018 hole uses the same specifications as the 0.0020 hole except for the hole dimension							
*2007	0.0020 / 51	0.0007 / 18	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0100 / 254	0.0010 / 25
*2010	0.0020 / 51	0.0010 / 25	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0110 / 279	
2015	0.0020 / 51	0.0015 / 38	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0110 / 279	
2018	0.0020 / 51	0.0018 / 46	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0120 / 305	
2020	0.0020 / 51	0.0020 / 51	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0120 / 305	
2025	0.0020 / 51	0.0025 / 64	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0120 / 305	
2030	0.0020 / 51	0.0030 / 76	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0120 / 305	
2035	0.0020 / 51	0.0035 / 89	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0130 / 330	
2040	0.0020 / 51	0.0040 / 102	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0130 / 330	
2515	0.0025 / 64	0.0015 / 38	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0110 / 279	0.0010 / 25 to 0.0013 / 33
2520	0.0025 / 64	0.0020 / 51	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0120 / 305	
2522	0.0025 / 64	0.0022 / 56	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0120 / 305	
2525	0.0025 / 64	0.0025 / 64	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0120 / 305	
2527	0.0025 / 64	0.0027 / 69	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0130 / 330	
2530	0.0025 / 64	0.0030 / 76	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0130 / 330	
2530A	0.0025 / 64	0.0030 / 76	0.0040 / 102	0.0010 / 25	0.0000 / 0	0.0120 / 305	
2535	0.0025 / 64	0.0035 / 89	0.0040/102	0.0010 / 25	0.0010 / 25	0.0130 / 330	
2540	0.0025 / 64	0.0040 / 102	0.0040/102	0.0010 / 25	0.0010 / 25	0.0140 / 356	
3025	0.0030 / 76	0.0025 / 64	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0140 / 356	0.0015 / 38 to 0.0018 / 46
3030	0.0030 / 76	0.0030 / 76	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0150 / 381	
3030A	0.0030 / 76	0.0030 / 76	0.0050 / 127	0.0015 / 38	0.0000 / 0	0.0140 / 356	
3035	0.0030 / 76	0.0035 / 89	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0150 / 381	
3040	0.0030 / 76	0.0040 / 102	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0150 / 381	
3520	0.0035 / 89	0.0020 / 51	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0140 / 356	0.0020 / 51
3525	0.0035 / 89	0.0025 / 64	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0150 / 381	
3530	0.0035 / 89	0.0030 / 76	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0150 / 381	
3535	0.0035 / 89	0.0035 / 89	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0160 / 406	
3540	0.0035 / 89	0.0040 / 102	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0160 / 406	
3550	0.0035 / 89	0.0050 / 127	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0170 / 432	
4040	0.0040 / 102	0.0040 / 102	0.0060 / 152	0.0015 / 38	0.0010 / 25	0.0180 / 457	0.0020 / 51 to 0.0025 / 64
4050	0.0040 / 102	0.0050 / 127	0.0060 / 152	0.0015 / 38	0.0010 / 25	0.0190 / 483	
4540	0.0045 / 114	0.0040 / 102	0.0070 / 178	0.0020 / 51	0.0010 / 25	0.0200 / 508	0.0030 / 76
4545	0.0045 / 114	0.0045 / 114	0.0070 / 178	0.0020 / 51	0.0010 / 25	0.0200 / 508	
4560	0.0045 / 114	0.0060 / 152	0.0070 / 178	0.0020 / 51	0.0010 / 25	0.0220 / 559	

*Flat Face Only. Other part numbers are available. Dimensions in inches unless otherwise specified.v

MaxiGuide™ Wedges
2131 Series





Specify:
Series/Wire Feed Angle-Hole Size/Bond Length-Length-Options

Example:
2131-2020-S
2131-1510-3/4-F-TiC

Material:
Tungsten Carbide Standard
Titanium Carbide Optional
(Specify "-TiC" in part no.)
Cermet Tip Optional
(Specify "-BKCER" in part no.)

Features:
The elliptical back radius design reduces heel cracks.

DASH NUMBER	H in. / µm ±0.0002/5	BL in. / µm ±0.0002 / 5	W in. / µm ±0.0002 / 5	FR in. / µm ±0.0002 / 5	BR in. / µm ±0.0002 / 5	T in. / µm ±0.0005 / 13	SUGGESTED WIRE DIAMETER in. / µm
0.0013 hole uses the same specifications as the 0.0015 hole except for the hole dimension							
0.0014 hole uses the same specifications as the 0.0015 hole except for the hole dimension							
*1505	0.0015 / 38	0.0005 / 13	0.0030 / 76	0.0005 / 13	0.0005 / 13	0.0110 / 279	0.0007 / 18 to 0.0008 / 20
*1510	0.0015 / 38	0.0010 / 25	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0110 / 279	
*1510A	0.0015 / 38	0.0010 / 25	0.0030 / 76	0.0010 / 25	0.0000 / 0	0.0110 / 279	
1515	0.0015 / 38	0.0015 / 38	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0110 / 279	
1520	0.0015 / 38	0.0020 / 51	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0120 / 305	
1525	0.0015 / 38	0.0025 / 64	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0120 / 305	
1530C	0.0015 / 38	0.0030 / 76	0.0030 / 76	0.0010 / 25	0.0004 / 10	0.0150 / 381	
*1810	0.0018 / 46	0.0010 / 25	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0150 / 381	0.0008 / 20 to 0.0010 / 25
*1810A	0.0018 / 46	0.0010 / 25	0.0040 / 102	0.0010 / 25	0.0000 / 0	0.0150 / 381	
1815	0.0018 / 46	0.0015 / 38	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0150 / 381	
1820	0.0018 / 46	0.0020 / 51	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0150 / 381	
1825	0.0018 / 46	0.0025 / 64	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0150 / 381	
1830C	0.0018 / 46	0.0030 / 76	0.0040 / 102	0.0010 / 25	0.0004 / 10	0.0150 / 381	
*2010	0.0020 / 51	0.0010 / 25	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0150 / 381	0.0010 / 25
2015	0.0020 / 51	0.0015 / 38	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0150 / 381	
2017	0.0020 / 51	0.0017 / 43	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0150 / 381	
2020	0.0020 / 51	0.0020 / 51	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0150 / 381	
2025	0.0020 / 51	0.0025 / 64	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0150 / 381	
2025C	0.0020 / 51	0.0025 / 64	0.0040 / 102	0.0010 / 25	0.0004 / 10	0.0150 / 381	
2030	0.0020 / 51	0.0030 / 76	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0150 / 381	
*2510	0.0025 / 64	0.0010 / 25	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0150 / 381	0.0010 / 25 to 0.0013 / 33
2515	0.0025 / 64	0.0015 / 38	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0150 / 381	
2520	0.0025 / 64	0.0020 / 51	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0150 / 381	
2525	0.0025 / 64	0.0025 / 64	0.0040 / 102	0.0010 / 25	0.0010 / 25	0.0150 / 381	
2530	0.0025 / 64	0.0030 / 76	0.0040 / 102	0.0015 / 38	0.0010 / 25	0.0150 / 381	
2530C	0.0025 / 64	0.0030 / 76	0.0040 / 102	0.0010 / 25	0.0004 / 10	0.0150 / 381	
2535	0.0025 / 64	0.0035 / 89	0.0040 / 102	0.0015 / 38	0.0010 / 25	0.0200 / 508	
2540	0.0025 / 64	0.0040 / 102	0.0040 / 102	0.0015 / 38	0.0010 / 25	0.0200 / 508	
3020	0.0030 / 76	0.0020 / 51	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0200 / 508	0.0015 / 38 to 0.0018 / 46
3025	0.0030 / 76	0.0025 / 64	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0200 / 508	
3030	0.0030 / 76	0.0030 / 76	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0200 / 508	
3035	0.0030 / 76	0.0035 / 89	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0250 / 635	
3040	0.0030 / 76	0.0040 / 102	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0250 / 635	
3045	0.0030 / 76	0.0045 / 114	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0250 / 635	
3050	0.0030 / 76	0.0050 / 127	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0250 / 635	
3525	0.0035 / 89	0.0025 / 64	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0200 / 508	0.0020 / 51
3530	0.0035 / 89	0.0030 / 76	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0250 / 635	
3535	0.0035 / 89	0.0035 / 89	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0250 / 635	
3540	0.0035 / 89	0.0040 / 102	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0250 / 635	
3545	0.0035 / 89	0.0045 / 114	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0250 / 635	
3550	0.0035 / 89	0.0050 / 127	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0250 / 635	
4030	0.0040 / 102	0.0030 / 76	0.0060 /152	0.0015 / 38	0.0010 / 25	0.0220 / 559	0.0020 / 51 to 0.0025 / 64
4035	0.0040 / 102	0.0035 / 89	0.0060 / 152	0.0015 / 38	0.0010 / 25	0.0230 / 584	
4040	0.0040 / 102	0.0040 / 102	0.0060 / 152	0.0015 / 38	0.0010 / 25	0.0230 / 584	
4540	0.0045 / 114	0.0040 / 102	0.0060 / 152	0.0020 / 51	0.0010 / 25	0.0350 / 889	0.0030 / 76
4545	0.0045 / 114	0.0045 / 114	0.0060 / 152	0.0020 / 51	0.0010 / 25	0.0350 / 889	
4550	0.0045 / 114	0.0050 /127	0.0060 / 152	0.0020 / 51	0.0010 / 25	0.0350 / 889	

*Flat Face Only. Other part numbers are available. Dimensions in inches unless otherwise specified.

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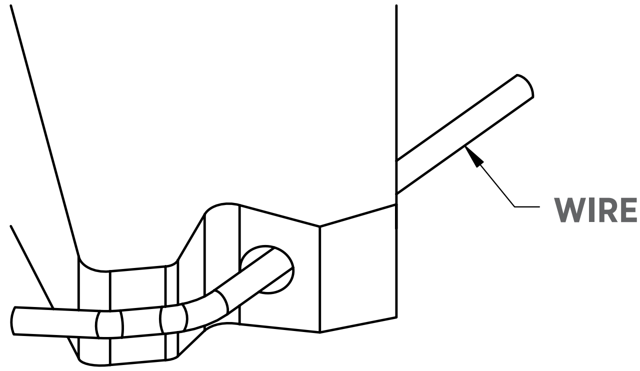
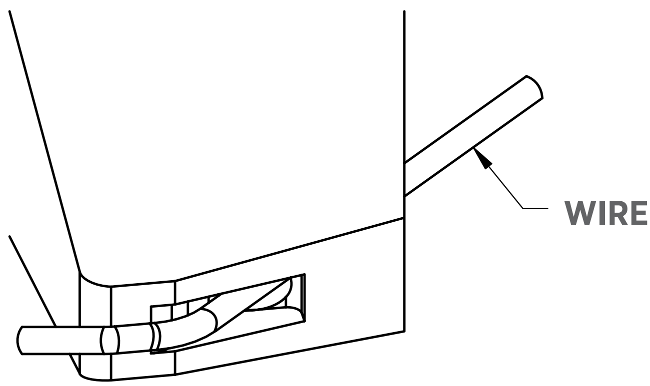
www.gaisertool.com

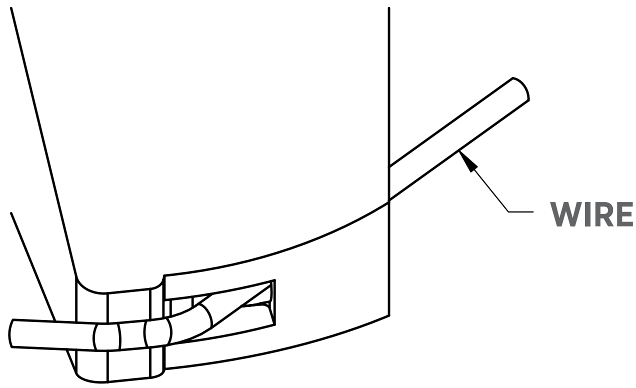
Open V-Notch Construction



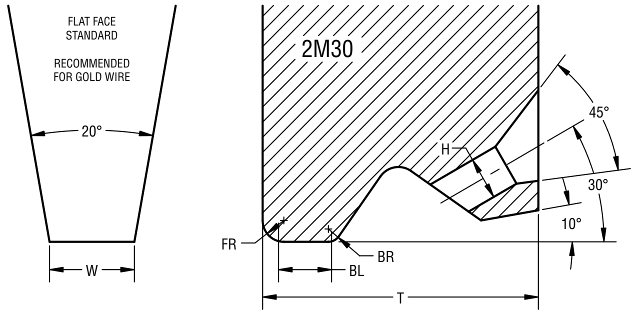
MaxiGuide Construction



MaxiBond Construction



Gold Wire Microwave Wedges
2M30 & 2M38 Series



Features:
Flat face, small geometry, vertical back grind for tight access small pad bonding applications.

Specify:
Series/Wire Feed Angle - Hole Size/Bond Length - Length - Options

Example:
2M30-2020-S
2M38-1510-3/4-TiC

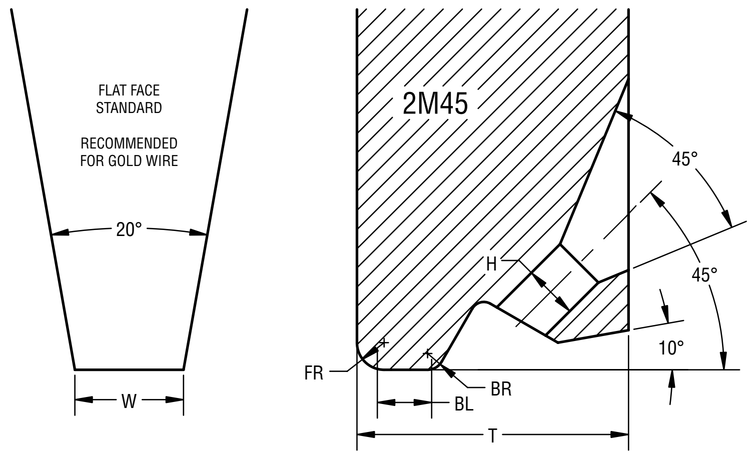
Material:
Tungsten Carbide Standard
Titanium Carbide Optional
(Specify "-TiC" in part no.)
Cermet Tip Optional
(Specify "-BKCER" in part no.)

DASH NUMBER	H in. / µm ±0.0002 / 5	BL in. / µm ±0.0002 / 5	W in. / µm ±0.0002 / 5	FR in. / µm ±0.0002 / 5	BR in. / µm ±0.0002 / 5	T 30° & 38° in. / µm ±0.0005 / 13	SUGGESTED WIRE DIAMETER in. / µm
0.0013 hole uses the same specifications as the 0.0015 hole except for the hole dimension							0.0007 / 18 to 0.0008 / 20
1505	0.0015 / 38	0.0005 / 13	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0100 / 254	
1507	0.0015 / 38	0.0007 / 18	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0100 / 254	
1510	0.0015 / 38	0.0010 / 25	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0100 / 254	
1513	0.0015 / 38	0.0013 / 33	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0100 / 254	
1515	0.0015 / 38	0.0015 / 38	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0100 / 254	
1520	0.0015 / 38	0.0020 / 51	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0110 / 279	
1505B	0.0015 / 38	0.0005 / 13	0.0030 / 76	0.0004 / 10	0.0004 / 10	0.0090 / 229	
1507B	0.0015 / 38	0.0007 / 18	0.0030 / 76	0.0004 / 10	0.0004 / 10	0.0090 / 229	
1510B	0.0015 / 38	0.0010 / 25	0.0030 / 76	0.0004 / 10	0.0004 / 10	0.0090 / 229	
1513B	0.0015 / 38	0.0013 / 33	0.0030 / 76	0.0004 / 10	0.0004 / 10	0.0100 / 254	
1515B	0.0015 / 38	0.0015 / 38	0.0030 / 76	0.0004 / 10	0.0004 / 10	0.0100 / 254	
1520B	0.0015 / 38	0.0020 / 51	0.0030 / 76	0.0004 / 10	0.0004 / 10	0.0100 / 254	
2005	0.0020 / 51	0.0005 / 13	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0100 / 254	0.0010 / 25
2007	0.0020 / 51	0.0007 / 18	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0100 / 254	
2010	0.0020 / 51	0.0010 / 25	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0100 / 254	
2013	0.0020 / 51	0.0013 / 33	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0120 / 305	
2015	0.0020 / 51	0.0015 / 38	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0120 / 305	
2020	0.0020 / 51	0.0020 / 51	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0120 / 305	
2025	0.0020 / 51	0.0025 / 64	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0130 / 330	
2005B	0.0020 / 51	0.0005 / 13	0.0040 / 102	0.0004 / 10	0.0004 / 10	0.0100 / 254	
2007B	0.0020 / 51	0.0007 / 18	0.0040 / 102	0.0004 / 10	0.0004 / 10	0.0100 / 254	
2010B	0.0020 / 51	0.0010 / 25	0.0040 / 102	0.0004 / 10	0.0004 / 10	0.0100 / 254	
2013B	0.0020 / 51	0.0013 / 33	0.0040 / 102	0.0004 / 10	0.0004 / 10	0.0120 / 305	
2015B	0.0020 / 51	0.0015 / 38	0.0040 / 102	0.0004 / 10	0.0004 / 10	0.0120 / 305	
2020B	0.0020 / 51	0.0020 / 51	0.0040 / 102	0.0004 / 10	0.0004 / 10	0.0120 / 305	

Other part numbers are available. Dimensions in inches unless otherwise specified.

capillaries
wedges
tab tools
die attach
other

Gold Wire Microwave Wedges
2M45 Series



Features:
Flat face, small geometry, vertical back grind for tight access small pad bonding applications.

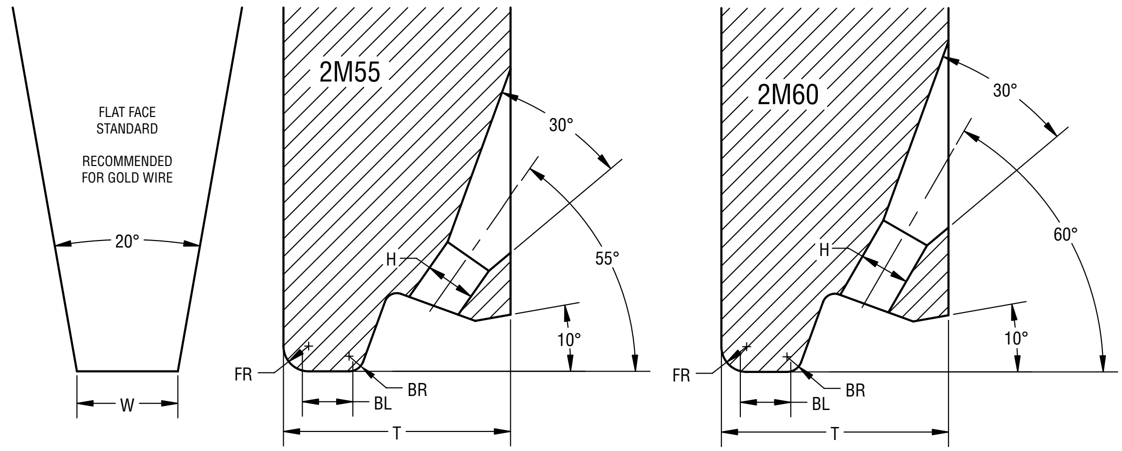
Specify:
Series/Wire Feed Angle - Hole Size/Bond Length - Length - Options

Example:
2M45-2020-S
2M45-1510-3/4-TiC

Material:
Tungsten Carbide Standard
Titanium Carbide Optional
(Specify "-TiC" in part no.)
Cermet Tip Optional
(Specify "-BKCER" in part no.)

DASH NUMBER	H in. / µm ±0.0002 / 5	BL in. / µm ±0.0002 / 5	W in. / µm ±0.0002 / 5	FR in. / µm ±0.0002 / 5	BR in. / µm ±0.0002 / 5	T 45° in. / µm ±0.0005 / 13	SUGGESTED WIRE DIAMETER in. / µm
0.0013 hole uses the same specifications as the 0.0015 hole except for the hole dimension							0.0007 / 18 to 0.0008 / 20
1505	0.0015 / 38	0.0005 / 13	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0080 / 203	
1507	0.0015 / 38	0.0007 / 18	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0080 / 203	
1510	0.0015 / 38	0.0010 / 25	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0080 / 203	
1513	0.0015 / 38	0.0013 / 33	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0080 / 203	
1515	0.0015 / 38	0.0015 / 38	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0080 / 203	
1520	0.0015 / 38	0.0020 / 51	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0090 / 229	
1505B	0.0015 / 38	0.0005 / 13	0.0030 / 76	0.0004 / 10	0.0004 / 10	0.0080 / 203	
1507B	0.0015 / 38	0.0007 / 18	0.0030 / 76	0.0004 / 10	0.0004 / 10	0.0080 / 203	
1510B	0.0015 / 38	0.0010 / 25	0.0030 / 76	0.0004 / 10	0.0004 / 10	0.0080 / 203	
1513B	0.0015 / 38	0.0013 / 33	0.0030 / 76	0.0004 / 10	0.0004 / 10	0.0080 / 203	
1515B	0.0015 / 38	0.0015 / 38	0.0030 / 76	0.0004 / 10	0.0004 / 10	0.0080 / 203	
1520B	0.0015 / 38	0.0020 / 51	0.0030 / 76	0.0004 / 10	0.0004 / 10	0.0080 / 203	
2005	0.0020 / 51	0.0005 / 13	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0080 / 203	0.0010 / 25
2007	0.0020 / 51	0.0007 / 18	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0080 / 203	
2010	0.0020 / 51	0.0010 / 25	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0090 / 229	
2013	0.0020 / 51	0.0013 / 33	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0090 / 229	
2015	0.0020 / 51	0.0015 / 38	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0090 / 229	
2020	0.0020 / 51	0.0020 / 51	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0100 / 254	
2005B	0.0020 / 51	0.0005 / 13	0.0040 / 102	0.0004 / 10	0.0004 / 10	0.0080 / 203	
2007B	0.0020 / 51	0.0007 / 18	0.0040 / 102	0.0004 / 10	0.0004 / 10	0.0080 / 203	
2010B	0.0020 / 51	0.0010 / 25	0.0040 / 102	0.0004 / 10	0.0004 / 10	0.0080 / 203	
2013B	0.0020 / 51	0.0013 / 33	0.0040 / 102	0.0004 / 10	0.0004 / 10	0.0080 / 203	
2015B	0.0020 / 51	0.0015 / 38	0.0040 / 102	0.0004 / 10	0.0004 / 10	0.0090 / 229	
2020B	0.0020 / 51	0.0020 / 51	0.0040 / 102	0.0004 / 10	0.0004 / 10	0.0090 / 229	

Other part numbers are available. Dimensions in inches unless otherwise specified.



Specify:
Series/Wire Feed Angle - Hole Size/Bond Length - Length - Options

Example:
2M55-2020-S
2M60-1510-3/4-TiC

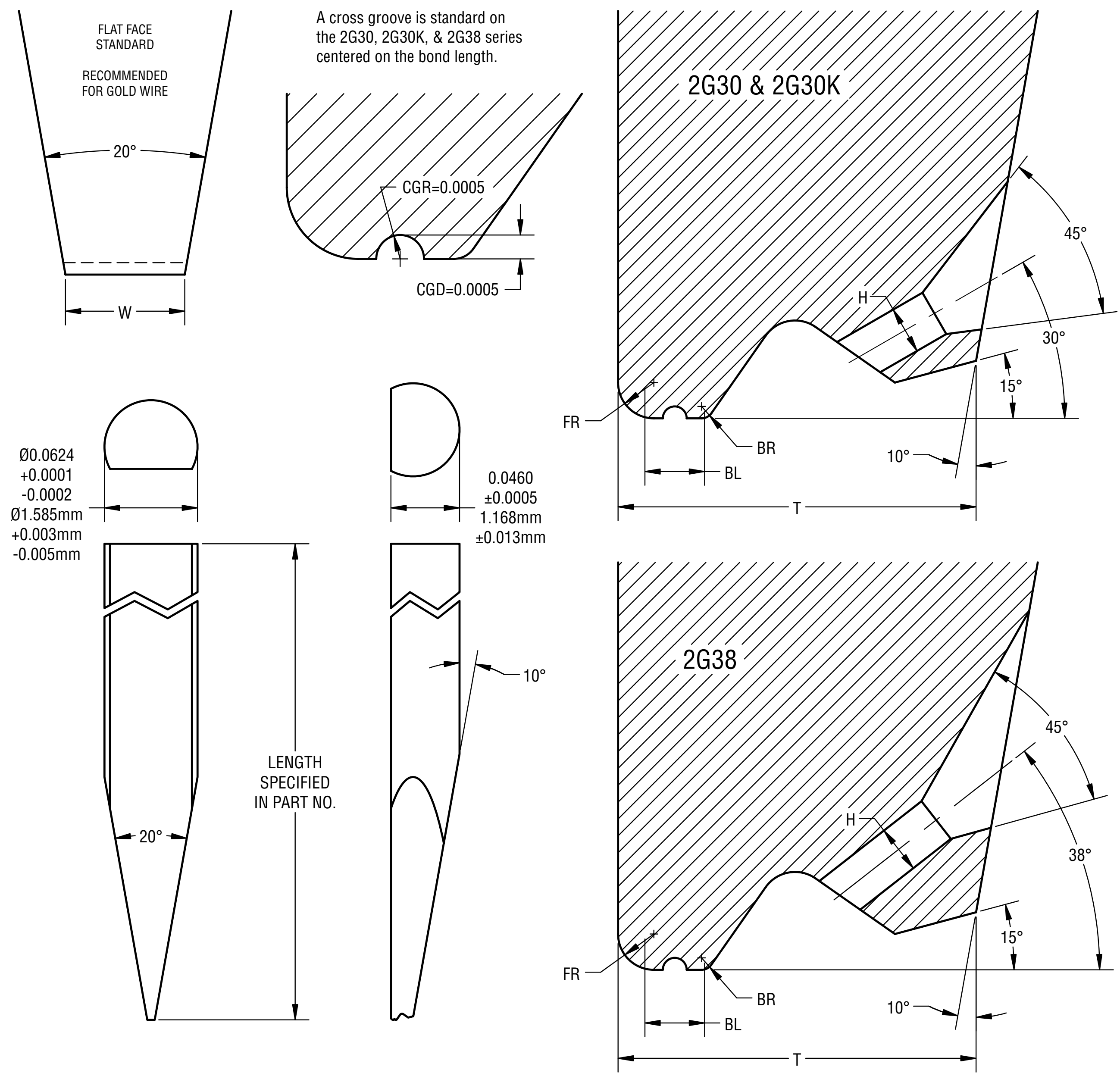
Features:
Flat face, small geometry, vertical back grind for tight access small pad bonding applications.

Material:
Tungsten Carbide Standard
Titanium Carbide Optional
(Specify "-TiC" in part no.)
Cermet Tip Optional
(Specify "-BKCER" in part no.)

DASH NUMBER	H in. / µm ±0.0002 / 5	BL in. / µm ±0.0002 / 5	W in. / µm ±0.0002 / 5	FR in. / µm ±0.0002 / 5	BR in. / µm ±0.0002 / 5	T 55° & 60° in. / µm ±0.0005 / 13	SUGGESTED WIRE DIAMETER in. / µm
0.0013 hole uses the same specifications as the 0.0015 hole except for the hole dimension							0.0007 / 18 to 0.0008 / 20
1505	0.0015 / 38	0.0005 / 13	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0080 / 203	
1507	0.0015 / 38	0.0007 / 18	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0080 / 203	
1510	0.0015 / 38	0.0010 / 25	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0080 / 203	
1513	0.0015 / 38	0.0013 / 33	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0080 / 203	
1515	0.0015 / 38	0.0015 / 38	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0080 / 203	
1520	0.0015 / 38	0.0020 / 51	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0080 / 203	
1505B	0.0015 / 38	0.0005 / 13	0.0030 / 76	0.0004 / 10	0.0004 / 10	0.0080 / 203	
1507B	0.0015 / 38	0.0007 / 18	0.0030 / 76	0.0004 / 10	0.0004 / 10	0.0080 / 203	
1510B	0.0015 / 38	0.0010 / 25	0.0030 / 76	0.0004 / 10	0.0004 / 10	0.0080 / 203	
1513B	0.0015 / 38	0.0013 / 33	0.0030 / 76	0.0004 / 10	0.0004 / 10	0.0080 / 203	
1515B	0.0015 / 38	0.0015 / 38	0.0030 / 76	0.0004 / 10	0.0004 / 10	0.0080 / 203	
1520B	0.0015 / 38	0.0020 / 51	0.0030 / 76	0.0004 / 10	0.0004 / 10	0.0080 / 203	
2005	0.0020 / 51	0.0005 / 13	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0080 / 203	0.0010 / 25
2007	0.0020 / 51	0.0007 / 18	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0080 / 203	
2010	0.0020 / 51	0.0010 / 25	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0080 / 203	
2013	0.0020 / 51	0.0013 / 33	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0090 / 229	
2015	0.0020 / 51	0.0015 / 38	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0090 / 229	
2020	0.0020 / 51	0.0020 / 51	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0090 / 229	
2005B	0.0020 / 51	0.0005 / 13	0.0040 / 102	0.0004 / 10	0.0004 / 10	0.0080 / 203	
2007B	0.0020 / 51	0.0007 / 18	0.0040 / 102	0.0004 / 10	0.0004 / 10	0.0080 / 203	
2010B	0.0020 / 51	0.0010 / 25	0.0040 / 102	0.0004 / 10	0.0004 / 10	0.0080 / 203	
2013B	0.0020 / 51	0.0013 / 33	0.0040 / 102	0.0004 / 10	0.0004 / 10	0.0080 / 203	
2015B	0.0020 / 51	0.0015 / 38	0.0040 / 102	0.0004 / 10	0.0004 / 10	0.0080 / 203	
2020B	0.0020 / 51	0.0020 / 51	0.0040 / 102	0.0004 / 10	0.0004 / 10	0.0080 / 203	

Other part numbers are available. Dimensions in inches unless otherwise specified.

Gold Wire Wedges
2G30, 2G30K, & 2G38 Series



Specify:
Series/Wire Feed Angle - Hole Size/Bond Length - Length - Options

Example:
2G30-2020-S
2G30K-2015-3/4-TiC

Material:
Tungsten Carbide Standard
Titanium Carbide Optional
(Specify “-TiC” in part no.)
Cermet Tip Optional
(Specify “-BKCER” in part no.)

SERIES: 2G30 & 2G38

DASH NUMBER	H in. / µm ±0.0002 / 5	BL in. / µm ±0.0002 / 5	W in. / µm ±0.0002 / 5	FR in. / µm ±.00002 / 5	BR in. / µm ±0.0002 / 5	T 30° & 38° in. / µm ±0.0005 / 13	SUGGESTED WIRE DIAMETER in. / µm
1515	0.0015 / 38	0.0015 / 38	0.0040 / 102	0.0010 / 25	0.0005 / 13	0.0110 / 279	0.0007 / 18 to 0.0008 / 20
1815	0.0018 / 46	0.0015 / 38	0.0050 / 127	0.0015 / 38	0.0005 / 13	0.0140 / 356	0.0008 / 20 to 0.0010 / 25
1820	0.0018 / 46	0.0020 / 51	0.0050 / 127	0.0015 / 38	0.0005 / 13	0.0150 / 381	
1825	0.0018 / 46	0.0025 / 64	0.0050 / 127	0.0015 / 38	0.0005 / 13	0.0150 / 381	
1830	0.0018 / 46	0.0030 / 76	0.0050 / 127	0.0015 / 38	0.0005 / 13	0.0160 / 406	
2015	0.0020 / 51	0.0015 / 38	0.0050 / 127	0.0015 / 38	0.0005 / 13	0.0140 / 356	0.0010 / 25
2020	0.0020 / 51	0.0020 / 51	0.0050 / 127	0.0015 / 38	0.0005 / 13	0.0150 / 381	
2025	0.0020 / 51	0.0025 / 64	0.0050 / 127	0.0015 / 38	0.0005 / 13	0.0150 / 381	
2030	0.0020 / 51	0.0030 / 76	0.0050 / 127	0.0015 / 38	0.0005 / 13	0.0160 / 406	
2040	0.0020 / 51	0.0040 / 102	0.0050 / 127	0.0015 / 38	0.0005 / 13	0.0170 / 432	
2520	0.0025 / 64	0.0020 / 51	0.0050 / 127	0.0015 / 38	0.0005 / 13	0.0170 / 432	0.0010 / 25 to 0.0013 / 33
2525	0.0025 / 64	0.0025 / 64	0.0050 / 127	0.0015 / 38	0.0005 / 13	0.0170 / 432	
2530	0.0025 / 64	0.0030 / 76	0.0050 / 127	0.0015 / 38	0.0005 / 13	0.0180 / 457	
2535	0.0025 / 64	0.0035 / 89	0.0050 / 127	0.0015 / 38	0.0005 / 13	0.0180 / 457	
2540	0.0025 / 64	0.0040 / 102	0.0050 / 127	0.0015 / 38	0.0005 / 13	0.0190 / 483	
3020	0.0030 / 76	0.0020 / 51	0.0050 / 127	0.0015 / 38	0.0005 / 13	0.0180 / 457	0.0015 / 38 to 0.0018 / 46
3025	0.0030 / 76	0.0025 / 64	0.0050 / 127	0.0015 / 38	0.0005 / 13	0.0190 / 483	
3030	0.0030 / 76	0.0030 / 76	0.0050 / 127	0.0015 / 38	0.0005 / 13	0.0190 / 483	
3035	0.0030 / 76	0.0035 / 89	0.0050 / 127	0.0015 / 38	0.0005 / 13	0.0200 / 508	
3040	0.0030 / 76	0.0040 / 102	0.0050 / 127	0.0015 / 38	0.0005 / 13	0.0200 / 508	
3530	0.0035 / 89	0.0030 / 76	0.0060 / 152	0.0015 / 38	0.0005 / 13	0.0220 / 559	0.0020 / 51
3535	0.0035 / 89	0.0035 / 89	0.0060 / 152	0.0015 / 38	0.0005 / 13	0.0230 / 584	
3540	0.0035 / 89	0.0040 / 102	0.0060 / 152	0.0015 / 38	0.0005 / 13	0.0230 / 584	
3545	0.0035 / 89	0.0045 / 114	0.0060 / 152	0.0015 / 38	0.0005 / 13	0.0240 / 610	
3550	0.0035 / 89	0.0050 / 127	0.0060 / 152	0.0015 / 38	0.0005 / 13	0.0240 / 610	

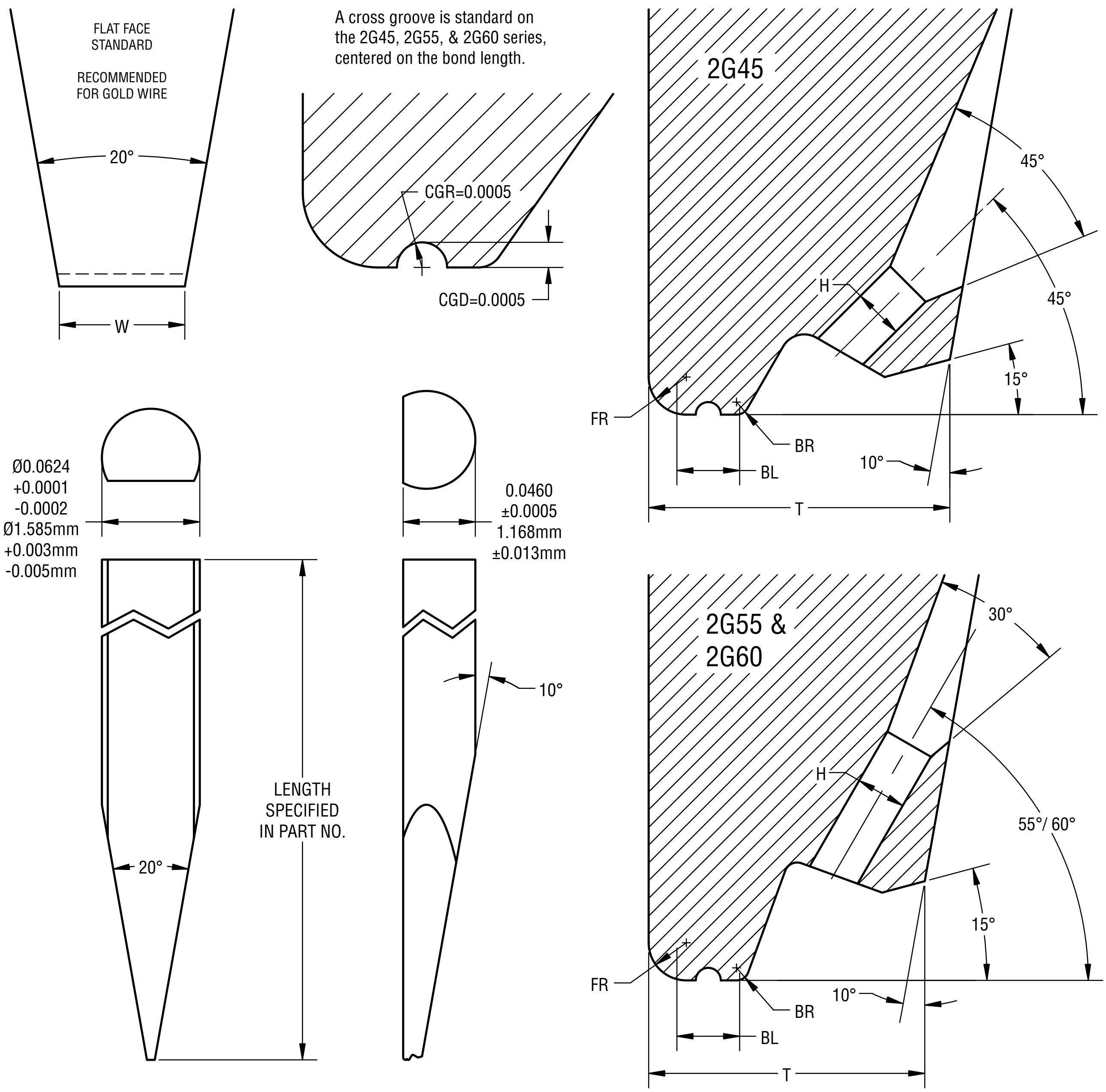
SERIES: 2G30K

DASH NUMBER	H in. / µm ±0.0002 / 5	BL in. / µm ±0.0002 / 5	W in. / µm ±0.0002 / 5	FR in. / µm ±0.0001 / 2.5	BR in. / µm ±0.0001 / 2.5	T 30° in. / µm ±0.0005 / 13	SUGGESTED WIRE DIAMETER in. / µm
2015	0.0020 / 51	0.0015 / 38	0.0040 / 102	0.0003 / 8	0.0002 / 5	0.0150 / 381	0.0010 / 25
2020	0.0020 / 51	0.0020 / 51	0.0040 / 102	0.0003 / 8	0.0002 / 5	0.0150 / 381	
2520	0.0025 / 64	0.0020 / 51	0.0050 / 127	0.0005 / 13	0.0003 / 8	0.0150 / 381	0.0010 / 25 to 0.0013 / 33
2525	0.0025 / 64	0.0025 / 64	0.0050 / 127	0.0005 / 13	0.0003 / 8	0.0150 / 381	
2525B	0.0025 / 64	0.0025 / 64	0.0040 / 102	0.0005 / 13	0.0003 / 8	0.0150 / 381	
2530	0.0025 / 64	0.0030 / 76	0.0050 / 127	0.0005 / 13	0.0003 / 8	0.0150 / 381	
2540	0.0025 / 64	0.0040 / 102	0.0050 / 127	0.0005 / 13	0.0003 / 8	0.0180 / 457	
2560	0.0025 / 64	0.0060 / 152	0.0050 / 127	0.0005 / 13	0.0003 / 8	0.0200 / 508	

DASH NUMBER	H in. / µm ±0.0002 / 5	BL in. / µm ±0.0002 / 5	W in. / µm ±0.0002 / 5	FR in. / µm ±0.0002 / 5	BR in. / µm ±0.0001 / 2.5	T 30° in. / µm ±0.0005 / 13	SUGGESTED WIRE DIAMETER in. / µm
3035	0.0030 / 76	0.0035 / 89	0.0050 / 127	0.0008 / 20	0.0005 / 13	0.0200 / 508	0.0015 / 38 to 0.0018 / 46
4530	0.0045 / 114	0.0030 / 76	0.0100 / 254	0.0010 / 25	0.0006 / 15	0.0260 / 660	0.0030 / 76
4535	0.0045 / 114	0.0035 / 89	0.0100 / 254	0.0010 / 25	0.0006 / 15	0.0260 / 660	

Other part numbers are available. Dimensions in inches unless otherwise specified.

Gold Wire Wedges
2G45, 2G55, & 2G60 Series



Specify:
Series/Wire Feed Angle - Hole Size/Bond Length - Length - Options

Example:
2G45-2020-S
2G60-2015-3/4-TiC

Material:
Tungsten Carbide Standard
Titanium Carbide Optional
(Specify "-TiC" in part no.)
Cermet Tip Optional
(Specify "-BKCER" in part no.)

SERIES: 2G45

DASH NUMBER	H in. / µm ±0.0002 / 5	BL in. / µm ±0.0002 / 5	W in. / µm ±0.0002 / 5	FR in. / µm ±0.0002 / 5	BR in. / µm ±0.0002 / 5	T 45° in. / µm ±0.0005 / 13	SUGGESTED WIRE DIAMETER in. / µm
1820	0.0018 / 46	0.0020 / 51	0.0050 / 127	0.0015 / 38	0.0005 / 13	0.0120 / 305	
1825	0.0018 / 46	0.0025 / 64	0.0050 / 127	0.0015 / 38	0.0005 / 13	0.0120 / 305	0.0008 / 20 to 0.0010 / 25
1830	0.0018 / 46	0.0030 / 76	0.0050 / 127	0.0015 / 38	0.0005 / 13	0.0130 / 330	
2020	0.0020 / 51	0.0020 / 51	0.0050 / 127	0.0015 / 38	0.0005 / 13	0.0120 / 305	
2025	0.0020 / 51	0.0025 / 64	0.0050 / 127	0.0015 / 38	0.0005 / 13	0.0120 / 305	0.0010 / 25
2030	0.0020 / 51	0.0030 / 76	0.0050 / 127	0.0015 / 38	0.0005 / 13	0.0130 / 330	
2520	0.0025 / 64	0.0020 / 51	0.0050 / 127	0.0015 / 38	0.0005 / 13	0.0130 / 330	
2525	0.0025 / 64	0.0025 / 64	0.0050 / 127	0.0015 / 38	0.0005 / 13	0.0140 / 356	
2530	0.0025 / 64	0.0030 / 76	0.0050 / 127	0.0015 / 38	0.0005 / 13	0.0140 / 356	0.0010 / 25 to 0.0013 / 33
2535	0.0025 / 64	0.0035 / 89	0.0050 / 127	0.0015 / 38	0.0005 / 13	0.0150 / 381	
2540	0.0025 / 64	0.0040 / 102	0.0050 / 127	0.0015 / 38	0.0005 / 13	0.0150 / 381	
3020	0.0030 / 76	0.0020 / 51	0.0050 / 127	0.0015 / 38	0.0005 / 13	0.0150 / 381	
3025	0.0030 / 76	0.0025 / 64	0.0050 / 127	0.0015 / 38	0.0005 / 13	0.0150 / 381	
3030	0.0030 / 76	0.0030 / 76	0.0050 / 127	0.0015 / 38	0.0005 / 13	0.0160 / 406	0.0015 / 38 to 0.0018 / 46
3035	0.0030 / 76	0.0035 / 89	0.0050 / 127	0.0015 / 38	0.0005 / 13	0.0160 / 406	
3040	0.0030 / 76	0.0040 / 102	0.0050 / 127	0.0015 / 38	0.0005 / 13	0.0170 / 432	
3525	0.0035 / 89	0.0025 / 64	0.0060 / 152	0.0015 / 38	0.0005 / 13	0.0170 / 432	
3530	0.0035 / 89	0.0030 / 76	0.0060 / 152	0.0015 / 38	0.0005 / 13	0.0180 / 457	
3535	0.0035 / 89	0.0035 / 89	0.0060 / 152	0.0015 / 38	0.0005 / 13	0.0180 / 457	
3540	0.0035 / 89	0.0040 / 102	0.0060 / 152	0.0015 / 38	0.0005 / 13	0.0190 / 483	0.0020 / 51
3545	0.0035 / 89	0.0045 / 114	0.0060 / 152	0.0015 / 38	0.0005 / 13	0.0190 / 483	
3550	0.0035 / 89	0.0050 / 127	0.0060 / 152	0.0015 / 38	0.0005 / 13	0.0200 / 508	
4530	0.0045 / 114	0.0030 / 76	0.0070 / 178	0.0020 / 51	0.0010 / 25	0.0210 / 533	0.0030 / 76

SERIES: 2G55 & 2G60

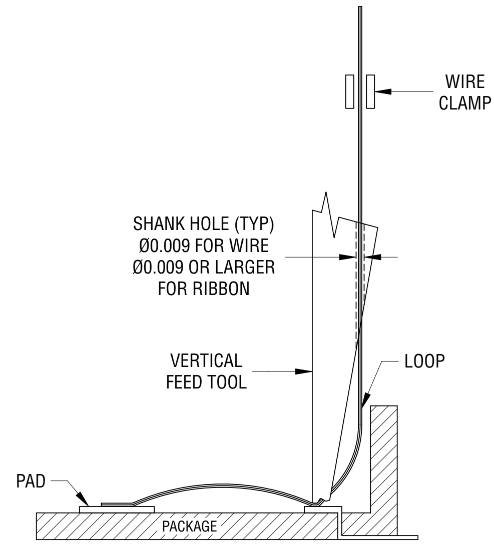
DASH NUMBER	H in. / µm ±0.0002 / 5	BL in. / µm ±0.0002 / 5	W in. / µm ±0.0002 / 5	FR in. / µm ±0.0002 / 5	BR in. / µm ±0.0002 / 5	T 55° & 60° in. / µm ±0.0005 / 13	SUGGESTED WIRE DIAMETER in. / µm
1815	0.0018 / 46	0.0015 / 38	0.0065 / 165	0.0015 / 38	0.0005 / 13	0.0100 / 254	
1820	0.0018 / 46	0.0020 / 51	0.0065 / 165	0.0015 / 38	0.0005 / 13	0.0100 / 254	
1825	0.0018 / 46	0.0025 / 64	0.0065 / 165	0.0015 / 38	0.0005 / 13	0.0110 / 279	0.0008 / 20 to 0.0010 / 25
1830	0.0018 / 46	0.0030 / 76	0.0065 / 165	0.0015 / 38	0.0005 / 13	0.0110 / 279	
1835	0.0018 / 46	0.0035 / 89	0.0065 / 165	0.0015 / 38	0.0005 / 13	0.0120 / 305	
2015	0.0020 / 51	0.0015 / 38	0.0065 / 165	0.0015 / 38	0.0005 / 13	0.0100 / 254	
2020	0.0020 / 51	0.0020 / 51	0.0065 / 165	0.0015 / 38	0.0005 / 13	0.0100 / 254	
2025	0.0020 / 51	0.0025 / 64	0.0065 / 165	0.0015 / 38	0.0005 / 13	0.0110 / 279	0.0010 / 25
2030	0.0020 / 51	0.0030 / 76	0.0065 / 165	0.0015 / 38	0.0005 / 13	0.0110 / 279	
2035	0.0020 / 51	0.0035 / 89	0.0065 / 165	0.0015 / 38	0.0005 / 13	0.0120 / 305	
2520	0.0025 / 64	0.0020 / 51	0.0065 / 165	0.0015 / 38	0.0005 / 13	0.0110 / 279	
2525	0.0025 / 64	0.0025 / 64	0.0065 / 165	0.0015 / 38	0.0005 / 13	0.0120 / 305	
2530	0.0025 / 64	0.0030 / 76	0.0065 / 165	0.0015 / 38	0.0005 / 13	0.0120 / 305	0.0010 / 25 to 0.0013 / 33
2535	0.0025 / 64	0.0035 / 89	0.0065 / 165	0.0015 / 38	0.0005 / 13	0.0130 / 330	
2540	0.0025 / 64	0.0040 / 102	0.0065 / 165	0.0015 / 38	0.0005 / 13	0.0130 / 330	
3020	0.0030 / 76	0.0020 / 51	0.0065 / 165	0.0015 / 38	0.0005 / 13	0.0120 / 305	
3025	0.0030 / 76	0.0025 / 64	0.0065 / 165	0.0015 / 38	0.0005 / 13	0.0130 / 330	
3030	0.0030 / 76	0.0030 / 76	0.0065 / 165	0.0015 / 38	0.0005 / 13	0.0130 / 330	0.0015 / 38 to 0.0018 / 46
3035	0.0030 / 76	0.0035 / 89	0.0065 / 165	0.0015 / 38	0.0005 / 13	0.0140 / 356	
3040	0.0030 / 76	0.0040 / 102	0.0065 / 165	0.0015 / 38	0.0005 / 13	0.0140 / 356	
3530	0.0035 / 89	0.0030 / 76	0.0065 / 165	0.0015 / 38	0.0005 / 13	0.0150 / 381	
3535	0.0035 / 89	0.0035 / 89	0.0065 / 165	0.0015 / 38	0.0005 / 13	0.0160 / 406	
3540	0.0035 / 89	0.0040 / 102	0.0065 / 165	0.0015 / 38	0.0005 / 13	0.0160 / 406	0.0020 / 51
3545	0.0035 / 89	0.0045 / 114	0.0065 / 165	0.0015 / 38	0.0005 / 13	0.0170 / 432	
3550	0.0035 / 89	0.0050 / 127	0.0065 / 165	0.0015 / 38	0.0005 / 13	0.0170 / 432	

Other part numbers are available. Dimensions in inches unless otherwise specified.

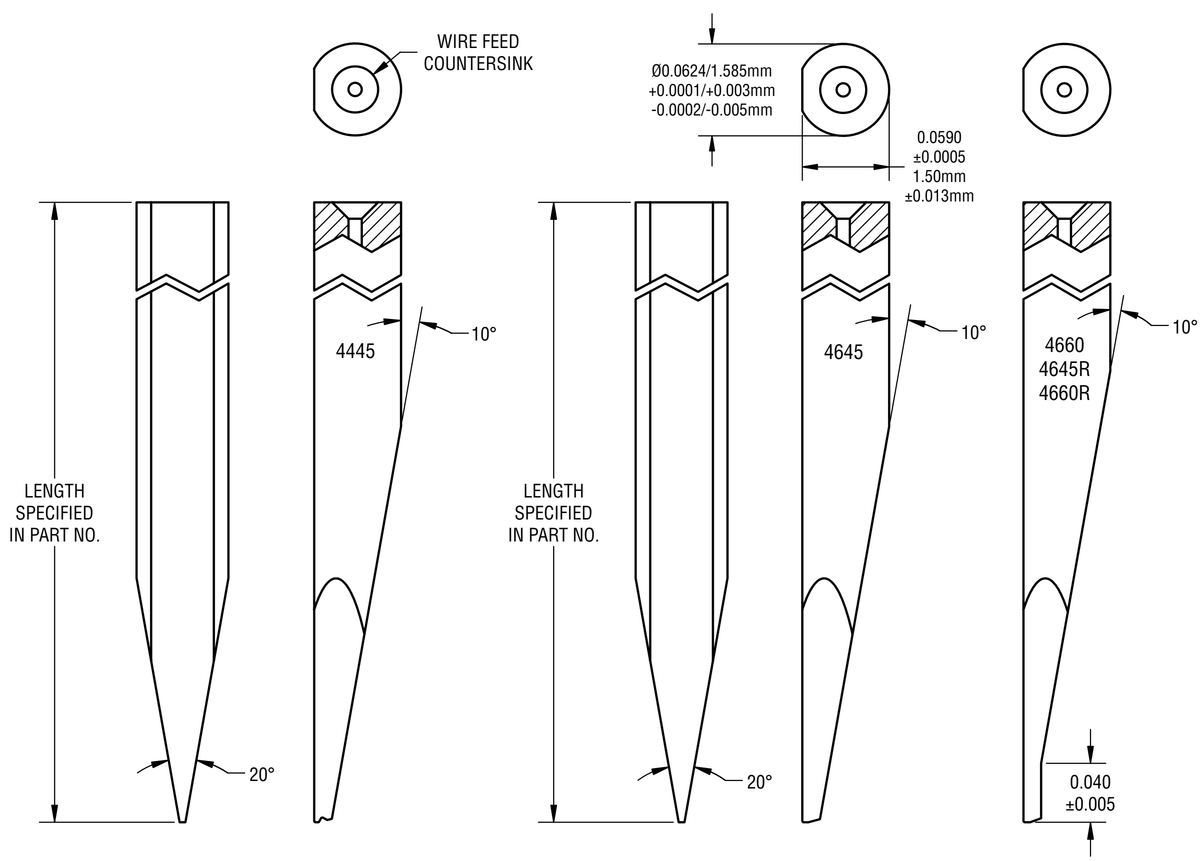
The deep access wedge design was created in order to meet the challenge of bonding into deep-cavity packages. The high walls of these packages make access with conventional 30°, 45°, and 60° wedge bonders very difficult. With a conventional bonder, the position of the wire clamps behind the bonding wedge limits access into deep packages. Also, the wire may be impeded between the wire clamps and the wedge by these walls.

Deep-access wedge bonders feed the wire vertically down the center of the tool. The wire clamp is located above the wedge instead of behind the wedge. This clamp position allows the wedge to penetrate deep-cavity packages.

The deep access bonding wedge is a combination of both a wedge and a capillary. The wire travels through the center of the wedge shank, exits down toward the bottom, out the back of the shank, and re-enters through the wire feed hole at either a 45° or 60° angle. This innovation in wedge bonding has provided the opportunity for small bond lengths into deep cavity packages.



Standard Shank for 4445, 4645, 4660, 4645R, & 4660R

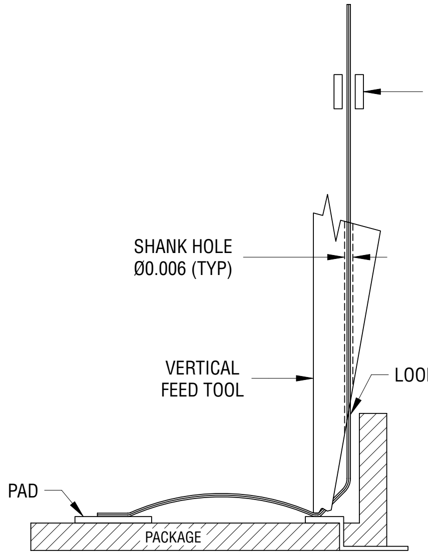


Standard Shank V-Notch Design **Standard Shank MaxiGuide™ Design**

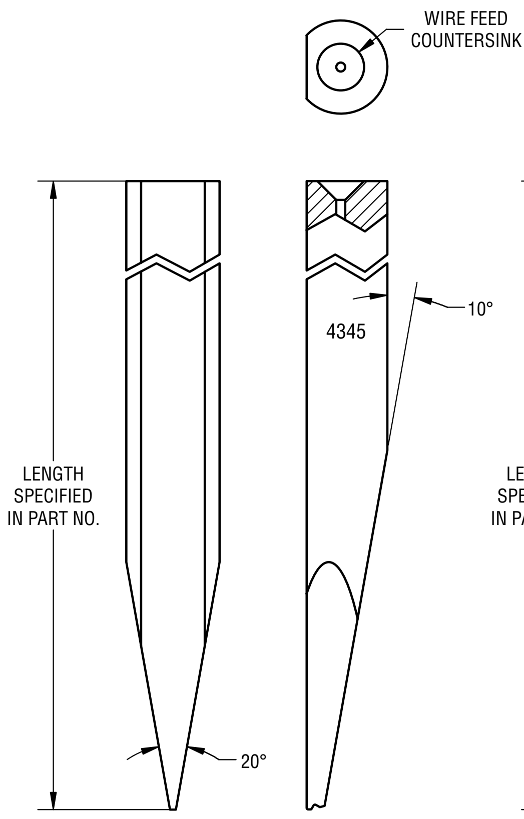
The close guide shank design locates the shank hole close to the wedge hole for optimum tail length control.

The following bonding machines use the deep access tool:

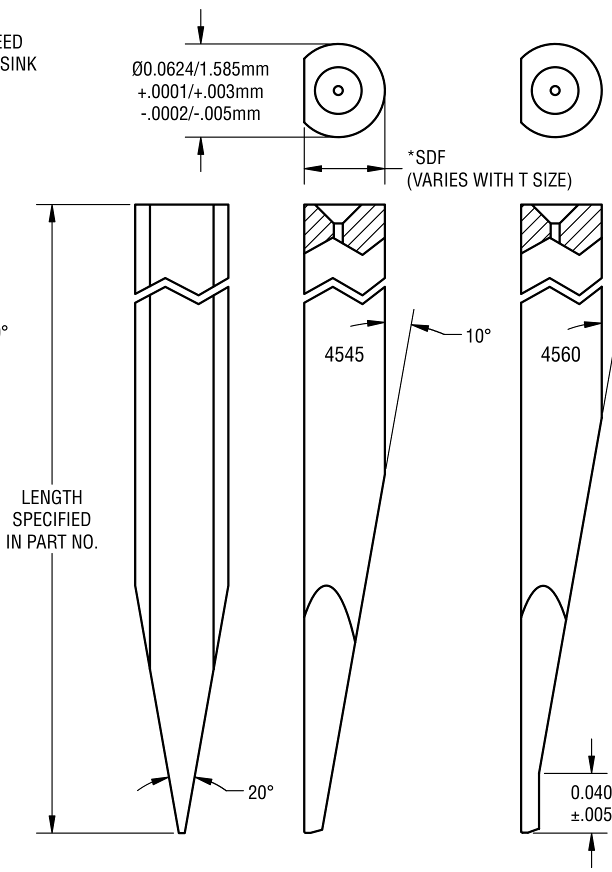
Hybond Model
K&S Model 4129
Mech El Model 990
West Bond Model 4600 & 7400A-46



Close Guide Shank for 4345, 4545, & 4560

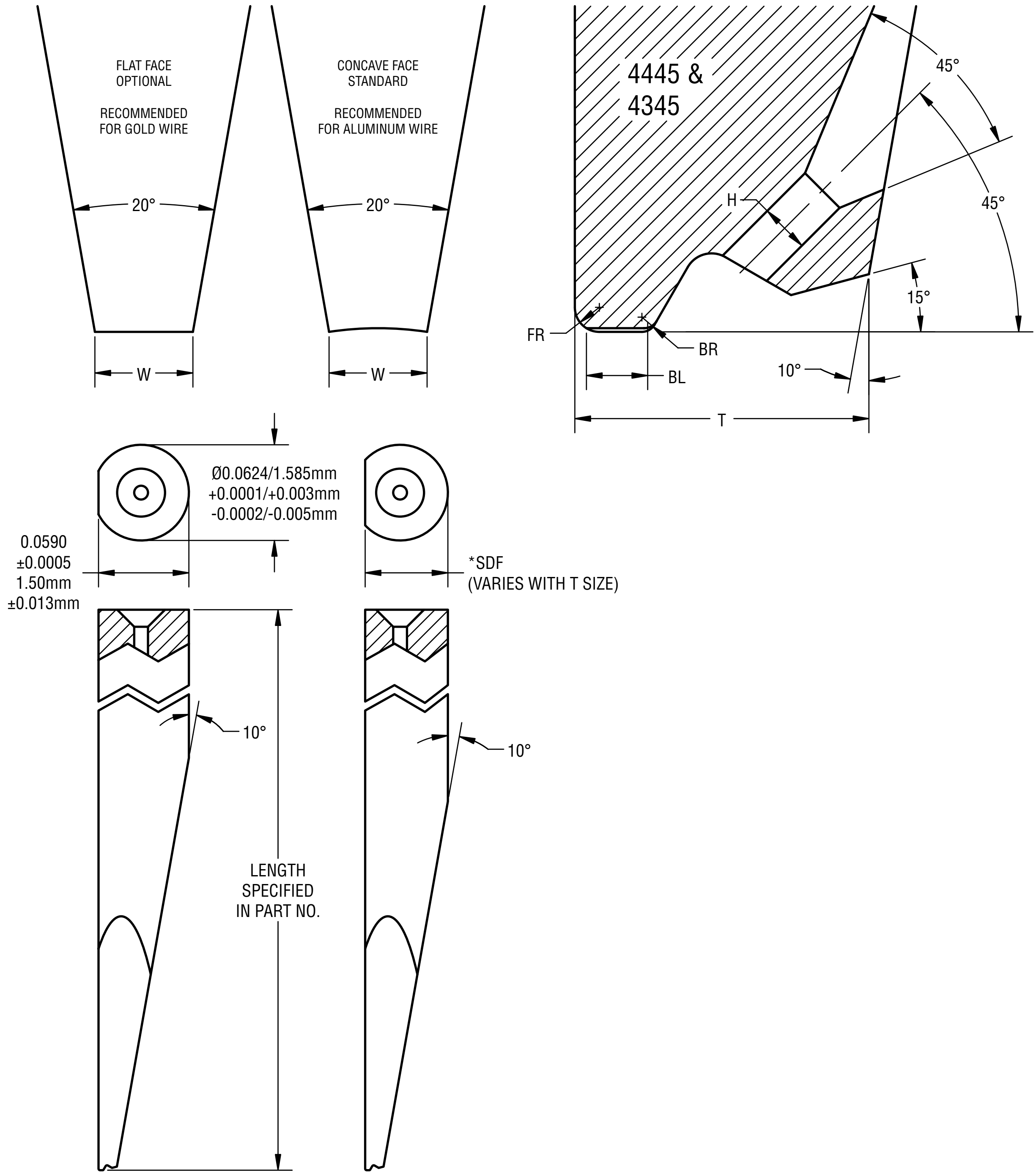


Close Guide V-Notch Design



Close Guide MaxiGuide™ Design

Deep-Access V-Notch Wedges
4445 & 4345 Series



4445 Standard Shank Design

4345 Close Guide Shank Design

Specify:
Series/Wire Feed Angle - Hole Size/Bond Length - Length - Options

Example:
4445-2020-S
4345-1510-3/4-F-V-BKCER
*Specify "-V" when ordering with Cermet tip

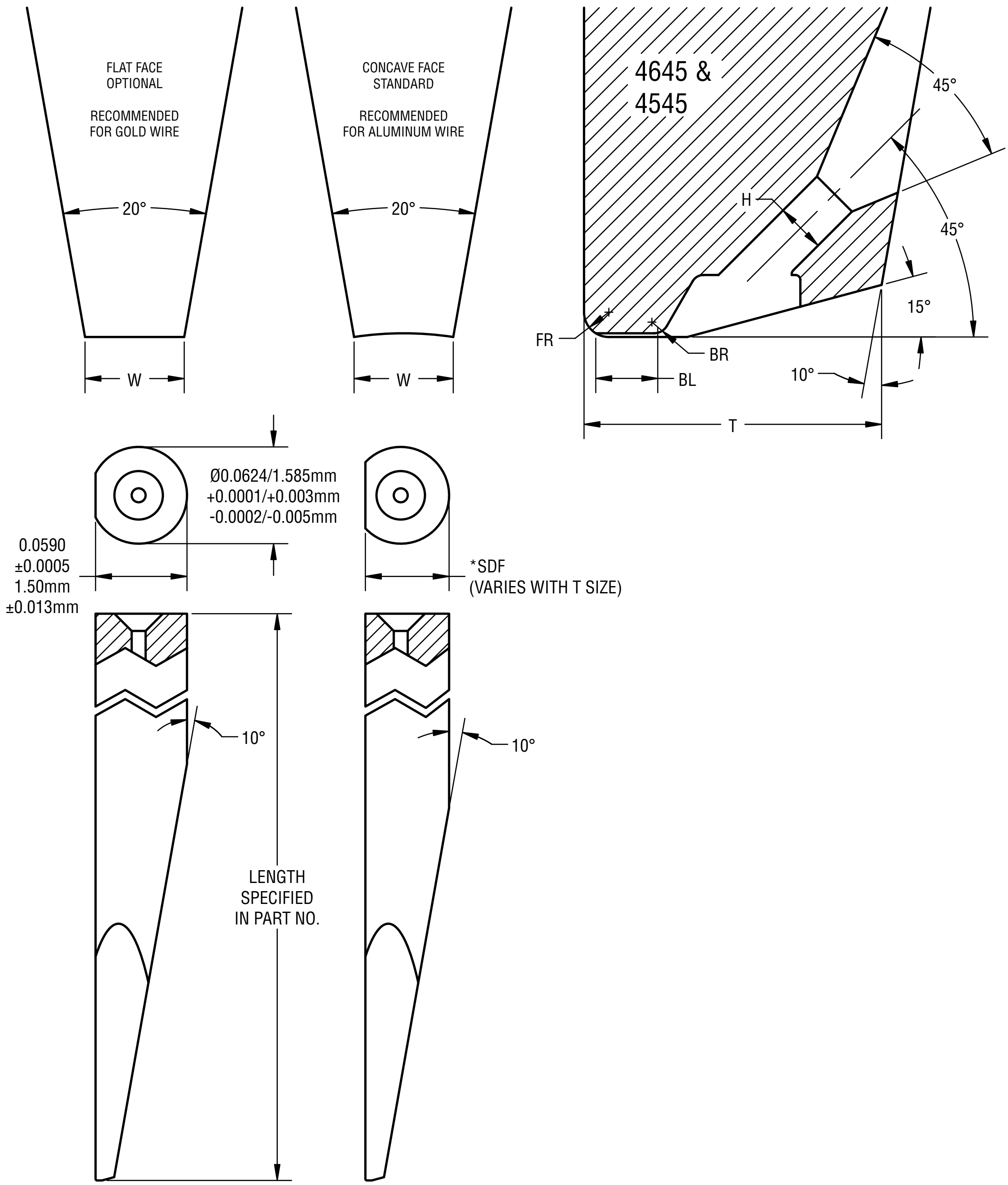
Material:
Tungsten Carbide Standard
Titanium Carbide Optional
(Specify "-TiC" in part no.)
Cermet Tip Optional
(Specify "-BKCER" in part no.)

Deep-Access V-Notch Wedges
4445 & 4345 Series

DASH NUMBER	H in. / µm ±0.0002 / 5	BL in. / µm ±0.0002 / 5	W in. / µm ±0.0002 / 5	FR in. / µm ±0.0002 / 5	BR in. / µm ±0.0002 / 5	T in. / µm ±0.0005 / 13	SUGGESTED WIRE DIAMETER in. / µm
*1305	0.0013 / 33	0.0005 / 13	0.0025 / 64	0.0005 / 13	0.0005 / 13	0.0080 / 203	0.0007 / 18 to 0.0008 / 20
*1307	0.0013 / 33	0.0007 / 18	0.0025 / 64	0.0005 / 13	0.0005 / 13	0.0080 / 203	
1315	0.0013 / 33	0.0015 / 38	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0080 / 203	
*1305A	0.0013 / 33	0.0005 / 13	0.0025 / 64	0.0005 / 13	0.0000 / 0	0.0080 / 203	
*1307A	0.0013 / 33	0.0007 / 18	0.0025 / 64	0.0005 / 13	0.0000 / 0	0.0080 / 203	
1310A	0.0013 / 33	0.0010 / 25	0.0030 / 76	0.0010 / 25	0.0000 / 0	0.0080 / 203	
1315A	0.0013 / 33	0.0015 / 38	0.0030 / 76	0.0010 / 25	0.0000 / 0	0.0090 / 229	
1320A	0.0013 / 33	0.0020 / 51	0.0030 / 76	0.0010 / 25	0.0000 / 0	0.0090 / 229	
*1505	0.0015 / 38	0.0005 / 13	0.0025 / 64	0.0005 / 13	0.0005 / 13	0.0120 / 305	
*1507	0.0015 / 38	0.0007 / 18	0.0025 / 64	0.0005 / 13	0.0005 / 13	0.0120 / 305	
*1510	0.0015 / 38	0.0010 / 25	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0120 / 305	
*1513	0.0015 / 38	0.0013 / 33	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0120 / 305	
1515	0.0015 / 38	0.0015 / 38	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0120 / 305	
1520	0.0015 / 38	0.0020 / 51	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0120 / 305	
1525	0.0015 / 38	0.0025 / 64	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0120 / 305	
1540	0.0015 / 38	0.0040 / 102	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0120 / 305	
*1505A	0.0015 / 38	0.0005 / 13	0.0025 / 64	0.0005 / 13	0.0000 / 0	0.0120 / 305	
*1507A	0.0015 / 38	0.0007 / 18	0.0025 / 64	0.0005 / 13	0.0000 / 0	0.0120 / 305	
*1510A	0.0015 / 38	0.0010 / 25	0.0030 / 76	0.0010 / 25	0.0000 / 0	0.0120 / 305	
1515A	0.0015 / 38	0.0015 / 38	0.0030 / 76	0.0010 / 25	0.0000 / 0	0.0120 / 305	
1519A	0.0015 / 38	0.0019 / 48	0.0030 / 76	0.0010 / 25	0.0000 / 0	0.0120 / 305	
1520A	0.0015 / 38	0.0020 / 51	0.0030 / 76	0.0010 / 25	0.0000 / 0	0.0120 / 305	
*1510B	0.0015 / 38	0.0010 / 25	0.0030 / 76	0.0004 / 10	0.0004 / 10	0.0080 / 203	
*2010	0.0020 / 51	0.0010 / 25	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0120 / 305	0.0010 / 25
2015	0.0020 / 51	0.0015 / 38	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0120 / 305	
2020	0.0020 / 51	0.0020 / 51	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0120 / 305	
2025	0.0020 / 51	0.0025 / 64	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0120 / 305	
2030	0.0020 / 51	0.0030 / 76	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0120 / 305	
2015A	0.0020 / 51	0.0015 / 38	0.0040 / 102	0.0010 / 25	0.0000 / 0	0.0120 / 305	
2020A	0.0020 / 51	0.0020 / 51	0.0040 / 102	0.0010 / 25	0.0000 / 0	0.0120 / 305	
2025A	0.0020 / 51	0.0025 / 64	0.0040 / 102	0.0010 / 25	0.0000 / 0	0.0120 / 305	
2520	0.0025 / 64	0.0020 / 51	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0130 / 330	0.0010 / 25 to 0.0013 / 33
2525	0.0025 / 64	0.0025 / 64	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0130 / 330	
2530	0.0025 / 64	0.0030 / 76	0.0040 / 102	0.0015 / 38	0.0006 / 15	0.0140 / 356	
2540	0.0025 / 64	0.0040 / 102	0.0040 / 102	0.0015 / 38	0.0006 / 15	0.0150 / 381	
2525A	0.0025 / 64	0.0025 / 64	0.0040 / 102	0.0010 / 25	0.0000 / 0	0.0130 / 330	
3025	0.0030 / 76	0.0025 / 64	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0160 / 406	0.0015 / 38 to 0.0018 / 46
3030	0.0030 / 76	0.0030 / 76	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0160 / 406	
3035	0.0030 / 76	0.0035 / 89	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0170 / 432	
3040	0.0030 / 76	0.0040 / 102	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0170 / 432	
3045	0.0030 / 76	0.0045 / 114	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0180 / 457	
3050	0.0030 / 76	0.0050 / 127	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0180 / 457	
3035A	0.0030 / 76	0.0035 / 89	0.0050 / 127	0.0015 / 38	0.0000 / 0	0.0170 / 432	
3045A	0.0030 / 76	0.0045 / 114	0.0050 / 127	0.0015 / 38	0.0000 / 0	0.0180 / 457	
3535	0.0035 / 89	0.0035 / 89	0.0060 / 152	0.0015 / 38	0.0010 / 25	0.0180 / 457	0.0020 / 51
3540	0.0035 / 89	0.0040 / 102	0.0060 / 152	0.0015 / 38	0.0010 / 25	0.0190 / 483	
3535A	0.0035 / 89	0.0035 / 89	0.0060 / 152	0.0015 / 38	0.0000 / 0	0.0180 / 457	
4035	0.0040 / 102	0.0035 / 89	0.0060 / 152	0.0015 / 38	0.0010 / 25	0.0190 / 483	0.0020 / 51 to 0.0025 / 64
4045	0.0040 / 102	0.0045 / 114	0.0060 / 152	0.0015 / 38	0.0010 / 25	0.0200 / 508	
4040A	0.0040 / 102	0.0040 / 102	0.0060 / 152	0.0015 / 38	0.0000 / 0	0.0200 / 508	
4540	0.0045 / 114	0.0040 / 102	0.0070 / 178	0.0020 / 51	0.0010 / 25	0.0220 / 559	0.0030 / 76
4550	0.0045 / 114	0.0050 / 127	0.0070 / 178	0.0020 / 51	0.0010 / 25	0.0230 / 584	
4555	0.0045 / 114	0.0055 / 140	0.0070 / 178	0.0020 / 51	0.0010 / 25	0.0230 / 584	
4560	0.0045 / 114	0.0060 / 152	0.0070 / 178	0.0020 / 51	0.0010 / 25	0.0240 / 610	
4545A	0.0045 / 114	0.0045 / 114	0.0070 / 178	0.0020 / 51	0.0000 / 0	0.0220 / 559	

*Flat Face Only. Other part numbers are available. Dimensions in inches unless otherwise specified.

Deep-Access MaxiGuide™ Wedges
4645 & 4545 Series



4645 Standard Shank Design

4545 Close Guide Shank Design

Specify:
Series/Wire Feed Angle - Hole Size/Bond Length - Length - Options

Example:
4645-2020-S
4545-1510-3/4-F-V-BKCER
*Specify "-V" when ordering with Cermet tip

Material:
Tungsten Carbide Standard
Titanium Carbide Optional
(Specify "-TiC" in part no.)
Cermet Tip Optional
(Specify "-BKCER" in part no.)

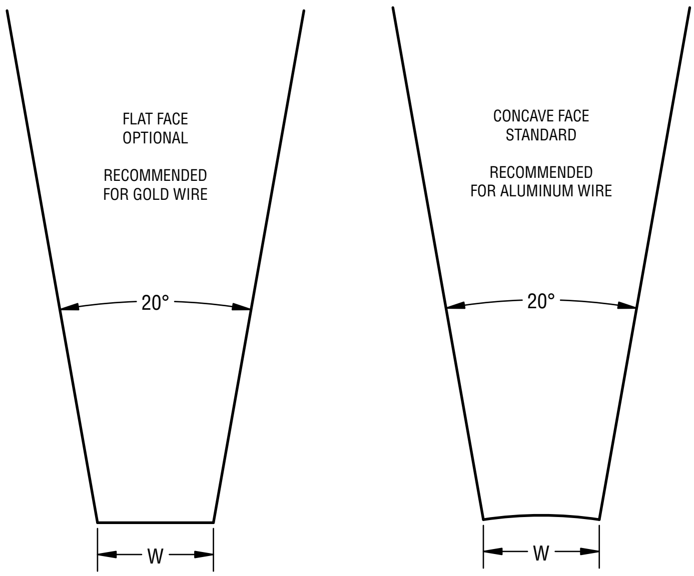
Deep-Access MaxiGuide™ Wedges
4645 & 4545 Series

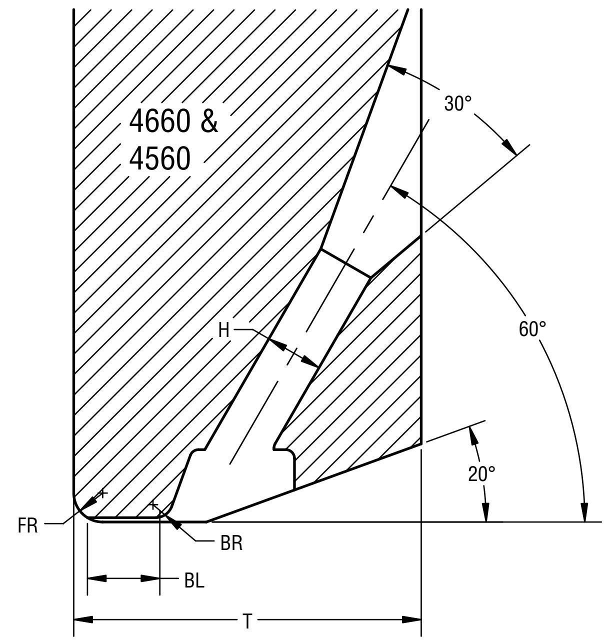
DASH NUMBER	H in. / µm ±0.0002 /5	BL in. / µm ±0.0002 / 5	W in. / µm ±0.0002 / 5	FR in. / µm ±0.0002 / 5	BR in. / µm ±0.0002 / 5	T in. / µm ±0.0005 / 13	SUGGESTED WIRE DIAMETER in. / µm
0.0013 hole uses the same specifications as the 0.0015 hole except for the hole dimension							0.0007 / 18 to 0.0008 / 20
0.0014 hole uses the same specifications as the 0.0015 hole except for the hole dimension							
*1505	0.0015 / 38	0.0005 / 13	0.0025 / 64	0.0005 / 13	0.0005 / 13	0.0080 / 203	
*1507	0.0015 / 38	0.0007 / 18	0.0025 / 64	0.0005 / 13	0.0005 / 13	0.0080 / 203	
*1510	0.0015 / 38	0.0010 / 25	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0090 / 229	
*1513	0.0015 / 38	0.0013 / 33	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0090 / 229	
1515	0.0015 / 38	0.0015 / 38	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0090 / 229	
1520	0.0015 / 38	0.0020 / 51	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0100 / 254	
1525	0.0015 / 38	0.0025 / 64	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0100 / 254	
*1510A	0.0015 / 38	0.0010 / 25	0.0030 / 76	0.0010 / 25	0.0000 / 0	0.0090 / 229	
1515A	0.0015 / 38	0.0015 / 38	0.0030 / 76	0.0010 / 25	0.0000 / 0	0.0090 / 229	
0.0018 hole uses the same specifications as the 0.0020 hole except for the hole dimension							0.0008 / 20 to 0.0010 / 25
*2007	0.0020 / 51	0.0007 / 18	0.0040 / 102	0.0005 / 13	0.0005 / 13	0.0100 / 254	0.0010 / 25
*2010	0.0020 / 51	0.0010 / 25	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0100 / 254	
2015	0.0020 / 51	0.0015 / 38	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0110 / 279	
2020	0.0020 / 51	0.0020 / 51	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0110 / 279	
2025	0.0020 / 51	0.0025 / 64	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0120 / 305	
2030	0.0020 / 51	0.0030 / 76	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0120 / 305	
2035	0.0020 / 51	0.0035 / 89	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0130 / 330	
2040	0.0020 / 51	0.0040 / 102	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0130 / 330	
2050	0.0020 / 51	0.0050 / 127	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0140 / 356	
0.0022 hole uses the same specifications as the 0.0025 hole except for the hole dimension							0.0010 / 25 to 0.0013 / 33
2520	0.0025 / 64	0.0020 / 51	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0130 / 330	
2525	0.0025 / 64	0.0025 / 64	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0140 / 356	
2530	0.0025 / 64	0.0030 / 76	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0140 / 356	
2535	0.0025 / 64	0.0035 / 89	0.0040 / 102	0.0015 / 38	0.0006 / 15	0.0150 / 381	
2540	0.0025 / 64	0.0040 / 102	0.0040 / 102	0.0015 / 38	0.0006 / 15	0.0150 / 381	
2525A	0.0025 / 64	0.0025 / 64	0.0040 / 102	0.0010 / 25	0.0000 / 0	0.0130 / 330	
3020	0.0030 / 76	0.0020 / 51	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0170 / 432	0.0015 / 38 to 0.0018 / 46
3025	0.0030 / 76	0.0025 / 64	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0180 / 457	
3030	0.0030 / 76	0.0030 / 76	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0180 / 457	
3035	0.0030 / 76	0.0035 / 89	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0190 / 483	
3040	0.0030 / 76	0.0040 / 102	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0190 / 483	
3050	0.0030 / 76	0.0050 / 127	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0200 / 508	
4545	0.0045 / 114	0.0045 / 114	0.0070 / 178	0.0020 / 51	0.0010 / 25	0.0240 / 610	0.0030 / 76
4560	0.0045 / 114	0.0060 / 152	0.0070 / 178	0.0020 / 51	0.0010 / 25	0.0270 / 686	

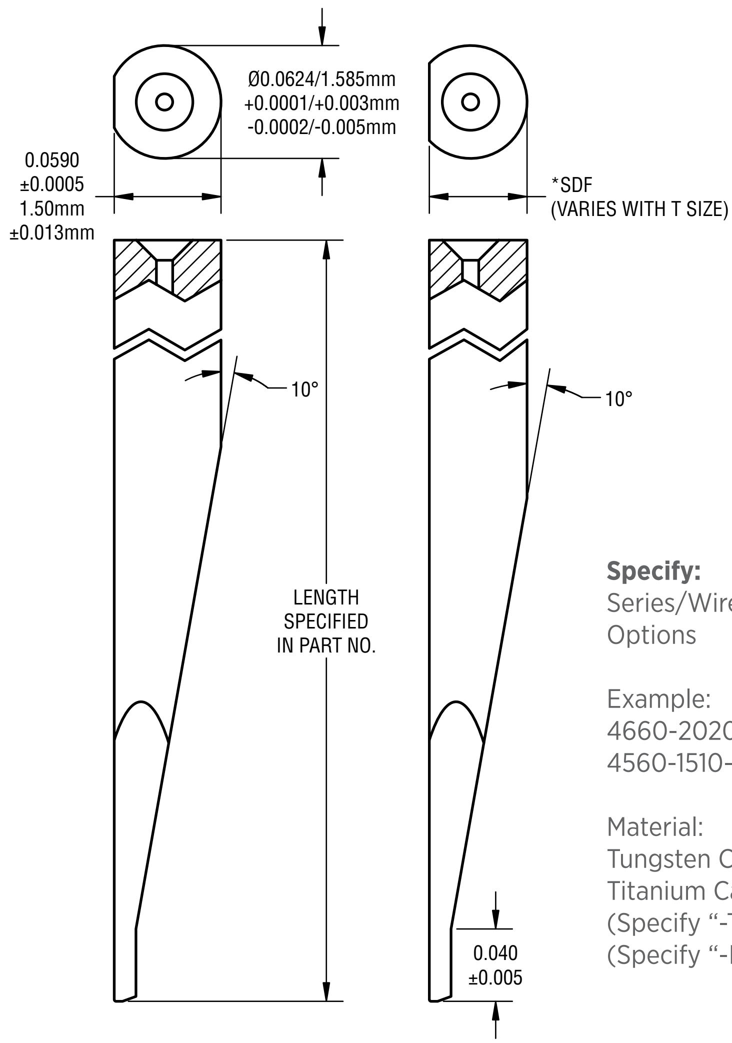
*Flat Face Only.
Other part numbers are available.
Dimensions in inches unless otherwise specified.

CoorsTek

Deep-Access MaxiGuide™ Wedges
4660 & 4560 Series







4660 Standard Shank Design

4560 Close Guide Shank Design

Specify:
Series/Wire Feed Angle - Hole Size/Bond Length - Length - Options

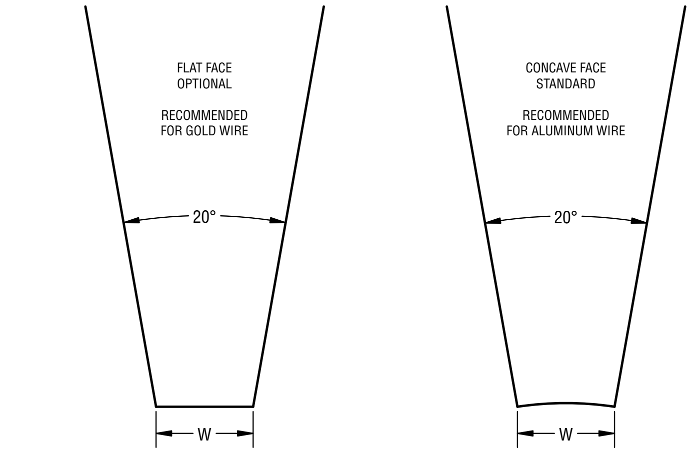
Example:
4660-2020-S
4560-1510-3/4-F-BKCER

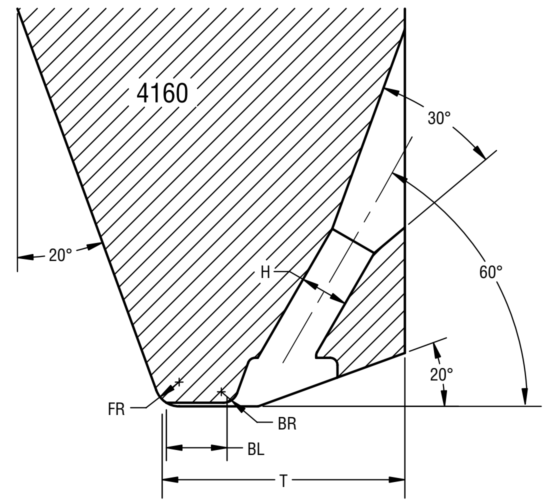
Material:
Tungsten Carbide Standard
Titanium Carbide Optional
(Specify "-TiC" in part no.)Cermet Tip Optional
(Specify "-BKCER" in part no.)

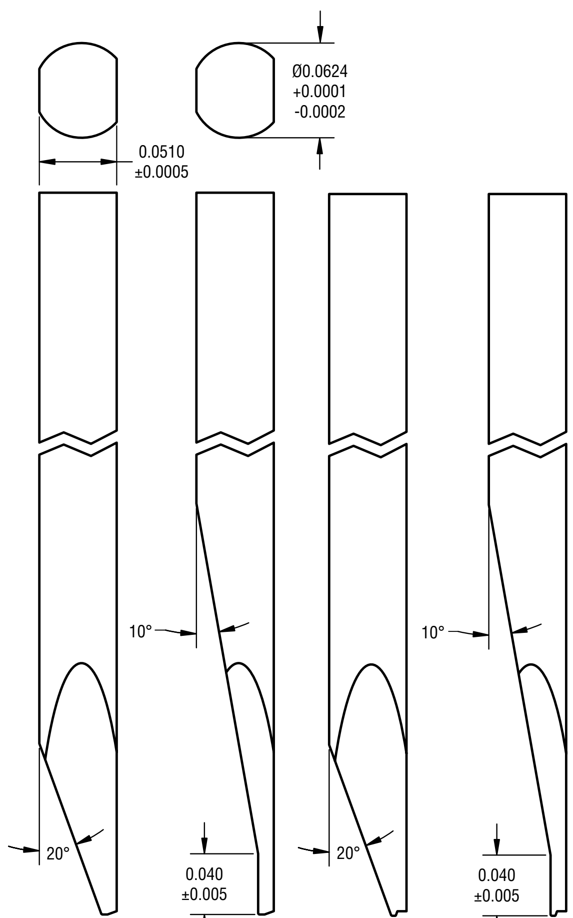
Deep-Access MaxiGuide™ Wedges
4660 & 4560 Series

DASH NUMBER	H in. / µm ±0.0002 / 5	BL in. / µm ±0.0002 / 5	W in. / µm ±0.0002 / 5	FR in. / µm ±0.0002 / 5	BR in. / µm ±0.0002 / 5	T in. / µm ±0.0005 / 13	SUGGESTED WIRE DIAMETER in. / µm
0.0013 hole uses the same specifications as the 0.0015 Hole except for the hole dimension							0.0007 / 18 to 0.0008 / 20
*1505	0.0015 / 38	0.0005 / 13	0.0025 / 64	0.0005 / 13	0.0005 / 13	0.0090 / 229	
*1507	0.0015 / 38	0.0007 / 18	0.0025 / 64	0.0005 / 13	0.0005 / 13	0.0090 / 229	
*1508	0.0015 / 38	0.0008 / 20	0.0025 / 64	0.0010 / 25	0.0006 / 15	0.0090 / 229	
*1510	0.0015 / 38	0.0010 / 25	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0090 / 229	
*1513	0.0015 / 38	0.0013 / 33	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0100 / 254	
1515	0.0015 / 38	0.0015 / 38	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0100 / 254	
1518	0.0015 / 38	0.0018 / 46	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0100 / 254	
1520	0.0015 / 38	0.0020 / 51	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0100 / 254	
1525	0.0015 / 38	0.0025 / 64	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0110 / 279	
1530	0.0015 / 38	0.0030 / 76	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0110 / 279	
1535	0.0015 / 38	0.0035 / 89	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0120 / 305	
*1508A	0.0015 / 38	0.0008 / 20	0.0025 / 64	0.0010 / 25	0.0000 / 0	0.0090 / 229	
*1510A	0.0015 / 38	0.0010 / 25	0.0030 / 76	0.0010 / 25	0.0000 / 0	0.0090 / 229	
1515A	0.0015 / 38	0.0015 / 38	0.0030 / 76	0.0010 / 25	0.0000 / 0	0.0100 / 254	
0.0017 hole uses the same specifications as the 0.0015 hole except for the hole dimension							0.0008 / 20 to 0.0010 / 25
0.0018 hole uses the same specifications as the 0.0020 hole except for the hole dimension							
*2005	0.0020 / 51	0.0005 / 13	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0120 / 305	0.0010 / 25
*2007	0.0020 / 51	0.0007 / 18	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0120 / 305	
*2010	0.0020 / 51	0.0010 / 25	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0120 / 305	
*2012	0.0020 / 51	0.0012 / 30	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0120 / 305	
2015	0.0020 / 51	0.0015 / 38	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0120 / 305	
2020	0.0020 / 51	0.0020 / 51	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0120 / 305	
2025	0.0020 / 51	0.0025 / 64	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0120 / 305	
2030	0.0020 / 51	0.0030 / 76	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0120 / 305	
2515	0.0025 / 64	0.0015 / 38	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0110 / 279	0.0010 / 25 to 0.0013 / 33
2520	0.0025 / 64	0.0020 / 51	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0120 / 305	
2525	0.0025 / 64	0.0025 / 64	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0120 / 305	
2530	0.0025 / 64	0.0030 / 76	0.0040 / 102	0.0015 / 38	0.0006 / 15	0.0120 / 305	
2520A	0.0025 / 64	0.0020 / 51	0.0040 / 102	0.0010 / 25	0.0000 / 0	0.0110 / 279	
2525A	0.0025 / 64	0.0025 / 64	0.0040 / 102	0.0010 / 25	0.0000 / 0	0.0120 / 305	
0.0027 hole uses the same specifications as the 0.0025 hole except for the hole dimension							0.0013 / 33 to 0.0015 / 38
*3010	0.0030 / 76	0.0010 / 25	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0130 / 330	0.0015 / 38 to 0.0018 / 46
3015	0.0030 / 76	0.0015 / 38	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0130 / 330	
3020	0.0030 / 76	0.0020 / 51	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0140 / 356	
3025	0.0030 / 76	0.0025 / 64	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0140 / 356	
3030	0.0030 / 76	0.0030 / 76	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0150 / 381	
3035	0.0030 / 76	0.0035 / 89	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0150 / 381	
3040	0.0030 / 76	0.0040 / 102	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0150 / 381	
3525	0.0035 / 89	0.0025 / 64	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0150 / 381	0.0020 / 51
3530	0.0035 / 89	0.0030 / 76	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0150 / 381	
3535	0.0035 / 89	0.0035 / 89	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0160 / 406	
3540	0.0035 / 89	0.0040 / 102	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0160 / 406	
3550	0.0035 / 89	0.0050 / 127	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0170 / 432	
4030	0.0040 / 102	0.0030 / 76	0.0060 / 152	0.0015 / 38	0.0010 / 25	0.0170 / 432	0.0020 / 51 to 0.0025 / 64
4040	0.0040 / 102	0.0040 / 102	0.0060 / 152	0.0015 / 38	0.0010 / 25	0.0180 / 457	
4540	0.0045 / 114	0.0040 / 102	0.0070 / 178	0.0020 / 51	0.0010 / 25	0.0200 / 508	0.0030 / 76
4545	0.0045 / 114	0.0045 / 114	0.0070 / 178	0.0020 / 51	0.0010 / 25	0.0200 / 508	

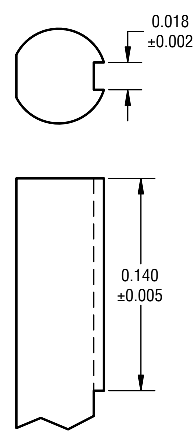
*Flat Face Only. Other part numbers are available. Dimensions in inches unless otherwise specified.





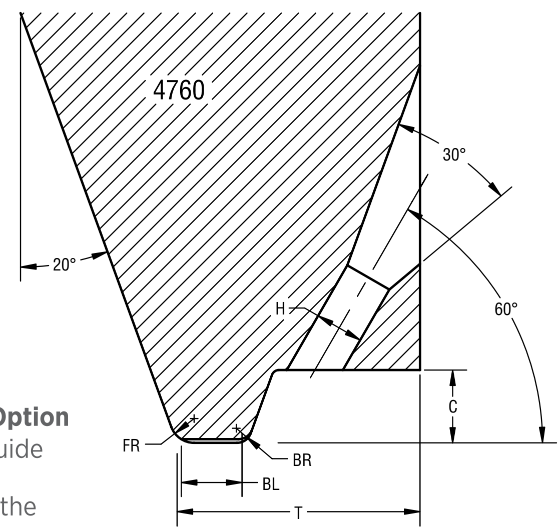


4160 Style Standard Shank | **4160V Style Vertical Grind Shank** | **4760 Style Standard Shank** | **4760V Style Vertical Grind Shank**



Modified Shank Option
Acts as Wire Guide

Add "-MS1" to the Part Number.



Features:
Designed for the Palomar 2470 Deep Access Wire Bonder.

Material:
Tungsten Carbide Standard
Titanium Carbide Optional
(Specify "-TiC" in part no.)
Cermet Tip Optional
(Specify "-BKCER" in part no.)

Specify: Series/Wire Feed Angle - Hole Size/Bond Length - Length - Options

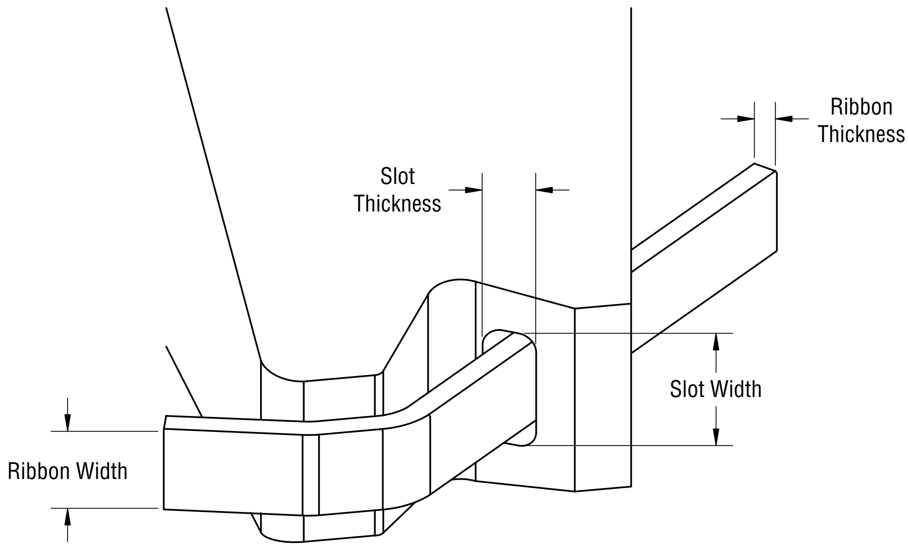
Example:
4160-2020-S
4760V-1510-3/4-F-BKCER

Deep-Access MaxiGuide™ Wedges
4160, 4160V, 4760, & 4760V Series

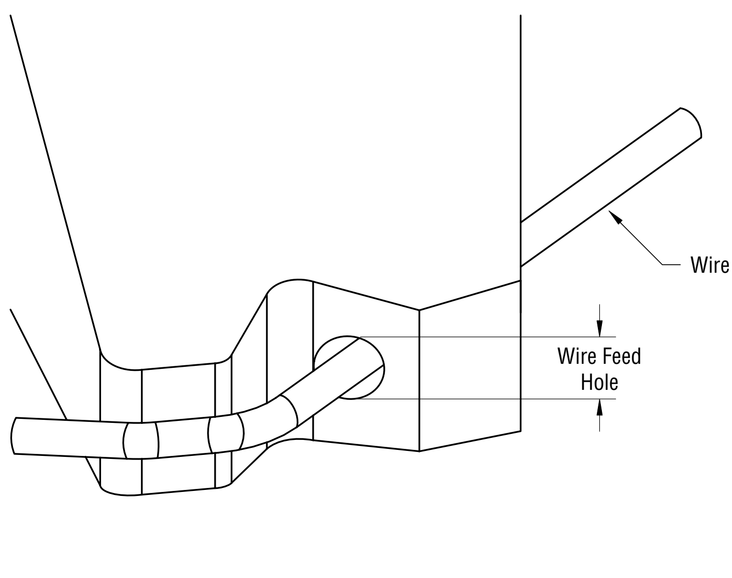
DASH NUMBER	H in. / µm ±0.0002 / 5	BL in. / µm ±0.0002 / 5	W in. / µm ±0.0002 / 5	FR in. / µm ±0.0002 / 5	BR in. / µm ±0.0002 / 5	T in. / µm ±0.0005 / 13	C in. / µm (ref) (4760 only)	SUGGESTED WIRE DIAMETER in. / µm
0.0013 hole uses the same specifications as the 0.0015 hole except for the hole dimension								0.0005 / 13 to 0.0008 / 20
*1505	0.0015 / 38	0.0005 / 13	0.0025 / 64	0.0005 / 13	0.0005 / 13	0.0080 / 203	0.002 / 51	
*1507	0.0015 / 38	0.0007 / 18	0.0025 / 64	0.0005 / 13	0.0005 / 13	0.0080 / 203	0.002 / 51	
*1510	0.0015 / 38	0.0010 / 25	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0080 / 203	0.002 / 51	
1515	0.0015 / 38	0.0015 / 38	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0080 / 203	0.002 / 51	
1520	0.0015 / 38	0.0020 / 51	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0080 / 203	0.002 / 51	
1525	0.0015 / 38	0.0025 / 64	0.0030 / 76	0.0010 / 25	0.0006 / 15	0.0090 / 229	0.002 / 51	
0.0017 hole uses the same specifications as the 0.0015 hole except for the hole dimension								0.0008 / 20 to 0.0010 / 25
0.0018 hole uses the same specifications as the 0.0020 hole except for the hole dimension								
*2005	0.0020 / 51	0.0005 / 13	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0080 / 203	0.003 / 76	0.0010 / 25 to 0.0015 / 38
*2010	0.0020 / 51	0.0010 / 25	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0090 / 229	0.003 / 76	
2015	0.0020 / 51	0.0015 / 38	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0090 / 229	0.003 / 76	
2020	0.0020 / 51	0.0020 / 51	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0100 / 254	0.003 / 76	
2025	0.0020 / 51	0.0025 / 64	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0100 / 254	0.003 / 76	
2030	0.0020 / 51	0.0030 / 76	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0110 / 279	0.003 / 76	
2035	0.0020 / 51	0.0035 / 89	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0110 / 279	0.003 / 76	
*2510	0.0025 / 64	0.0010 / 25	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0100 / 254	0.003 / 76	0.0012 / 30 to 0.0015 / 38
2515	0.0025 / 64	0.0015 / 38	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0110 / 279	0.003 / 76	
2520	0.0025 / 64	0.0020 / 51	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0110 / 279	0.003 / 76	
2525	0.0025 / 64	0.0025 / 64	0.0040 / 102	0.0010 / 25	0.0006 / 15	0.0120 / 305	0.003 / 76	
2530	0.0025 / 64	0.0030 / 76	0.0040 / 102	0.0015 / 38	0.0006 / 15	0.0130 / 330	0.003 / 76	
2535	0.0025 / 64	0.0035 / 89	0.0040 / 102	0.0015 / 38	0.0006 / 15	0.0130 / 330	0.003 / 76	
2540	0.0025 / 64	0.0040 / 102	0.0040 / 102	0.0015 / 38	0.0006 / 15	0.0140 / 356	0.003 / 76	
3020	0.0030 / 76	0.0020 / 51	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0140 / 356	0.004 / 102	0.0015 / 38 to 0.0020 / 51
3025	0.0030 / 76	0.0025 / 64	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0140 / 356	0.004 / 102	
3030	0.0030 / 76	0.0030 / 76	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0150 / 381	0.004 / 102	
3035	0.0030 / 76	0.0035 / 89	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0150 / 381	0.004 / 102	
3040	0.0030 / 76	0.0040 / 102	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0160 / 406	0.004 / 102	
3045	0.0030 / 76	0.0045 / 114	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0160 / 406	0.004 / 102	
3050	0.0030 / 76	0.0050 / 127	0.0050 / 127	0.0015 / 38	0.0010 / 25	0.0170 / 432	0.004 / 102	

*Flat Face Only.
Other part numbers are available.
Dimensions in inches unless otherwise specified.

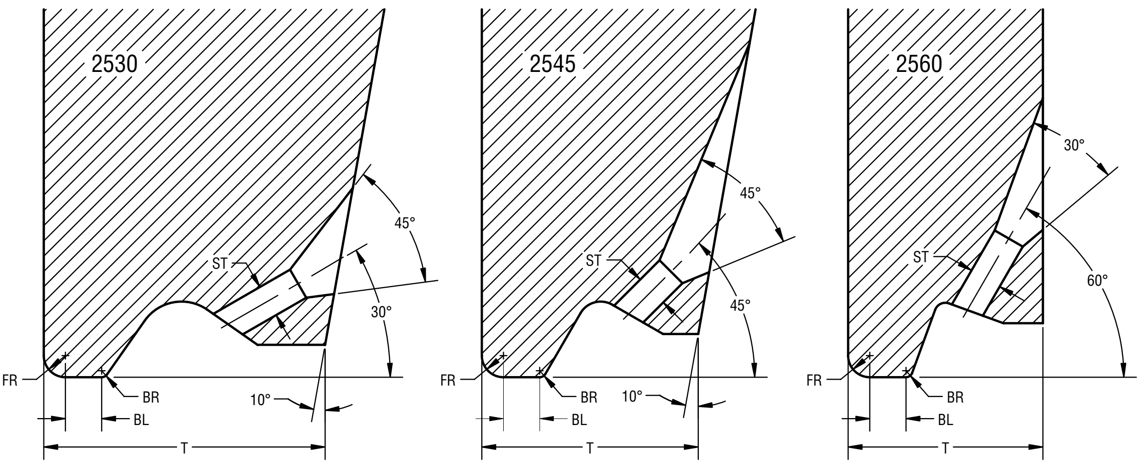
Ribbon Bonding Wedge



Wire Bonding Wedge



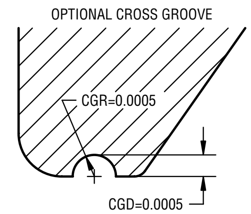
Ribbon Wedges
2530, 2545, & 2560 Series



Simply specify the ribbon thickness, width, and bond length and Gaiser calculates the ribbon feed slot dimensions for optimum performance.

Deep access vertical feed ribbon tools are also available - see series 4645R and 4660R.

Material:
Tungsten Carbide Standard
Titanium Carbide Optional
(Specify "-TiC" in part no.)
Cermet Tip Optional
(Specify "-BKCER" in part no.)

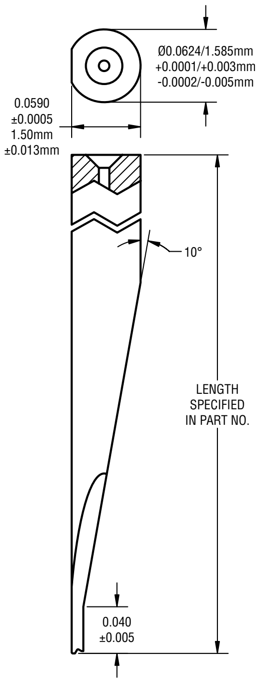


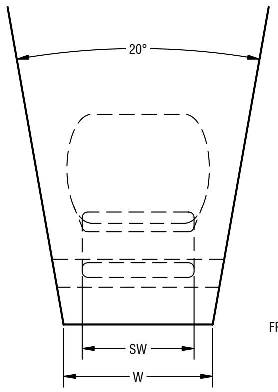
Specify: Series/Ribbon Feed Angle - Ribbon Thickness - Ribbon Width - Bond Length - Tool Length - Options

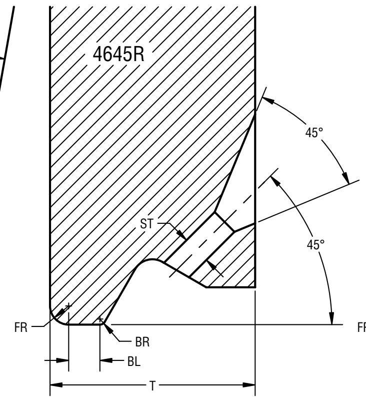
Example:
2530-.5-4-2.0-L (RT="0.5"=0.0005 in., RW="4"=0.0040 in., BL or BF="2.0"=0.0020 in.)
2545-1-5-3.0-3/4-CG-TiC (RT="1"=0.0010 in., RW="5"=0.0050 in., BL or BF="3.0"=0.0030 in.)

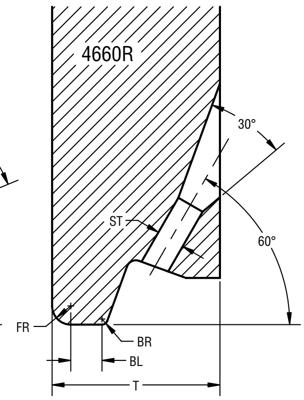
BL (BF) in. / µm ±0.0002 / 5	FR in. / µm ±0.0002 / 5	BR in. / µm +0.0002 / 5 -0.0001 / 2.5	SW in./µm ±0.0005 / 13	W in./µm ±0.0003 / 8	T 30° in. / µm ±0.0005 / 13	T 45° in. / µm ±0.0005 / 13	T 60° in. / µm ±0.0005 / 13	RIBBON THICKNESS in. / µm	RIBBON WIDTH in. / µm
0.0005 / 13	0.0010 / 25	0.0003 / 8	0.0035 / 89	0.005 / 127	0.012 / 305	0.008 / 203	0.008 / 203	0.00025 / 6 to 0.0005 / 13	0.002 / 51
0.0010 / 25	0.0010 / 25	0.0003 / 8	0.0035 / 89	0.005 / 127	0.012 / 305	0.009 / 229	0.008 / 203		
0.0015 / 38	0.0010 / 25	0.0003 / 8	0.0035 / 89	0.005 / 127	0.013 / 330	0.009 / 229	0.008 / 203		
0.0020 / 51	0.0010 / 25	0.0003 / 8	0.0035 / 89	0.005 / 127	0.013 / 330	0.010 / 254	0.009 / 229		
0.0020 / 51	0.0010 / 25	0.0003 / 8	0.0050 / 127	0.007 / 178	0.013 / 330	0.010 / 254	0.009 / 229	0.0005 / 13 to 0.001 / 25	0.003 / 76
0.0025 / 64	0.0010 / 25	0.0003 / 8	0.0050 / 127	0.007 / 178	0.014 / 356	0.010 / 254	0.009 / 229		
0.0030 / 76	0.0010 / 25	0.0003 / 8	0.0050 / 127	0.007 / 178	0.014 / 356	0.011 / 279	0.010 / 254		
0.0040 / 102	0.0010 / 25	0.0003 / 8	0.0050 / 127	0.007 / 178	0.015 / 381	0.012 / 305	0.011 / 279		
0.0025 / 64	0.0010 / 25	0.0003 / 8	0.0060 / 152	0.008 / 203	0.014 / 356	0.010 / 254	0.009 / 229	0.0005 / 13 to 0.002 / 51	0.004 / 102
0.0030 / 76	0.0010 / 25	0.0003 / 8	0.0060 / 152	0.008 / 203	0.014 / 356	0.011 / 279	0.010 / 254		
0.0040 / 102	0.0010 / 25	0.0003 / 8	0.0060 / 152	0.008 / 203	0.015 / 381	0.012 / 305	0.011 / 279		
0.0025 / 64	0.0010 / 25	0.0003 / 8	0.0070 / 178	0.009 / 229	0.014 / 356	0.010 / 254	0.009 / 229		0.005 / 127
0.0030 / 76	0.0010 / 25	0.0003 / 8	0.0070 / 178	0.009 / 229	0.014 / 356	0.011 / 279	0.010 / 254		
0.0040 / 102	0.0010 / 25	0.0003 / 8	0.0070 / 178	0.009 / 229	0.015 / 381	0.012 / 305	0.011 / 279		
0.0030 / 76	0.0010 / 25	0.0003 / 8	0.0110 / 279	0.013 / 330	0.014 / 356	0.011 / 279	0.010 / 254		0.008 / 203
0.0040 / 102	0.0010 / 25	0.0003 / 8	0.0110 / 279	0.013 / 330	0.015 / 381	0.012 / 305	0.011 / 279		
0.0050 / 127	0.0010 / 25	0.0003 / 8	0.0110 / 279	0.013 / 330	0.016 / 406	0.013 / 330	0.012 / 305		
0.0030 / 76	0.0010 / 25	0.0003 / 8	0.0130 / 330	0.016 / 406	0.014 / 356	0.011 / 279	0.010 / 254		0.010 / 254
0.0040 / 102	0.0010 / 25	0.0003 / 8	0.0130 / 330	0.016 / 406	0.015 / 381	0.012 / 305	0.011 / 279		
0.0050 / 127	0.0010 / 25	0.0003 / 8	0.0130 / 330	0.016 / 406	0.016 / 406	0.013 / 330	0.012 / 305		

Chart contains typical configurations. T dimension varies with ribbon size - consult factory for exact T dimension.
Other configurations available based on ribbon size. Standard 1/16 inch diameter shank.
Dimensions in inches unless otherwise specified.





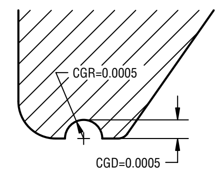




Vertical feed, deep access, tubular shank construction.

Material: Tungsten Carbide Standard
Cermet Tip Optional
(Specify "-BKCER" in part no.)

OPTIONAL CROSS GROOVE



Simply specify the ribbon thickness, width, and bond length. Gaiser calculates the ribbon feed slot dimensions for optimum performance.

Specify: Series/Ribbon Feed Angle - Ribbon Thickness - Ribbon Width - Bond Length - Tool Length - Options

Example:

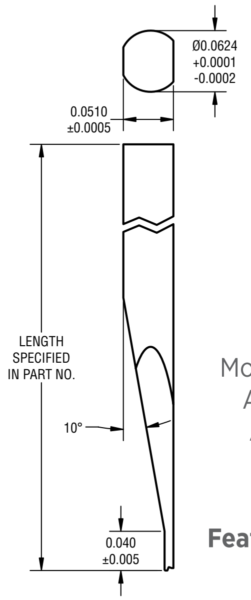
4645R-.5-4-2.0-L-CG (RT=".5"=0.0005 in., RW="4"=0.0040 in., BL or BF="2.0"=0.0020 in.)
4660R-1-5-3.0-3/4-BKCER (RT="1"=0.0010 in., RW="5"=0.0050 in., BL or BF="3.0"=0.0030 in.)

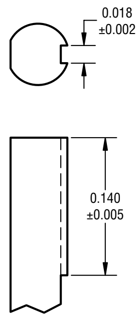
BL (BF) in. / µm ±0.0002 / 5	FR in. / µm ±0.0002 / 5	BR in./µm +0.0002 / 5 -0.0001 / 2.5	SW in. / µm ±0.0005 / 13	W in. / µm ±0.0003 / 8	T 45° in. / µm ±0.0005 / 13	T 60° in. / µm ±0.0005 / 13	RIBBON THICKNESS in. / µm	RIBBON WIDTH in. / µm
0.0010 / 25	0.0010 / 25	0.0003 / 8	0.0035 / 89	0.005 / 127	0.009 / 229	0.008 / 203	0.00025 / 6 to 0.0005 / 13	0.002 / 51
0.0015 / 38	0.0010 / 25	0.0003 / 8	0.0035 / 89	0.005 / 127	0.009 / 229	0.008 / 203		
0.0020 / 51	0.0010 / 25	0.0003 / 8	0.0035 / 89	0.005 / 127	0.010 / 254	0.009 / 229		
0.0020 / 51	0.0010 / 25	0.0003 / 8	0.0050 / 127	0.007 / 178	0.010 / 254	0.009 / 229		
0.0025 / 64	0.0010 / 25	0.0003 / 8	0.0050 / 127	0.007 / 178	0.010 / 254	0.009 / 229	0.0005 / 13 to 0.001 / 25	0.003 / 76
0.0030 / 76	0.0010 / 25	0.0003 / 8	0.0050 / 127	0.007 / 178	0.011 / 279	0.010 / 254		
0.0040 / 102	0.0010 / 25	0.0003 / 8	0.0050 / 127	0.007 / 178	0.012 / 305	0.011 / 279		
0.0025 / 64	0.0010 / 25	0.0003 / 8	0.0060 / 152	0.008 / 203	0.010 / 254	0.009 / 229		
0.0030 / 76	0.0010 / 25	0.0003 / 8	0.0060 / 152	0.008 / 203	0.011 / 279	0.010 / 254	0.0005 / 13 to 0.002 / 51	0.004 / 102
0.0040 / 102	0.0010 / 25	0.0003 / 8	0.0060 / 152	0.008 / 203	0.012 / 305	0.011 / 279		
0.0025 / 64	0.0010 / 25	0.0003 / 8	0.0070 / 178	0.009 / 229	0.010 / 254	0.009 / 229		
0.0030 / 76	0.0010 / 25	0.0003 / 8	0.0070 / 178	0.009 / 229	0.011 / 279	0.010 / 254		0.005 / 127
0.0040 / 102	0.0010 / 25	0.0003 / 8	0.0070 / 178	0.009 / 229	0.012 / 305	0.011 / 279		
0.0030 / 76	0.0010 / 25	0.0003 / 8	0.0110 / 279	0.013 / 330	0.011 / 279	0.010 / 254		
0.0040 / 102	0.0010 / 25	0.0003 / 8	0.0110 / 279	0.013 / 330	0.012 / 305	0.011 / 279		0.008 / 203
0.0050 / 127	0.0010 / 25	0.0003 / 8	0.0110 / 279	0.013 / 330	0.013 / 330	0.012 / 305		
0.0030 / 76	0.0010 / 25	0.0003 / 8	0.0130 / 330	0.016 / 406	0.011 / 279	0.010 / 254		
0.0040 / 102	0.0010 / 25	0.0003 / 8	0.0130 / 330	0.016 / 406	0.012 / 305	0.011 / 279		0.010 / 254
0.0050 / 127	0.0010 / 25	0.0003 / 8	0.0130 / 330	0.016 / 406	0.013 / 330	0.012 / 305		

Chart contains typical configurations. T dimension varies with ribbon size – consult factory for exact T dimension.
Other configurations available based on ribbon size.
Dimensions in inches unless otherwise specified.

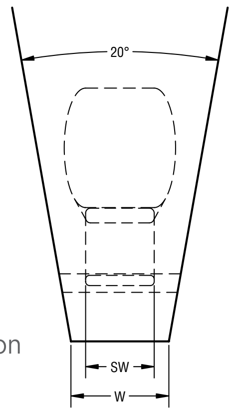
CoorsTek

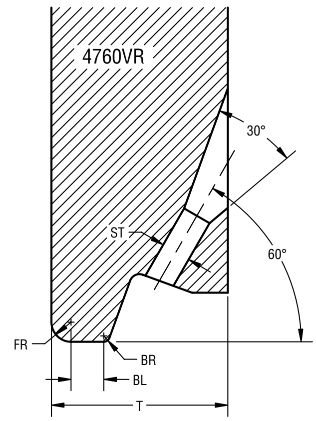
Ribbon Wedges
4760VR Series





Modified Shank Option
Acts as Wire Guide
Add "-MS1" to the
Part Number





Material: Tungsten Carbide Standard
Titanium Carbide Optional
(Specify "-TiC" in part no.)
Cermet Tip Optional
(Specify "-BKCER" in part no.)

Features: Designed for the Palomar 2470 Deep Access Wire Bonder

Specify: Series/Ribbon Feed Angle - Ribbon Thickness - Ribbon Width - Bond Length - Tool Length - Options

Example:
4760VR-.5-4-2.0-3/4 (RT="0.5"=0.0005 in., RW="4"=0.0040 in., BL or BF="2.0"=0.0020 in.)
4760VR-1-5-3.0-3/4-CG-TiC (RT="1"=0.0010 in., RW="5"=0.0050 in., BL or BF="3.0"=0.0030 in.)

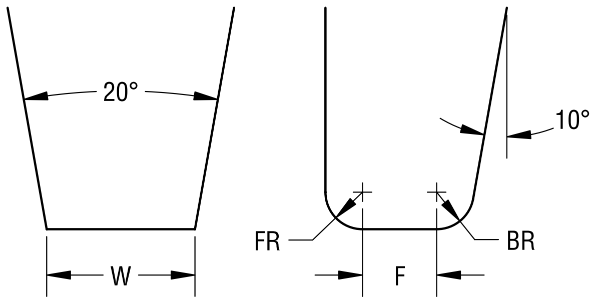
BL (BF) in. / µm ±0.0002 / 5	FR in. / µm ±0.0002 / 5	BR in. / µm +0.0002 / 5 -0.0001 / 2.5	ST in. / µm ±0.0002 / 5	SW in. / µm ±0.0005 / 13	W in. / µm ±0.0003 / 8	*T in. / µm ±0.0005 / 13	RIBBON THICKNESS in. / µm	RIBBON WIDTH in. / µm
0.0005 / 13	0.0010 / 25	0.0003 / 8	0.0015 / 38	0.0035 / 89	0.005 / 127	0.008 / 203	0.00025 / 6 to 0.0009 / 23	0.002 / 51
0.0010 / 25	0.0010 / 25	0.0003 / 8	0.0015 / 38	0.0035 / 89	0.005 / 127	0.008 / 203		
0.0015 / 38	0.0010 / 25	0.0003 / 8	0.0015 / 38	0.0035 / 89	0.005 / 127	0.008 / 203		
0.0020 / 51	0.0010 / 25	0.0003 / 8	0.0015 / 38	0.0035 / 89	0.005 / 127	0.009 / 229		
0.0020 / 51	0.0010 / 25	0.0003 / 8	0.0025 / 64	0.0050 / 127	0.007 / 178	0.009 / 229	0.0010 / 25 to 0.0019 / 48	0.003 / 76
0.0025 / 64	0.0010 / 25	0.0003 / 8	0.0025 / 64	0.0050 / 127	0.007 / 178	0.009 / 229		
0.0030 / 76	0.0010 / 25	0.0003 / 8	0.0025 / 64	0.0050 / 127	0.007 / 178	0.010 / 254		
0.0040 / 102	0.0010 / 25	0.0003 / 8	0.0025 / 64	0.0050 / 127	0.007 / 178	0.011 / 279		
0.0025 / 64	0.0010 / 25	0.0003 / 8	0.0025 / 64	0.0060 / 152	0.008 / 203	0.009 / 229		0.004 / 102
0.0030 / 76	0.0010 / 25	0.0003 / 8	0.0025 / 64	0.0060 / 152	0.008 / 203	0.010 / 254		
0.0040 / 102	0.0010 / 25	0.0003 / 8	0.0025 / 64	0.0060 / 152	0.008 / 203	0.011 / 279		
0.0025 / 64	0.0010 / 25	0.0003 / 8	0.0025 / 64	0.0070 / 178	0.009 / 229	0.009 / 229		0.005 / 127
0.0030 / 76	0.0010 / 25	0.0003 / 8	0.0025 / 64	0.0070 / 178	0.009 / 229	0.010 / 254		
0.0040 / 102	0.0010 / 25	0.0003 / 8	0.0025 / 64	0.0070 / 178	0.009 / 229	0.011 / 279		
0.0030 / 76	0.0010 / 25	0.0003 / 8	0.0025 / 64	0.0110 / 279	0.013 / 330	0.010 / 254		0.008 / 203
0.0040 / 102	0.0010 / 25	0.0003 / 8	0.0025 / 64	0.0110 / 279	0.013 / 330	0.011 / 279		
0.0050 / 127	0.0010 / 25	0.0003 / 8	0.0025 / 64	0.0110 / 279	0.013 / 330	0.012 / 305		
0.0030 / 76	0.0010 / 25	0.0003 / 8	0.0025 / 64	0.0130 / 330	0.016 / 406	0.010 / 254		0.010 / 254
0.0040 / 102	0.0010 / 25	0.0003 / 8	0.0025 / 64	0.0130 / 330	0.016 / 406	0.011 / 279		
0.0050 / 127	0.0010 / 25	0.0003 / 8	0.0025 / 64	0.0130 / 330	0.016 / 406	0.012 / 305		

Chart contains typical configurations. T dimension varies with ribbon size – consult factory for exact T dimension.
Other configurations available based on ribbon size.
Dimensions in inches unless otherwise specified.

CoorsTek

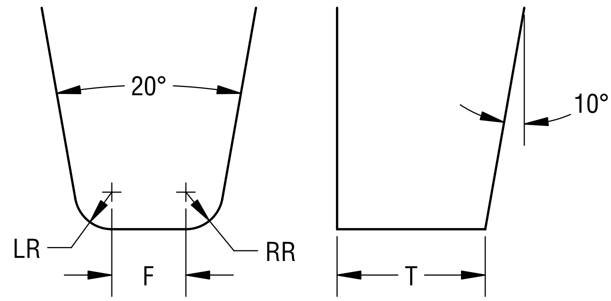
Special Application Wedges
2100, 2100A, & 2100B Series

2100 Series



Specify: 2100(W-FR-F-BR)-Length-Shank Dia.

2100A Series



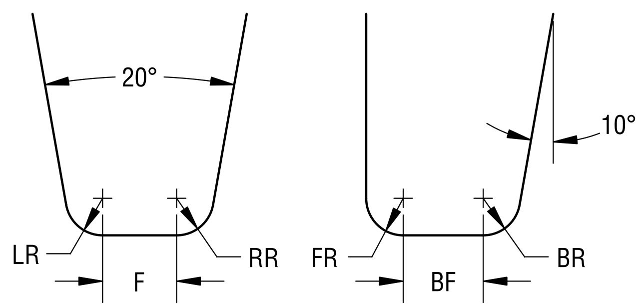
Specify: 2100A(T-LR-F-RR)-Length-Shank Dia.

Example:

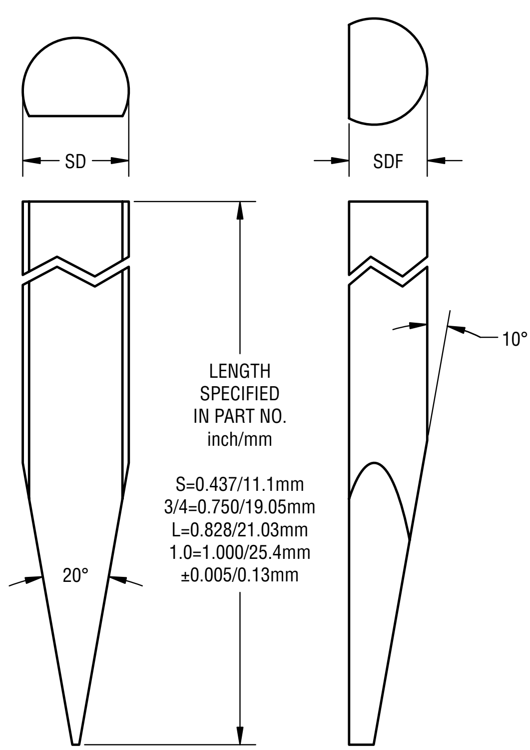
2100(40-10-20-5)-S-1/16

- Series
- W("40"=0.0040 inch)
- FR("10"=0.0010 inch)
- F("20"=0.0020 inch)
- BR("5"=0.0005 inch)
- Shank Length("S"=0.437 inch)
- Shank("1/16"=see table)

2100B Series

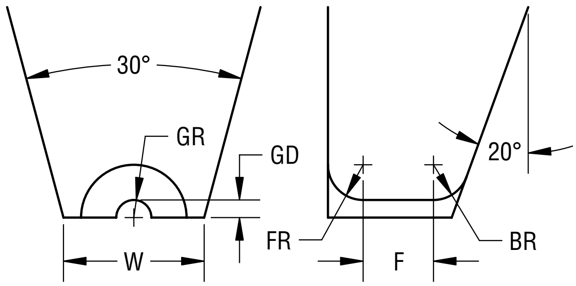


Specify: 2100B(F-BF-FR-BR-LR-RR)-Length-Shank Dia.



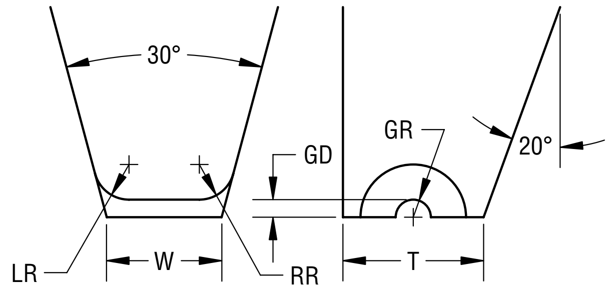
SHANK TABLE		
SHANK	SHANK DIAMETER (SD) in. / mm +0.0001 / 0.003 -0.0002 / 0.005	SHANK DIAMETER FLAT (SDF) in. / mm ±0.0005 / 0.013
1/16	0.0624 / 1.585	0.0460 / 1.168
1/16A	0.0624 / 1.585	0.0590 / 1.500
2mm	0.0786 / 2.000	0.0630 / 1.600
3/32	0.0936 / 2.377	0.0880 / 2.235
3mm	0.1179 / 2.995	0.0900 / 2.290
1/8	0.1249 / 3.172	0.1180 / 3.000

2300 Series



Specify: 2300(W-FR-F-BR-GD-GR)-Length-Shank Dia.

2300A Series



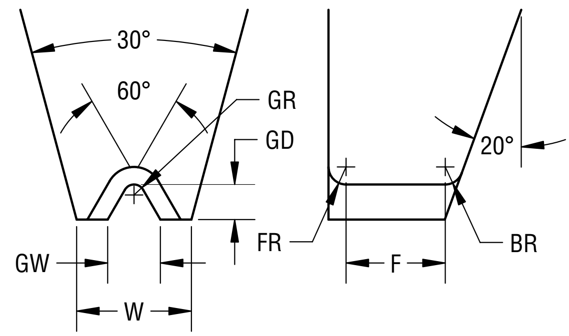
Specify: 2300A(W-LR-T-RR-GD-GR)-Length-Shank Dia.

Example:

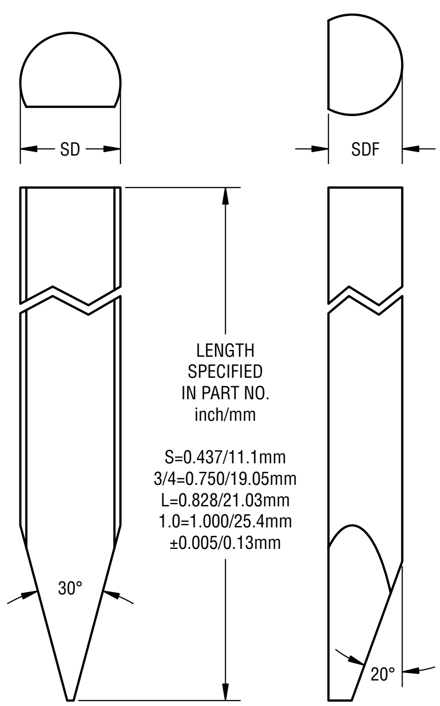
2300(40-10-50-10-5-10)-S-1/16

- Series
- W (“40”=0.0040 inch)
- FR (“10”=0.0010 inch)
- F (“50”=0.0050 inch)
- BR (“5”=0.0005 inch)
- GD (“10”=0.0010 inch
- GR (“10”=0.0010 inch
- Shank Length (“S=0.437 inch)
- Shank (1/16=see table)

2300C Series

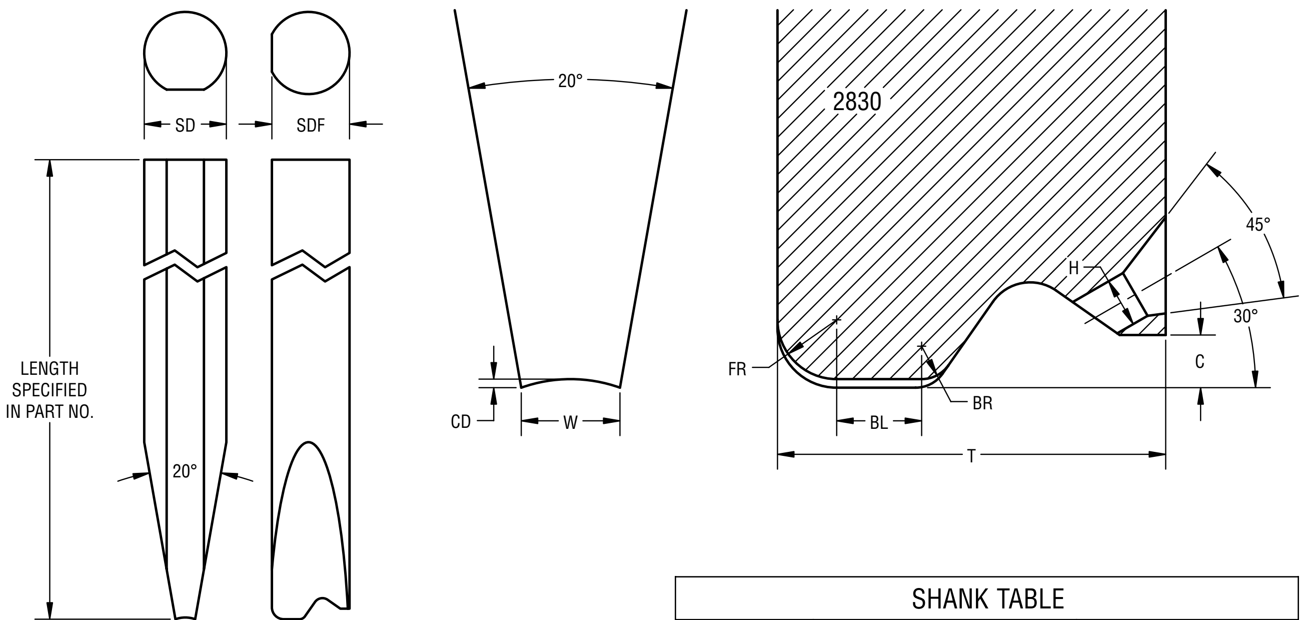


Specify: 2300C(W-FR-F-BR-GD-GR-GW)-Length-Shank Dia.



SHANK TABLE		
SHANK	SHANK DIAMETER (SD) in. / mm +0.0001 / 0.003 -0.0002 / 0.005	SHANK DIAMETER FLAT (SDF) in. / mm ±0.0005 / 0.013
1/16	0.0624 / 1.585	0.0460 / 1.168
1/16A	0.0624 / 1.585	0.0590 / 1.500
2mm	0.0786 / 2.000	0.0630 / 1.600
3/32	0.0936 / 2.377	0.0880 / 2.235
3mm	0.1179 / 2.995	0.0900 / 2.290
1/8	0.1249 / 3.172	0.1180 / 3.000

Large Wire Wedges
2830 Series



SHANK TABLE		
SHANK	SHANK DIAMETER (SD) in. / mm +0.0001 / 0.003 -0.0002 / 0.005	SHANK DIAMETER FLAT (SDF) in. / mm ±0.0005 / 0.013
1/16A	0.0624 / 1.585	0.0590 / 1.500
2mm	0.0786 / 2.000	0.0630 / 1.600
3/32	0.0936 / 2.377	0.0880 / 2.235
3mm	0.1179 / 2.995	0.0900 / 2.290
1/8	0.1249 / 3.172	0.1180 / 3.000

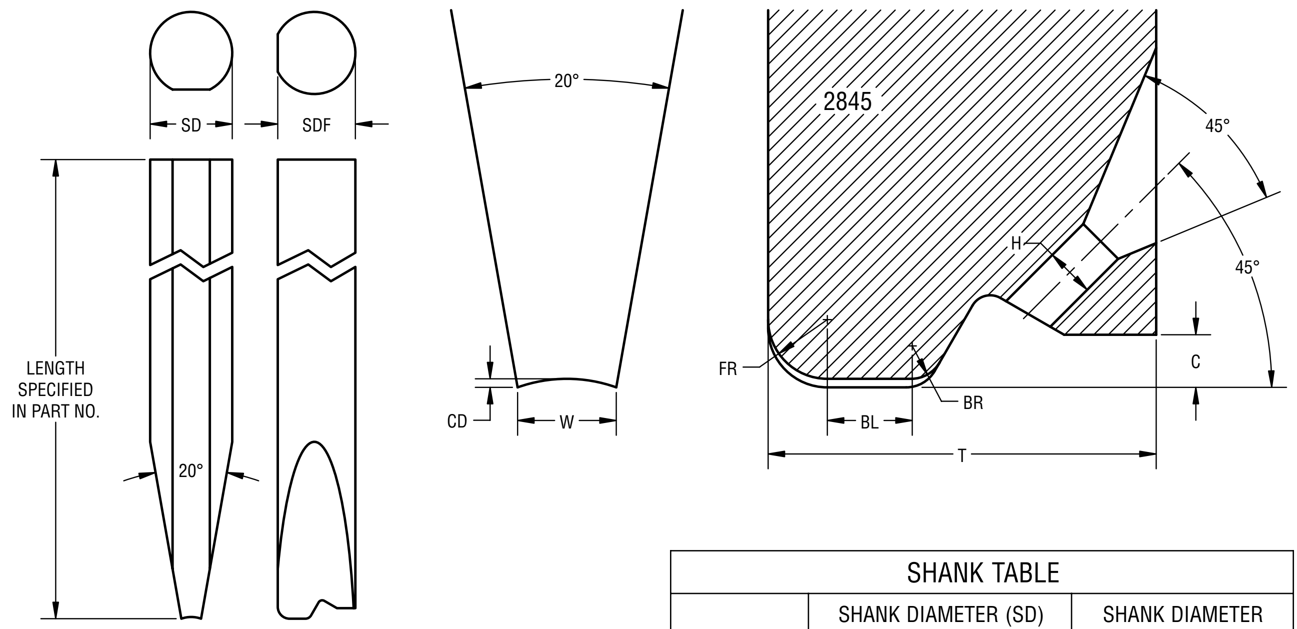
Material:
Tungsten Carbide

Specify:
Series/Wire Feed Angle - Wire Diameter - Shank (See Table) - Length

Example:
2830-5-1/16A-L
2830-12-1/8-1.0

2830 SERIES PART NUMBER	H in. / µm ±0.0005 / 13	BL in. / µm ±0.0005 / 13	W in. / µm ±0.0005 / 13	C in. / µm ±0.0005 / 13	FR in. / µm ±0.0005 / 13	BR in. / µm ±0.0005 / 13	T in. / mm ±0.001 / .025	MINIMUM SHANK DIAMETER	CD in. / µm ±0.0005 / 13	SUGGESTED WIRE DIAMETER in. / µm
2830-3	0.0045 / 114	0.0070 / 178	0.0100 / 254	0.0050 / 127	0.0060 / 152	0.0040 / 102	0.059 / 1.50	1/16A	0.0008 / 20	0.003 / 76
2830-4	0.0060 / 152	0.0100 / 254	0.0120 / 305	0.0070 / 178	0.0080 / 203	0.0050 / 127	0.059 / 1.50		0.0010 / 25	0.004 / 102
2830-5	0.0075 / 191	0.0120 / 305	0.0150 / 381	0.0080 / 203	0.0090 / 229	0.0050 / 127	0.059 / 1.50		0.0013 / 33	0.005 / 127
2830-6	0.0090 / 229	0.0120 / 305	0.0180 / 457	0.0090 / 229	0.0090 / 229	0.0060 / 152	0.059 / 1.50		0.0016 / 41	0.006 / 152
2830-7	0.0105 / 267	0.0120 / 305	0.0210 / 533	0.0090 / 229	0.0090 / 229	0.0060 / 152	0.059 / 1.50		0.0018 / 46	0.007 / 178
2830-8	0.0120 / 305	0.0120 / 305	0.0240 / 610	0.0050 / 127	0.0090 / 229	0.0060 / 152	0.059 / 1.50		0.0020 / 51	0.008 / 203
2830-10	0.0140 / 356	0.0150 / 381	0.0300 / 762	0.0100 / 254	0.0100 / 254	0.0060 / 152	0.077 / 1.96	3/32	0.0025 / 64	0.010 / 254
2830-12	0.0160 / 406	0.0180 / 457	0.0360 / 914	0.0100 / 254	0.0110 / 279	0.0070 / 178	0.110 / 2.80	1/8	0.0030 / 76	0.012 / 305
2830-15	0.0200 / 508	0.0200 / 508	0.0450 / 1143	0.0100 / 254	0.0120 / 305	0.0080 / 203	0.110 / 2.80		0.0038 / 97	0.015 / 381
2830-20	0.0250 / 635	0.0250 / 635	0.0600 / 1524	0.0100 / 254	0.0120 / 305	0.0080 / 203	0.118 / 3.00		0.0050 / 127	0.020 / 508

Dimensions in inches unless otherwise specified.



Material:
Tungsten Carbide

SHANK TABLE		
SHANK	SHANK DIAMETER (SD) in. / mm +0.0001 / 0.003 -0.0002 / 0.005	SHANK DIAMETER FLAT (SDF) in. / mm ±0.0005 / 0.013
1/16	0.0624 / 1.585	0.0460 / 1.168
1/16A	0.0624 / 1.585	0.0590 / 1.500
2mm	0.0786 / 2.000	0.0630 / 1.600
3/32	0.0936 / 2.377	0.0880 / 2.235
3mm	0.1179 / 2.995	0.0900 / 2.290
1/8	0.1249 / 3.172	0.1180 / 3.000

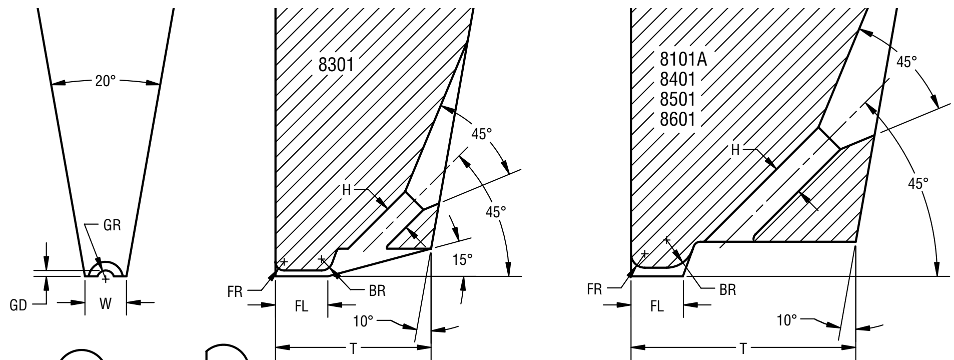
Specify:
Series/Wire Feed Angle - Wire Diameter - Shank(See Table) - Length

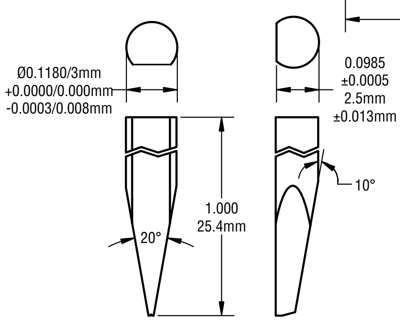
Example:
2845-5-1/16A-L
2845-12-1/8-1.0

2845 SERIES PART NUMBER	H in. / µm ±0.0005 / 13	BL in. / µm ±0.0005 / 13	W in. / µm ±0.0005 / 13	C in. / µm ±0.0005 / 13	FR in. / µm ±0.0005 / 13	BR in. / µm ±0.0005 / 13	T in. / mm ±0.001 / .025	MINIMUM SHANK DIAMETER	CD in. / µm ±0.0005 / 13	SUGGESTED WIRE DIAMETER in. / µm
2845-3	0.0045 / 114	0.0070 / 178	0.0100 / 254	0.0050 / 127	0.0060 / 152	0.0040 / 102	0.045 / 1.14	1/16	0.0008 / 20	0.003 / 76
2845-4	0.0060 / 152	0.0100 / 254	0.0120 / 305	0.0070 / 178	0.0080 / 203	0.0050 / 127	0.059 / 1.50		0.0010 / 25	0.004 / 102
2845-5	0.0075 / 191	0.0120 / 305	0.0150 / 381	0.0080 / 203	0.0090 / 229	0.0050 / 127	0.059 / 1.50		0.0013 / 33	0.005 / 127
2845-6	0.0090 / 229	0.0120 / 305	0.0180 / 457	0.0090 / 229	0.0090 / 229	0.0060 / 152	0.059 / 1.50	1/16A	0.0016 / 41	0.006 / 152
2845-7	0.0105 / 267	0.0120 / 305	0.0210 / 533	0.0090 / 229	0.0090 / 229	0.0060 / 152	0.059 / 1.50		0.0018 / 46	0.007 / 178
2845-8	0.0120 / 305	0.0120 / 305	0.0240 / 610	0.0050 / 127	0.0090 / 229	0.0060 / 152	0.059 / 1.50		0.0020 / 51	0.008 / 203
2845-10	0.0140 / 356	0.0150 / 381	0.0300 / 762	0.0100 / 254	0.0100 / 254	0.0060 / 152	0.088 / 2.23		0.0025 / 64	0.010 / 254
2845-12	0.0160 / 406	0.0180 / 457	0.0360 / 914	0.0100 / 254	0.0110 / 279	0.0070 / 178	0.088 / 2.23	3/32	0.0030 / 76	0.012 / 305
2845-15	0.0200 / 508	0.0200 / 508	0.0450 / 1143	0.0100 / 254	0.0120 / 305	0.0080 / 203	0.088 / 2.23		0.0038 / 97	0.015 / 381
2845-20	0.0250 / 635	0.0250 / 635	0.0600 / 1524	0.0100 / 254	0.0120 / 305	0.0080 / 203	0.118 / 3.00	1/8	0.0050 / 127	0.020 / 508

Dimensions in inches unless otherwise specified.

Large Wire U-Groove Wedges
8101A, 8301, 8401, 8501, & 8601 Series





Standard Shank & Length

Features: Designed for the Shinkawa Bonder

Material: Tungsten Carbide

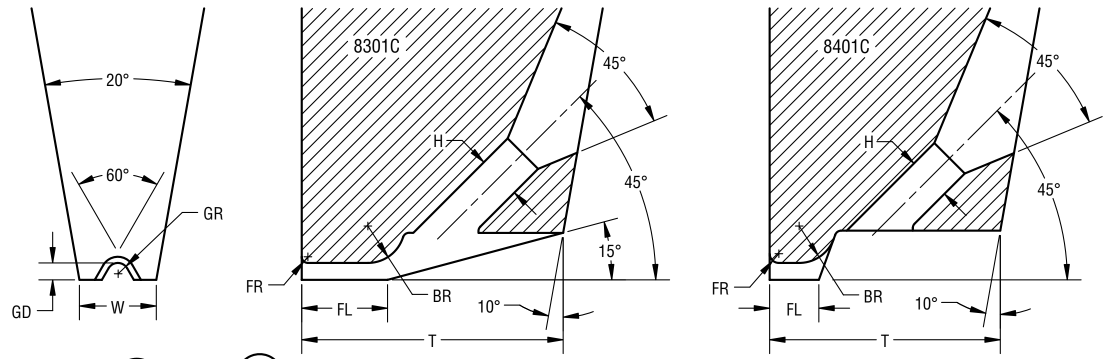
Example Part Number (Standard Shank & Length): 8301-5

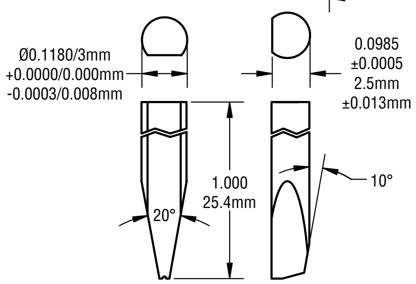
Example Part Number (Optional Shank & Length): 8301-5-1/16-L

PART NUMBER	FL in. / µm ±0.0010 / 25	FR in. / µm ±0.0005 / 13	BR in. / µm ±0.0005 / 13	H in. / µm ±0.0005 / 13	W in. / µm ±0.0010 / 25	GR in. / µm ±0.0002 / 5	GD in. / µm ±0.0002 / 5	T in. / µm ±0.0020 / 51	WIRE DIAMETER in. / µm
8301-1	0.0080 / 203	0.0020 / 51	0.0027 / 69	0.0060 / 152	0.0100 / 254	0.0020 / 51	0.0013 / 33	0.0360 / 914	0.0040 / 102
8301-4	0.0120 / 305	0.0020 / 51	0.0027 / 69	0.0060 / 152	0.0100 / 254	0.0020 / 51	0.0013 / 33	0.0400 / 1016	
8301-2	0.0100 / 254	0.0025 / 64	0.0033 / 84	0.0075 / 190	0.0120 / 305	0.0025 / 64	0.0017 / 43	0.0400 / 1016	0.0050 / 127
8301-5	0.0150 / 381	0.0025 / 64	0.0033 / 84	0.0075 / 190	0.0120 / 305	0.0025 / 64	0.0017 / 43	0.0450 / 1143	
8501-1	0.0150 / 381	0.0040 / 102	0.0080 / 203	0.0090 / 229	0.0200 / 508	0.0030 / 76	0.0025 / 64	0.0650 / 1651	
8601-1	0.0175 / 445	0.0040 / 102	0.0080 / 203	0.0090 / 229	0.0200 / 508	0.0030 / 76	0.0025 / 64	0.0650 / 1651	
8301-3	0.0120 / 305	0.0030 / 76	0.0040 / 102	0.0090 / 229	0.0150 / 381	0.0030 / 76	0.0020 / 51	0.0440 / 1118	0.0060 / 152
8301-6	0.0180 / 457	0.0030 / 76	0.0040 / 102	0.0090 / 229	0.0150 / 381	0.0030 / 76	0.0020 / 51	0.0500 / 1270	
8101A-3	0.0140 / 356	0.0040 / 102	0.0100 / 254	0.0110 / 279	0.0240 / 610	0.0040 / 102	0.0030 / 76	0.0650 / 1651	0.0080 / 203
8401-3	0.0176 / 447	0.0040 / 102	0.0100 / 254	0.0110 / 279	0.0240 / 610	0.0040 / 102	0.0030 / 76	0.0690 / 1753	
8501-3	0.0263 / 600	0.0040 / 102	0.0100 / 254	0.0145 / 368	0.0240 / 610	0.0040 / 102	0.0030 / 76	0.0820 / 2083	
8101A-4	0.0180 / 457	0.0050 / 127	0.0120 / 305	0.0140 / 356	0.0300 / 762	0.0050 / 127	0.0040 / 102	0.0710 / 1803	0.0100 / 254
8401-4	0.0220 / 560	0.0050 / 127	0.0120 / 305	0.0140 / 356	0.0300 / 762	0.0050 / 127	0.0040 / 102	0.0750 / 1905	
8501-4	0.0300 / 762	0.0050 / 127	0.0120 / 305	0.0180 / 457	0.0300 / 762	0.0050 / 127	0.0040 /102	0.0900 / 2286	
8101A-5	0.0210 / 533	0.0060 / 152	0.0140 / 356	0.0170 / 432	0.0300 / 762	0.0060 / 152	0.0050 / 127	0.0790 / 2006	0.0120 / 305
8401-5	0.0264 / 671	0.0060 / 152	0.0140 / 356	0.0170 / 432	0.0300 / 762	0.0060 / 152	0.0050 / 127	0.0840 / 2134	
*8501-5	0.0360 / 914	0.0060 / 152	0.0140 / 356	0.0216 / 549	0.0300 / 762	0.0060 / 152	0.0050 / 127	0.1100 / 2794	
8101A-6	0.0250 / 635	0.0070 / 178	0.0160 / 406	0.0190 / 483	0.0300 / 762	0.0070 / 178	0.0060 / 152	0.0820 / 2082	0.0138 / 351
8401-6	0.0300 / 762	0.0070 / 178	0.0160 / 406	0.0190 / 483	0.0300 / 762	0.0070 / 178	0.0060 / 152	0.0870 / 2210	
*8501-6	0.0414 / 1052	0.0070 / 178	0.0160 / 406	0.0290 / 737	0.0300 / 762	0.0070 / 178	0.0060 / 152	0.1100 / 2794	
8101A-7	0.0280 / 711	0.0080 / 203	0.0170 / 432	0.0235 / 597	0.0350 / 889	0.0080 / 203	0.0065 / 165	0.0880 / 2235	0.0157 / 399
8401-7	0.0346 / 879	0.0080 / 203	0.0170 / 432	0.0235 / 597	0.0350 / 889	0.0080 / 203	0.0065 / 165	0.0950 / 2413	
8401-7A	0.0460 / 1168	0.0080 / 203	0.0170 / 432	0.0235 / 597	0.0350 / 889	0.0080 / 203	0.0065 / 165	0.0950 / 2413	
*8801-7	0.0470 / 1194	0.0080 / 203	0.0170 / 432	0.0280 / 711	0.0500 / 1270	0.0080 / 203	0.0065 / 165	0.1500 / 3810	
*8101A-8	0.0360 / 914	0.0100 / 254	0.0180 / 457	0.0300 / 762	0.0350 / 889	0.0100 / 254	0.0087 / 220	0.1100 / 2794	0.0200 / 508
*8401-8	0.0440 / 1118	0.0100 / 254	0.0180 / 457	0.0300 / 762	0.0350 / 889	0.0100 / 254	0.0087 / 220	0.1060 / 2692	
*8801-8	0.0500 / 1270	0.0100 / 254	0.0180 / 457	0.0360 / 914	0.0500 / 1270	0.0100 / 254	0.0087 / 220	0.1500 / 3810	

*SDF = 0.110/2.79mm. Dimensions in inches unless otherwise specified.

Large Wire V-Groove Wedges
8301C & 8401C Series





Standard Shank & Length

Features: Designed for the Shinkawa Bonder

Material: Tungsten Carbide

Example Part Number (Standard Shank & Length): 8301C-5

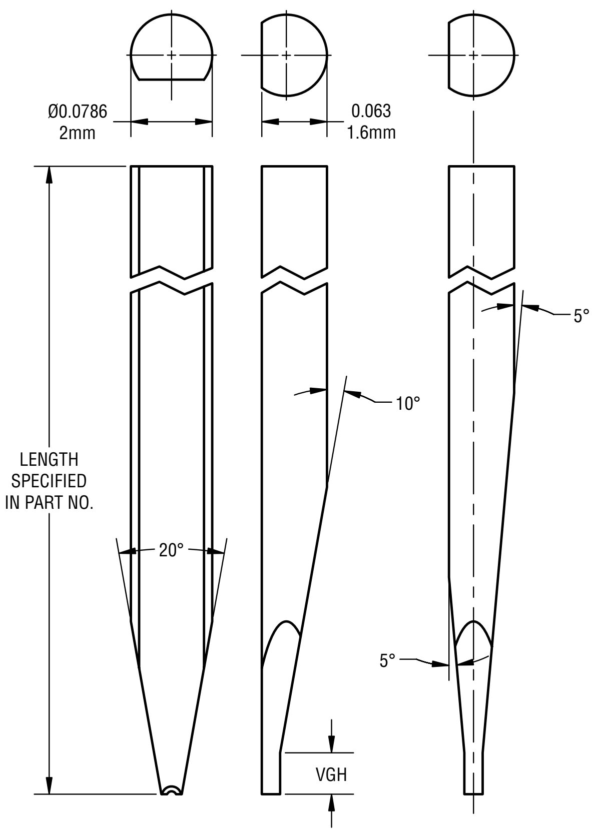
Example Part Number (Optional Shank & Length): 8301C-5-1/16-L

PART NUMBER	BL in. / µm ±0.0010 / 25	FL in. / µm ±0.0010 / 25	FR in. / µm ±0.0005 / 13	BR in. / µm ±0.0005 / 13	H in. / µm ±0.0005 / 13	W in. / µm ±0.0010 / 25	GR in. / µm ±0.0002 / 5	GD in. / µm ±0.0002 / 5	T in. / µm ±0.0020 / 51	WIRE DIAMETER in. / µm
8301C-19	0.0040 / 102	0.0080 / 203	0.0020 / 51	0.0048 / 122	0.0060 / 152	0.0150 / 381	0.0014 / 36	0.0022 / 56	0.0290 / 737	
8301C-10	0.0060 / 152	0.0100 / 254	0.0020 / 51	0.0048 / 122	0.0060 / 152	0.0150 / 381	0.0014 / 36	0.0022 / 56	0.0310 / 787	0.0040 / 102
8301C-1	0.0088 / 224	0.0130 / 330	0.0020 / 51	0.0048 / 122	0.0060 / 152	0.0150 / 381	0.0014 / 36	0.0022 / 56	0.0340 / 864	
8301C-20	0.0050 / 127	0.0090 / 229	0.0020 / 51	0.0060 / 152	0.0075 / 190	0.0150 / 381	0.0018 / 46	0.0028 / 71	0.0380 / 965	
8301C-11	0.0075 / 190	0.0120 / 305	0.0020 / 51	0.0060 / 152	0.0075 / 190	0.0150 / 381	0.0018 / 46	0.0028 / 71	0.0400 / 1020	0.0050 / 127
8301C-2	0.0110 / 279	0.0150 / 381	0.0020 / 51	0.0060 / 152	0.0075 / 190	0.0150 / 381	0.0018 / 46	0.0028 / 71	0.0430 / 1090	
8301C-21	0.0060 / 152	0.0110 / 279	0.0030 / 76	0.0072 / 183	0.0090 / 229	0.0150 / 381	0.0021 / 53	0.0033 / 84	0.0460 / 1168	
8301C-12	0.0090 / 229	0.0140 / 356	0.0030 / 76	0.0072 / 183	0.0090 / 229	0.0150 / 381	0.0021 / 53	0.0033 / 84	0.0490 / 1245	0.0060 / 152
8301C-3	0.0132 / 335	0.0180 / 457	0.0030 / 76	0.0072 / 183	0.0090 / 229	0.0150 / 381	0.0021 / 53	0.0033 / 84	0.0530 / 1346	
8301C-22	0.0080 / 203	0.0140 / 356	0.0030 / 76	0.0096 / 244	0.0110 / 279	0.0250 / 635	0.0028 / 71	0.0044 / 112	0.0570 / 1448	
8301C-13	0.0120 / 305	0.0180 / 457	0.0030 / 76	0.0096 / 244	0.0110 / 279	0.0250 / 635	0.0028 / 71	0.0044 / 112	0.0610 / 1550	0.0080 / 203
8301C-4	0.0176 / 447	0.0230 / 584	0.0030 / 76	0.0096 / 244	0.0110 / 279	0.0250 / 635	0.0028 / 71	0.0044 / 112	0.0670 / 1701	
8301C-23	0.0100 / 254	0.0160 / 406	0.0030 / 76	0.0120 / 305	0.0140 / 356	0.0250 / 635	0.0035 / 89	0.0055 / 140	0.0730 / 1854	
8301C-14	0.0150 / 381	0.0210 / 533	0.0030 / 76	0.0120 / 305	0.0140 / 356	0.0250 / 635	0.0035 / 89	0.0055 / 140	0.0780 / 1981	
8301C-5	0.0220 / 559	0.0280 / 711	0.0030 / 76	0.0120 / 305	0.0140 / 356	0.0250 / 635	0.0035 / 89	0.0055 / 140	0.0850 / 2159	0.0100 / 254
8401C-4	0.0100 / 254	0.0160 / 406	0.0030 / 76	0.0120 / 305	0.0140 / 356	0.0300 / 762	0.0035 / 89	0.0055 / 140	0.0750 / 1905	
8401C-14	0.0150 / 381	0.0210 / 533	0.0030 / 76	0.0120 / 305	0.0140 / 356	0.0300 / 762	0.0035 / 89	0.0055 / 140	0.0880 / 2235	
8401C-5	0.0120 / 305	0.0180 / 457	0.0030 / 76	0.0140 / 356	0.0170 / 432	0.0300 / 762	0.0042 / 107	0.0066 / 168	0.0840 / 2134	0.0120 / 305
8401C-15	0.0180 / 457	0.0240 / 610	0.0030 / 76	0.0140 / 356	0.0170 / 432	0.0300 / 762	0.0042 / 107	0.0066 / 168	0.0950 / 2413	
8401C-6	0.0140 / 356	0.0200 / 508	0.0030 / 76	0.0160 / 406	0.0190 / 483	0.0300 / 762	0.0049 / 125	0.0077 / 196	0.0870 / 2210	0.0140 / 360
*8401C-16	0.0210 / 533	0.0270 / 686	0.0030 / 76	0.0160 / 406	0.0190 / 483	0.0300 / 762	0.0049 / 125	0.0077 / 196	0.1100 / 2794	
8401C-7	0.0160 / 406	0.0230 / 584	0.0040 / 102	0.0170 / 432	0.0240 / 610	0.0350 / 889	0.0056 / 142	0.0088 / 224	0.0950 / 2413	0.0160 / 406
*8401C-17	0.0240 / 610	0.0310 / 787	0.0040 / 102	0.0170 / 432	0.0240 / 610	0.0350 / 889	0.0056 / 142	0.0088 / 224	0.1100 / 2794	
*8401C-8	0.0200 / 508	0.0270 / 686	0.0040 / 102	0.0180 / 457	0.0300 / 762	0.0350 / 889	0.0070 / 178	0.0110 / 279	0.1100 / 2794	0.0200 / 508
*8401C-18	0.0300 / 762	0.0370 / 940	0.0040 / 102	0.0180 / 457	0.0300 / 762	0.0350 / 889	0.0070 / 178	0.0110 / 279	0.1100 / 2794	

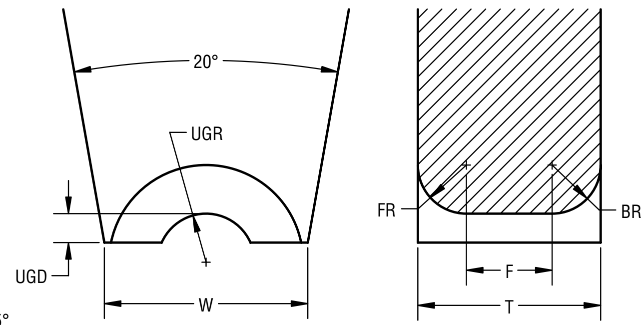
*SDF = 0.110/2.79mm   Dimensions in inches unless otherwise specified.

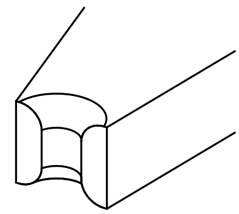
COORSTEK

Large Wire U-Groove Wedges
8236-UG Series



Front View **Shank Style -B** **Shank Style -A**





Features:
Designed for large wire applications in Ultrasonic (Cho-onpa) bonders
Special polished FR & BR

Material: Tungsten Carbide

Lengths:
-K = 1.142 inch/29mm
-M = 1.339 inch/34mm
Other = Specify

Specify: Series (no-hole design) - U-Groove - Wire Size(µm) - Designation - Shank Style - Tool Length

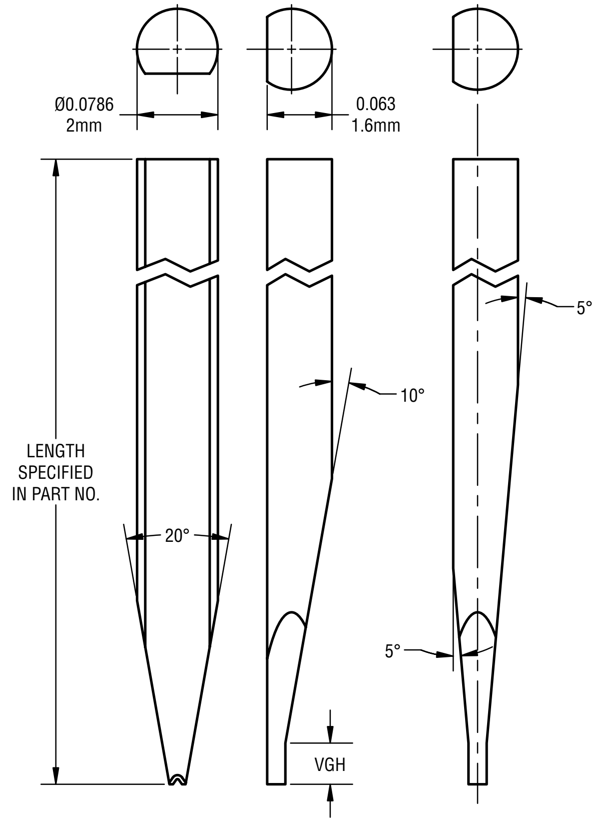
Example: 8236-UG-200-1-A-K

DASH NUMBER	T in. / µm	F in. / µm	FR & BR in. / µm	UGR in. / µm	UGD in. / µm	W in. / µm	VGH in. / µm
-100-1	0.0098 / 250	0.0051 / 130	0.0024 / 60	0.0024 / 60	0.0014 / 36	0.0098 / 250	0.0400 / 1016
-125-1	0.0118 / 300	0.0059 / 150	0.0030 / 76	0.0030 / 76	0.0017 / 43	0.0118 / 300	0.0400 / 1016
-125-2	0.0128 / 325	0.0068 / 173	0.0030 / 76	0.0030 / 76	0.0017 / 43	0.0118 / 300	0.0400 / 1016
-125-3	0.0138 / 350	0.0078 / 198	0.0030 / 76	0.0030 / 76	0.0017 / 43	0.0118 / 300	0.0400 / 1016
-125-4	0.0148 / 375	0.0088 / 224	0.0030 / 76	0.0030 / 76	0.0017 / 43	0.0118 / 300	0.0400 / 1016
-150-1	0.0138 / 350	0.0068 / 173	0.0035 / 88	0.0035 / 88	0.0021 / 53	0.0138 / 350	0.0400 / 1016
-175-1	0.0157 / 400	0.0075 / 190	0.0041 / 104	0.0041 / 104	0.0024 / 60	0.0157 / 400	0.0400 / 1016
-200-1	0.0177 / 450	0.0083 / 210	0.0047 / 120	0.0047 / 120	0.0028 / 71	0.0197 / 500	0.0400 / 1016
-250-1	0.0217 / 550	0.0098 / 250	0.0059 / 150	0.0059 / 150	0.0035 / 88	0.0217 / 550	0.0600 / 1524
-300-1	0.0256 / 650	0.0114 / 290	0.0071 / 180	0.0071 / 180	0.0047 / 120	0.0236 / 600	0.0600 / 1524
-350-1	0.0299 / 760	0.0134 / 340	0.0083 / 210	0.0083 / 210	0.0055 / 140	0.0276 / 700	0.0600 / 1524
-400-1	0.0339 / 860	0.0150 / 380	0.0094 / 240	0.0094 / 240	0.0063 / 160	0.0315 / 800	0.0600 / 1524
-450-1	0.0390 / 990	0.0177 / 450	0.0106 / 270	0.0106 / 270	0.0071 / 180	0.0354 / 900	0.0600 / 1524
-500-1	0.0433 / 1100	0.0197 / 500	0.0118 / 300	0.0118 / 300	0.0079 / 200	0.0394 / 1000	0.0600 / 1524

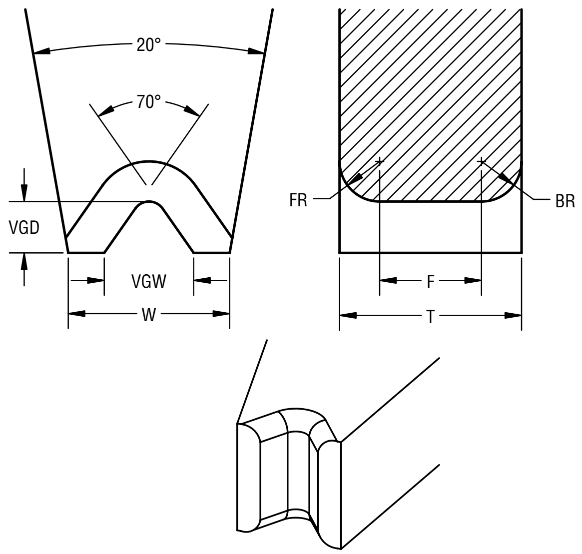
Dimensions in inches unless otherwise specified.

Large Wire V-Groove Wedges

8236-VE Series



Front View **Shank Style -B** **Shank Style -A**



Features:
Designed for large wire applications in Ultrasonic (Cho-onpa) bonders
Special polished FR & BR

Material: Tungsten Carbide

Lengths:
-K = 1.142 inch/29mm
-M = 1.339 inch/34mm
Other = Specify

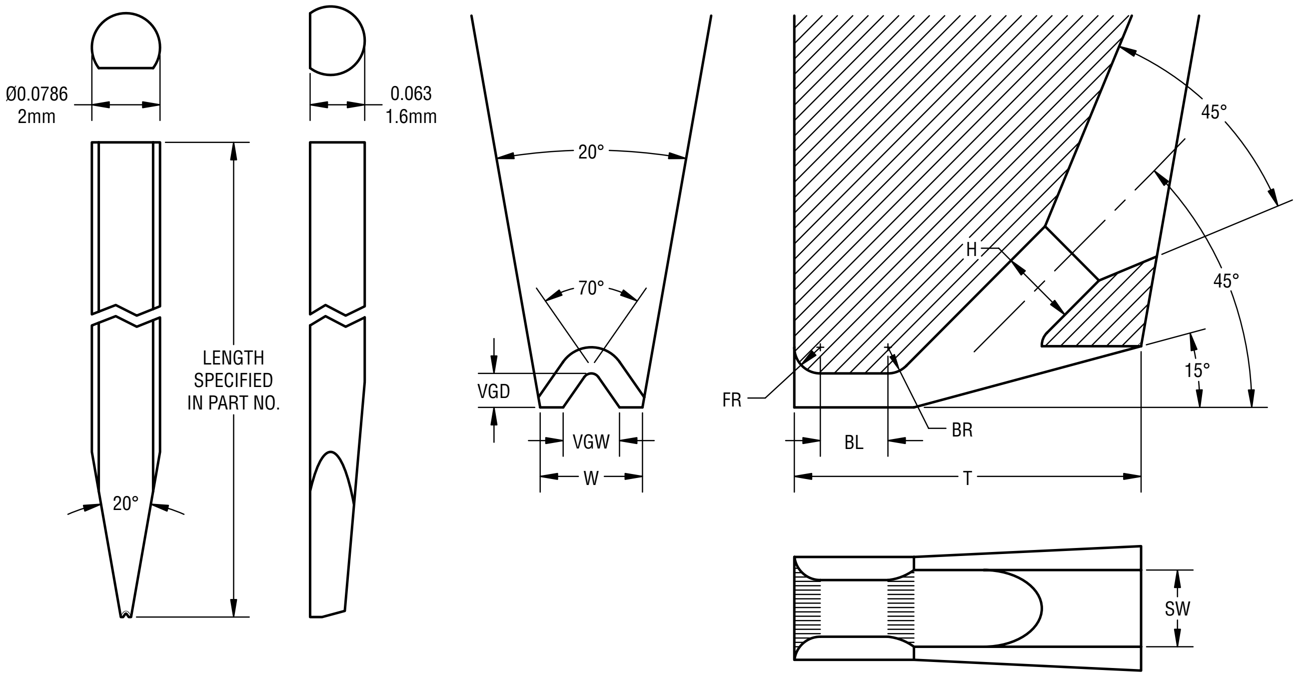
Specify: Series (no-hole design) - V-Groove - Wire Size(μm) - FR/BR Ratio (% of wire dia.) - Shank Style - Tool Length

Example: 8236-VE-200-30-A-K

DASH NUMBER	T in. / μm	F in. / μm	FR & BR in. / μm	VGW in. / μm	W in. / μm	VGH in. / μm
-100-30	0.0098 / 250	0.0074 / 188	0.0012 / 30	0.0043 / 110	0.0079 / 200	0.0400 / 1016
-100-50	0.0098 / 250	0.0058 / 147	0.0020 / 51	0.0043 / 110	0.0079 / 200	0.0400 / 1016
-125-30	0.0118 / 300	0.0088 / 224	0.0015 / 38	0.0054 / 138	0.0098 / 250	0.0400 / 1016
-125-50	0.0118 / 300	0.0068 / 173	0.0025 / 64	0.0054 / 138	0.0098 / 250	0.0400 / 1016
-150-30	0.0138 / 350	0.0102 / 260	0.0018 / 45	0.0065 / 165	0.0118 / 300	0.0400 / 1016
-150-50	0.0138 / 350	0.0078 / 198	0.0030 / 76	0.0065 / 165	0.0118 / 300	0.0400 / 1016
-200-30	0.0177 / 450	0.0129 / 330	0.0024 / 60	0.0087 / 220	0.0157 / 400	0.0400 / 1016
-200-50	0.0177 / 450	0.0099 / 252	0.0039 / 100	0.0087 / 220	0.0157 / 400	0.0400 / 1016
-250-50	0.0217 / 550	0.0119 / 302	0.0049 / 125	0.0108 / 275	0.0197 / 500	0.0600 / 1524
-300-50	0.0256 / 650	0.0138 / 350	0.0059 / 150	0.0130 / 330	0.0236 / 600	0.0600 / 1524
-350-50	0.0299 / 760	0.0161 / 410	0.0069 / 175	0.0152 / 385	0.0276 / 700	0.0600 / 1524
-380-50	0.0323 / 820	0.0173 / 440	0.0075 / 191	0.0165 / 418	0.0299 / 760	0.0600 / 1524
-400-50	0.0343 / 870	0.0185 / 470	0.0079 / 200	0.0173 / 440	0.0315 / 800	0.0600 / 1524
-450-50	0.0390 / 990	0.0212 / 540	0.0089 / 225	0.0195 / 495	0.0354 / 900	0.0600 / 1524
-500-50	0.0433 / 1100	0.0237 / 600	0.0098 / 250	0.0217 / 550	0.0394 / 1000	0.0600 / 1524

Dimensions in inches unless otherwise specified.

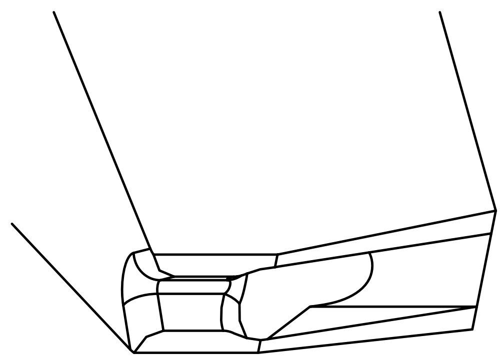
Large Wire V-Groove Wedges
8245-VE Series



Features:
Designed for large wire applications in Ultrasonic (Cho-onpa) bonders
Special polished FR & BR
Special heavy hole polish

Material: Tungsten Carbide

Lengths:
-K = 1.142 inch / 29mm
-M = 1.339 inch / 34mm
Other = Specify



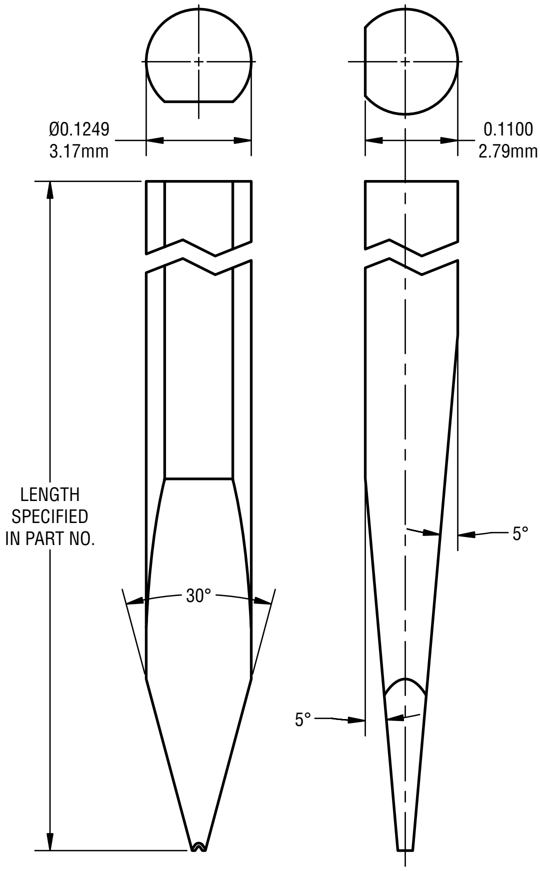
Specify: Series (45° wire feed angle) - V-Groove - Wire Size(μm)/Designation - FR/BR Ratio (% of wire dia.) - Tool Length

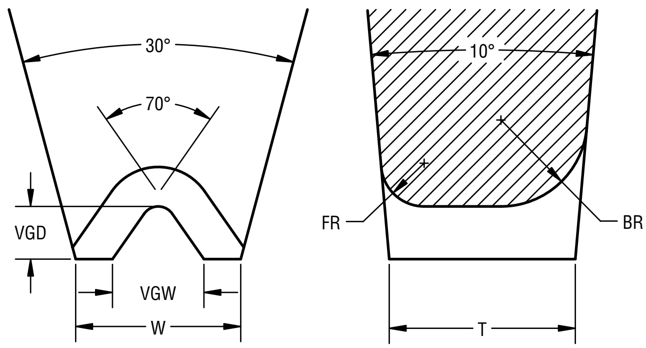
Example: 8245-VE-150N-50-K

DASH NUMBER	T in. / μm	FL in. / μm	BL in. / μm	FR & BR in. / μm	H in. / μm	W in. / μm	VGW in. / μm
-100N-50	0.0290 / 737	0.0098 / 250	0.0058 / 150	0.0020 / 51	0.0059 / 150	0.0079 / 200	0.0043 / 109
-125N-50	0.0360 / 914	0.0118 / 300	0.0068 / 174	0.0025 / 64	0.0074 / 188	0.0098 / 250	0.0054 / 137
-150N-50	0.0400 / 1016	0.0138 / 350	0.0078 / 198	0.0030 / 76	0.0088 / 224	0.0118 / 300	0.0065 / 165
-200N-50	0.0540 / 1372	0.0157 / 400	0.0079 / 200	0.0039 / 100	0.0118 / 300	0.0157 / 400	0.0087 / 221
-250N-50	0.0630 / 1600	0.0197 / 500	0.0099 / 252	0.0049 / 125	0.0148 / 375	0.0197 / 500	0.0108 / 274
-300N-50	0.0630 / 1600	0.0236 / 600	0.0118 / 300	0.0059 / 150	0.0177 / 450	0.0236 / 600	0.0130 / 330

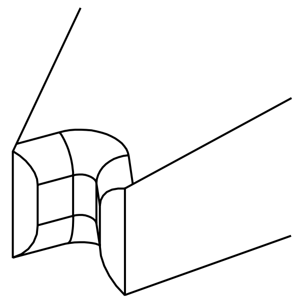
Dimensions in inches unless otherwise specified.

Large Wire V-Groove Wedges
8870 Series





Applications:
Designed for large aluminum wire applications in
F&K Delvotec bonders
Hesse & Knipps bonders
K&S large wire bonders



Material: Tungsten Carbide

Lengths:
-2.000= 2.000 in. / 51mm
-1.500 = 1.500 in. / 38mm
-1.968 = 1.968 in. / 50mm

Specify:
Series - Dash No. - Tool Length

Example:
8870-005-0-1.500
8870-016-1-1.968

DASH NUMBER	T in. / µm	FR in. / µm	BR in. / µm	VGW in. / µm	VGD in. / µm	W in. / µm
-004-0	0.0114 / 290	0.0027 / 69	0.0054 / 137	0.0046 / 117	0.0027 / 69	0.0080 / 203
-005-0	0.0142 / 361	0.0034 / 86	0.0068 / 173	0.0057 / 145	0.0034 / 86	0.0100 / 254
-006-0	0.0170 / 432	0.0041 / 104	0.0082 / 208	0.0068 / 173	0.0040 / 102	0.0120 / 305
-006-1	0.0148 / 376	0.0041 / 104	0.0082 / 208	0.0068 / 173	0.0040 / 102	0.0120 / 305
-007-0	0.0175 / 444	0.0048 / 122	0.0096 / 244	0.0080 / 203	0.0048 / 122	0.0140 / 356
-008-0	0.0226 / 574	0.0054 / 137	0.0109 / 277	0.0091 / 231	0.0055 / 140	0.0160 / 400
-008-1	0.0195 / 495	0.0054 / 137	0.0109 / 277	0.0091 / 231	0.0055 / 140	0.0160 / 400
-010-0	0.0250 / 635	0.0068 / 173	0.0136 / 345	0.0122 / 310	0.0075 / 191	0.0200 / 500
-012-0	0.0340 / 864	0.0082 / 208	0.0163 / 371	0.0146 / 371	0.0090 / 229	0.0240 / 610
-012-3	0.0294 / 747	0.0082 / 208	0.0163 / 371	0.0146 / 371	0.0090 / 229	0.0240 / 610
-014-0	0.0345 / 876	0.0110 / 279	0.0140 / 356	0.0171 / 434	0.0105 / 267	0.0270 / 686
-015-0	0.0375 / 952	0.0102 / 259	0.0204 / 516	0.0183 / 465	0.0113 / 287	0.0300 / 762
-016-0	0.0440 / 1118	0.0106 / 269	0.0211 / 536	0.0195 / 495	0.0118 / 300	0.0320 / 813
-016-1	0.0390 / 990	0.0106 / 269	0.0211 / 536	0.0195 / 495	0.0118 / 300	0.0320 / 813
-016-2	0.0335 / 851	0.0106 / 269	0.0211 / 536	0.0195 / 495	0.0118 / 300	0.0320 / 813
-018-0	0.0360 / 914	0.0122 / 310	0.0245 / 622	0.0220 / 559	0.0140 / 356	0.0360 / 914
-020-0	0.0487 / 1237	0.0136 / 345	0.0272 / 691	0.0244 / 620	0.0150 / 381	0.0400 / 1016

Dimensions in inches unless otherwise specified.

CoorsTek

Wedge Abbreviations

BF	Bond Foot
BKCER	Black Cermet
BL	Bond Length
BR	Back Radius
C	Clearance dimension
CBR	Chamferred Back Radius
CC	Concave
CC-CG	Concave w/ Cross Groove
CER	Cermet
CG	Cross Groove
CGD	Cross Groove Depth
CG-F	Cross Groove w/ Flat Face
CGR	Cross Groove Radius
CGW	Cross Groove Width
CSF	Concave Side Flats
DSR	Double Side Relief
ELBR	Elliptical Back Radius
F	Flat Face
FL	Foot Length
FMF	Fine Matte Finish
H	Hole
HHP	Heavy Hole Polish
L	Length
LG	Longitudinal Groove
MOD. C	Modified C dimension
MS1	Modified Shank #1
PBR	Polished Back Radius
PCS	Polished Countersink
PFR	Polished Front Radius
RMF	Rough Matte Finish
SD	Shank Diameter
SDF	Shank Diameter Flat
T	Tip dimension
TiC	Titanium Carbide
V	Vertical (grind)
VGD	V-Groove Depth
VGH	Vertical Grind Height
VGR	V-Groove Radius
VGW	V-Groove Width
W	Width dimension
WC	Tungsten Carbide
WFA	Wire Feed Angle
10DBA	10° Back Angle
180REV	180° Reverse (shank)
20DBA	20° Back Angle
30DG	30° (W angle)
45SC	45° Side Chamfers

Single-Point Tape Automated Bonding (TAB)

The acronym TAB stands for "tape automated bonding." Very often, even when tape is not present, the term "single-point TAB bonding" is commonly used when referring to bonding a lead, trace, ribbon, or wire that is already in place, and requires the application of force and ultrasonic energy.

By definition, TAB bonding utilizes the die being mounted onto a roll of tape where the leads are connected to the die. After this process of connecting the inner lead bonds (ILB) is complete, the reel of tape containing the die is fed to a station that cuts the die and connected leads in preparation for connecting the outer lead bonds (OLB) to the package. In the past, the ILB and OLB were bonded all at once. This was accomplished with the use of a tool called a thermode. The disadvantage of this method is the problem of maintaining equal force and therefore equal strength on each lead. A method for the bonding of each lead separately was developed to address this problem – Single-Point TAB.

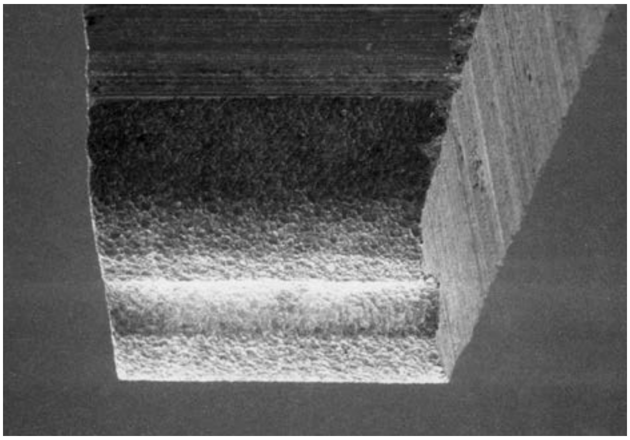


Figure 1 – Single point TAB tool incorporating a single cross groove

The initial Gaiser single point TAB tools were wedges that incorporated a single-cross groove. The wedge design was used because of the bonding machine's ability to reposition the bonding head or work surface so that the wedge would be in-line with the lead. This assured that the cross groove always stayed perpendicular to the lead.

As customers began using the single CG wedge, a need arose to use the tool without having to rotate the package or the bonding head.

In these circumstances it was determined that when bonding east and west leads, the single CG tool did not produce adequate bond strengths. In order to improve the coupling of the east and west bonds, the double CG design was created.

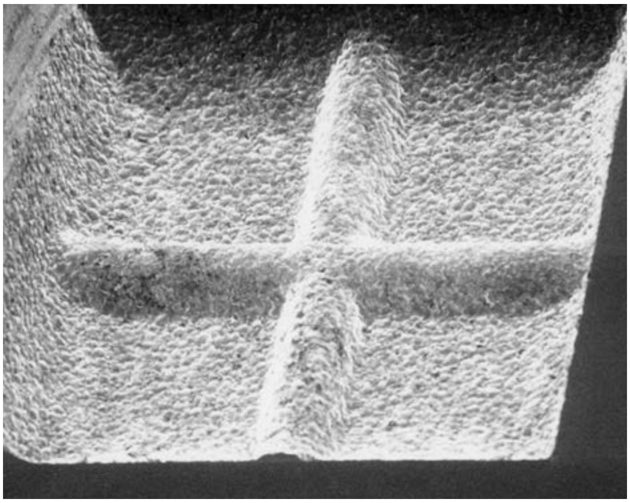


Figure 2 – Single-point TAB tool incorporating a double cross groove

With the increase in interest of using a ball bonder to do TAB, Gaiser developed three new series of tools. The first design, 1183 series, was similar to the double CG wedge. It was available with or without a flat ground on the shank. Having no flat on the shank offered flexibility in how the tool was positioned in the transducer horn. For either the "x" or "+" pattern, the tool needed simply to be rotated. Once the bonding pattern was determined the optional flat ("SDF" for the "+" and "SDFA" for the "x") could be called out. Customers have experienced that the ultrasonics transfer more efficiently with the grooves in these patterns.

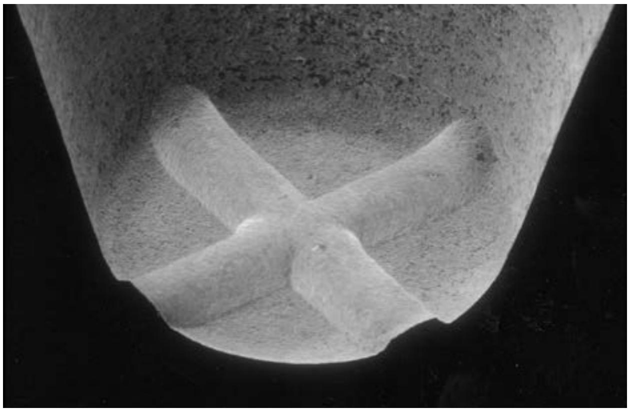


Figure 3 – 1183 series single point TAB tool

Single-Point TAB Tools

More recent designs having considerable success are the protruding radius (1184 series) and the protruding "V" (1186 series) tools. These designs help grip the lead better during bonding than the cross groove designs. The disadvantage of the protruding tools is that they have a shorter life span than the cross groove style. They are available in WC, TiC, polycrystalline diamond (PCD), and cermet materials.

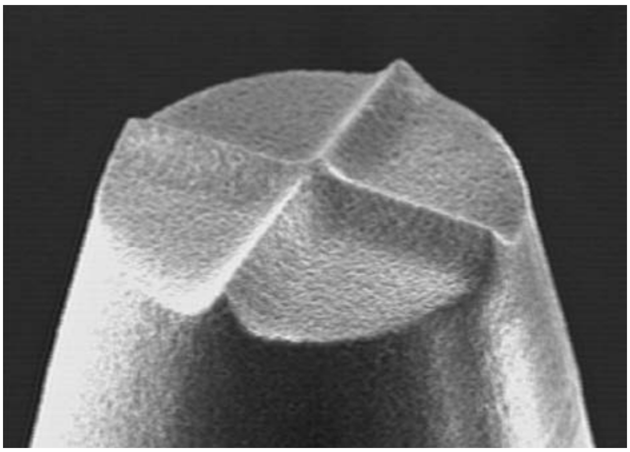


Figure 4 – 1186 series protruding "V" TAB tool

The benefit of the single-point TAB approach is that each lead is bonded separately, thus assuring the quality of each lead.

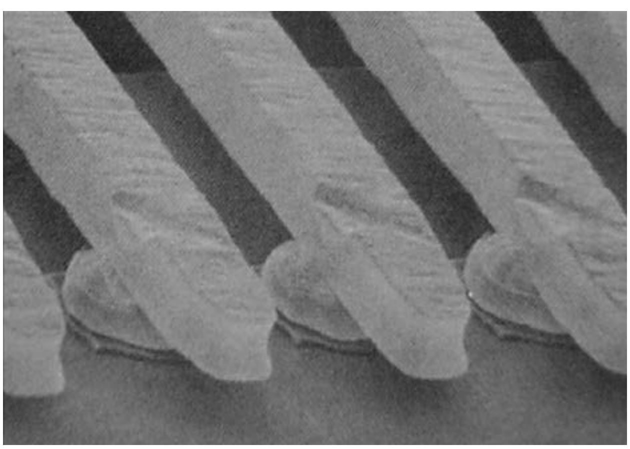


Figure 5 – Device with TAB bonded leads and impression

The most common methods for wafer bumping utilize the same techniques used in making standard die metallizations. Other methods of wafer bumping involve the process of putting a ball bond down on the die pad, terminating the wire just above the ball, then flattening the ball to become the new raised die "pad."

Gaiser has developed several tool series for ball bumping. These include the 1732 and 1733 series (see Capillary section of catalog pages 38 and 39). Since the wire is terminated above the ball, there is no need for an outside radius or a face on the capillary to make the lead bond.

Tamping tools are used for tamping wafer balls or to flatten out rough metallizations in pre-bonding. The 1152 and 1552 series in this section are designed for these purposes.

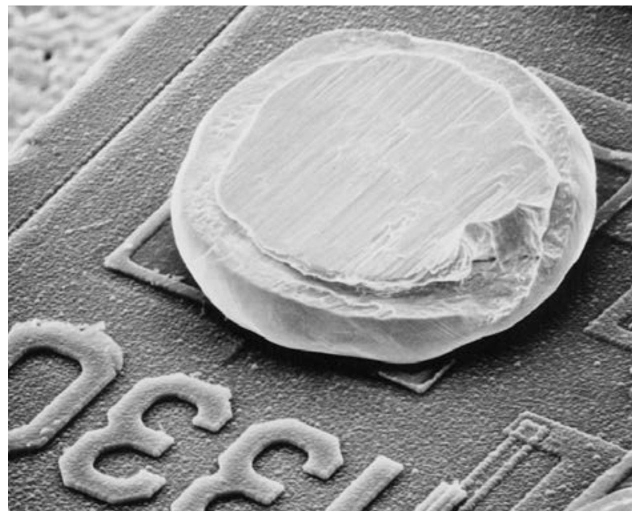


Figure 6 – Example of ball bump that has been tamped

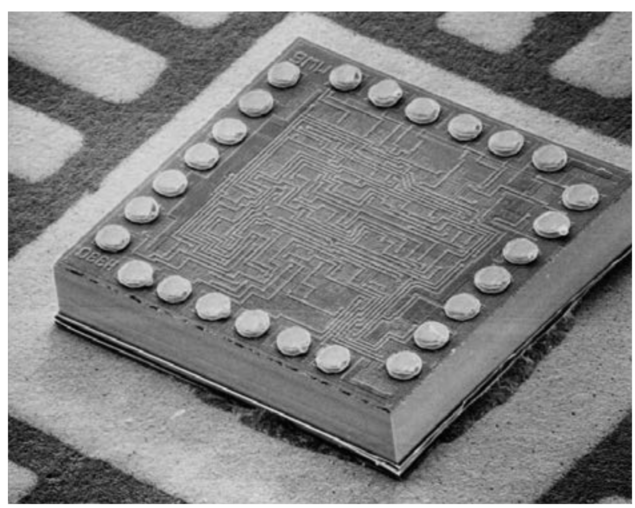


Figure 7 – Device that has had ball bumps placed and tamped in preparation for the ILB

Single-Point TAB Tools
Disk Drive Industry Related

Wire bonding in the disk drive industry is used in both head gimbal assembly (HGA) and head stack assembly (HSA). Wire bonding technology is used to bond wires or traces at the MR or GMR head and at the pre-amp. Additionally, wires or flexible traces may be ultrasonically bonded at some location between the head and the pre-amp.

The wire size in the disk drive industry is typically expressed in gauge, with 48 gauge to 52 gauge being the most common. These wires are usually insulated, gold-plated copper, and bonded at ambient temperature.

Size (AWG)	Nominal Diameter in. / µm
46	0.00157 / 40
47	0.00140 / 36
48	0.00124 / 32
49	0.00111 / 28
50	0.00099 / 25
51	0.00088 / 22
52	0.00078 / 20

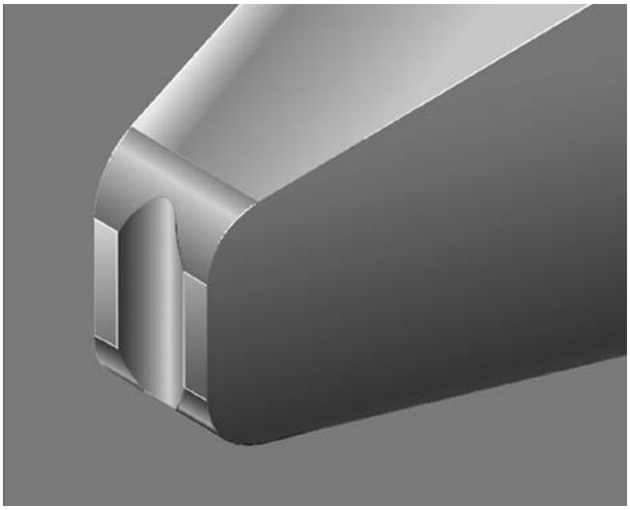


Figure 8 – Typical 48 gauge disk drive bond tool

Flexible traces, such as FOS (flex on suspension) and TSA (trace suspension assembly), are rapidly replacing wires in the disk drive industry. These traces can be bonded with an 1186 style protruding "V" single point TAB tool, or with a "waffle" style tool. Wire bonding technology has all but replaced solder reflow technology in disk drive manufacturing.

With the waffle tool, the patterns of grooves and mesas create an aggressive footprint that grips the trace or lead and effectively transmit ultrasonic energy.

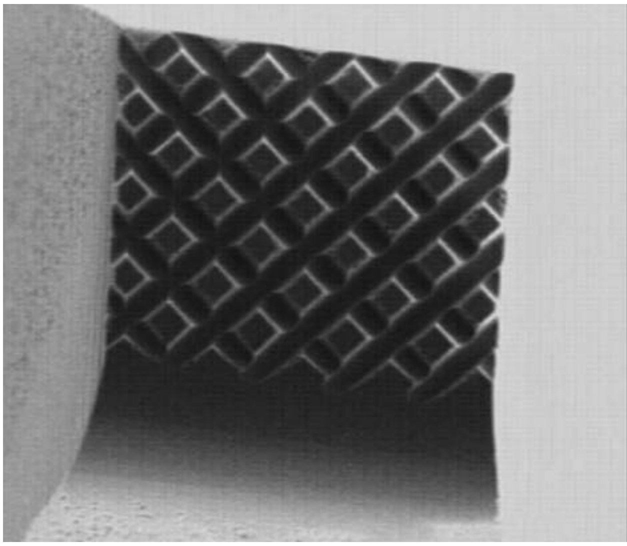


Figure 9 – Example of a waffle tool

Another wire bonding technology used in the disk drive industry is the "ball-in-the-corner" bond made at the junction between the head and the trace.

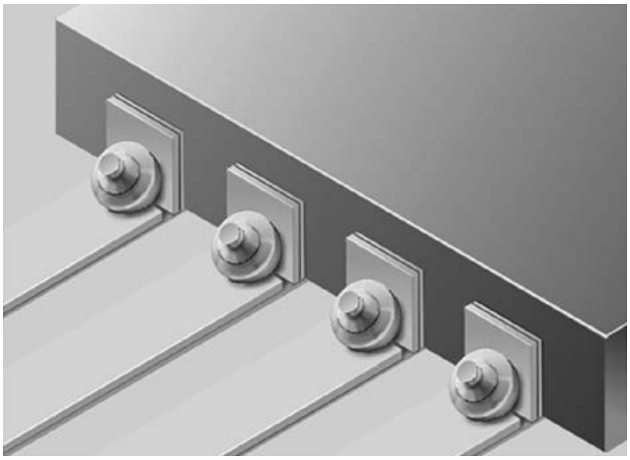
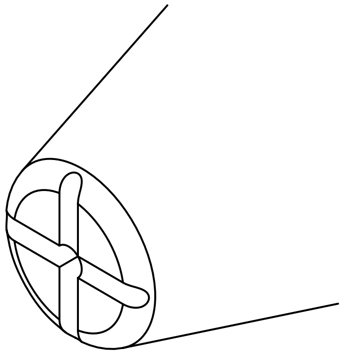
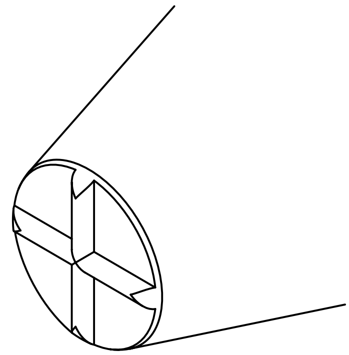


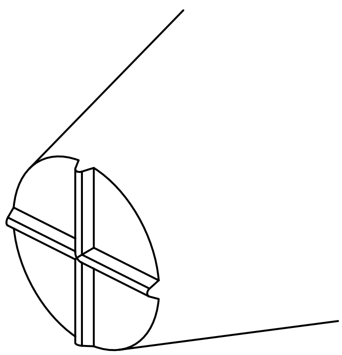
Figure 10 – Example of a ball-in-the-corner application



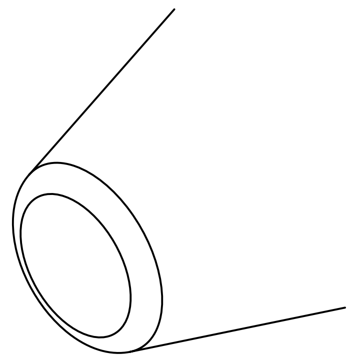
1183 Series
Double Cross Groove Design



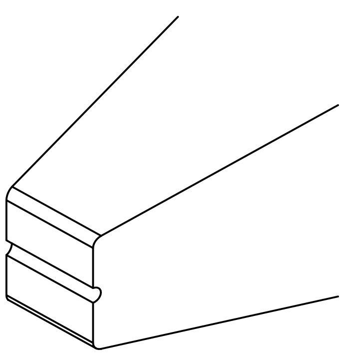
1184 Series
Protruding Radius Design



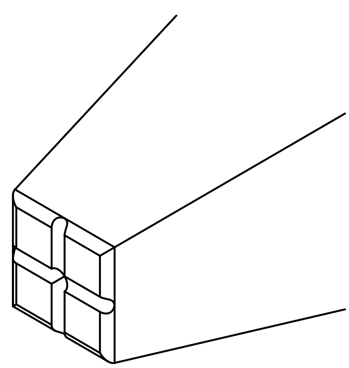
1186 Series
Protruding “V” Design



1152 & 1552 Series
Tamping Tool

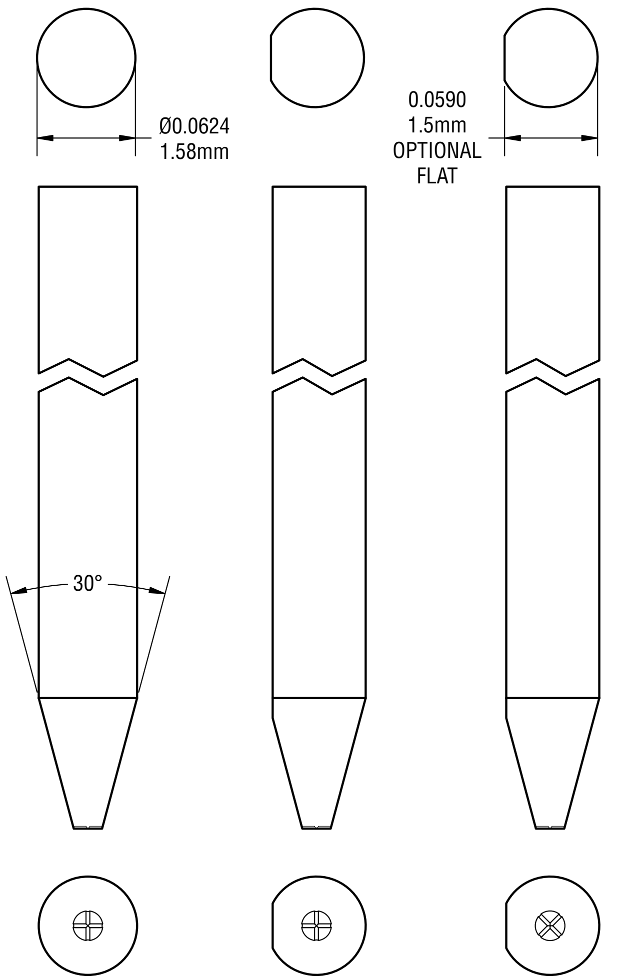


2T01 & 2T02 Series
Single Cross Groove Design

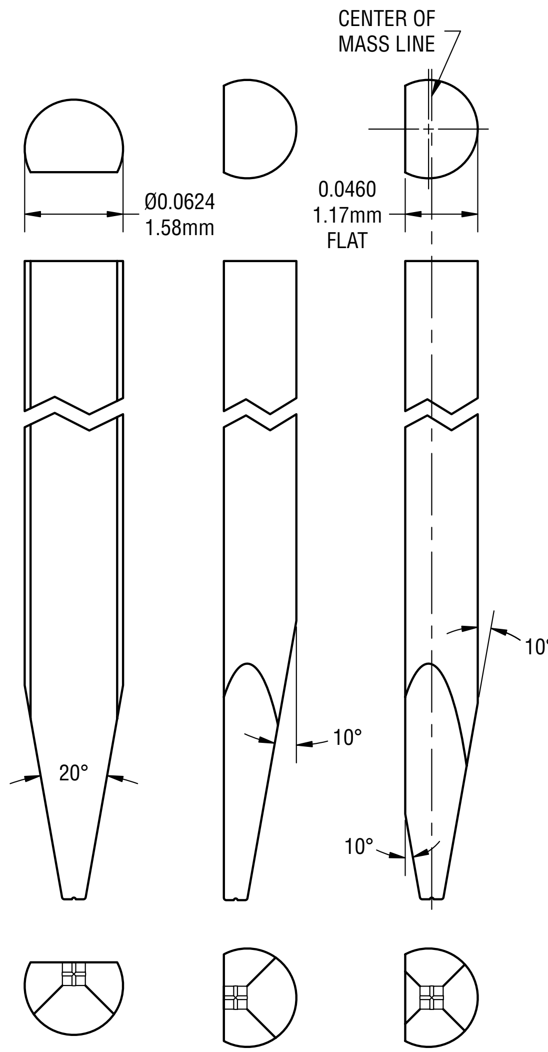


2T21 & 2T22 Series
Double Cross Groove Design

Series: 1183, 1184 1186, 1152



Series: 2T01, 2T02 2T21, 2T22



The standard conical grind TAB tool has a round shank and a 30° cone.

20° & 15° cone angles may be specified as "-20D" & "-15D"

Bottlenecks may be designed. See the Capillary Modifications on pages 26 & 27

The "-SDF" Shank Diameter Flat option produces a "+" pattern relative to the flat.

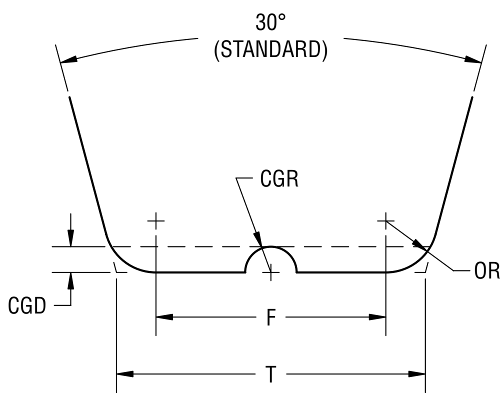
The "-SDFA" Shank Diameter Flat option produces an "x" pattern relative to the flat.

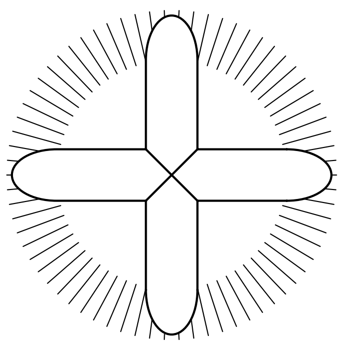
The 2T01 & 2T21 have tip geometries similar to small wire bonding wedges, except without wire feed holes. This allows for ease of use in a typical wedge bonder for a TAB bonding application.

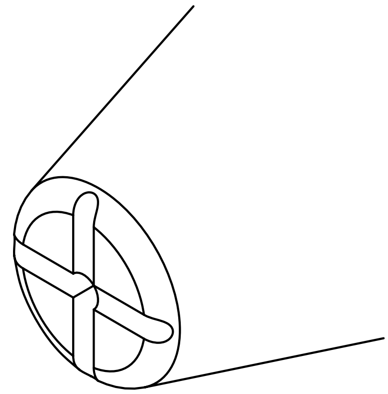
The 2T02 & 2T22 series employ Center of Mass design to provide optimum transfer of ultrasonic energy.

Dimensions in inches unless otherwise specified.

1183 Series
Double Cross Groove Single-Point TAB Tool







Specify:
Series - Face/Outside Radius/Cross Groove Spec. - Length - Options

Example:
1183-06010B-750-TiC-SDF-20D
1183-02008D-437

Material:
Tungsten Carbide Standard
-TiC = Titanium Carbide
-BKCER = Cermet Tip
-DT = Diamond Tip

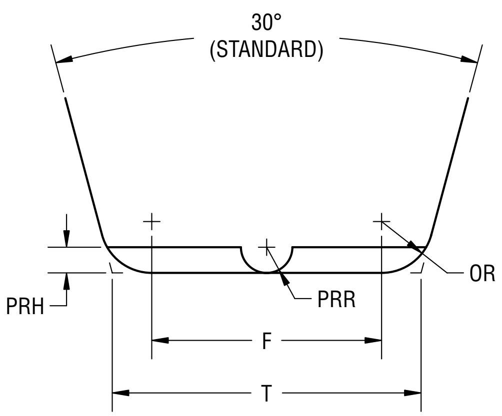
Options:
-SDF = Tool makes a "+" pattern
-SDFA = Tool makes a "x" pattern
-20D = 20° Cone Angle (30° standard)
Bottlenecks may be designed

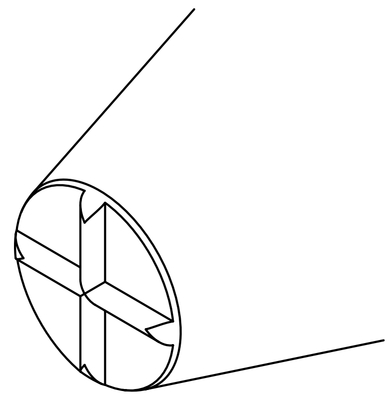
Lengths:
-375 = 0.375 in./9.52mm
-437 = 0.437 in./11.1mm
-625 = 0.625 in./15.88mm
-750 = 0.750 in./19.05mm
-828 = 0.828 in./21.03mm
-1.0 = 1.000 in./25.4mm
Other = Specify

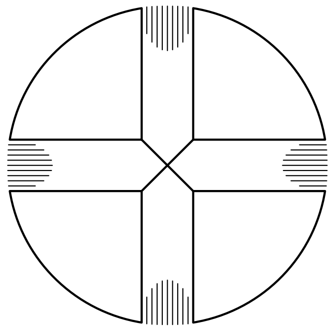
DASH NUMBER	FACE in. / µm ±0.0002 / 5	OR in. / µm ±0.0002 / 5	T 30° in. / µm ±0.0003 / 8	CGR in. / µm ±0.0001 / 3	CGD in. / µm ±0.0001 / 3
01705D	0.0017 / 43	0.0005 / 13	0.0024 / 61	0.0003 / 8	0.0003 / 8
02008D	0.0020 / 51	0.0008 / 20	0.0032 / 81	0.0003 / 8	0.0003 / 8
02010B	0.0020 / 51	0.0010 / 25	0.0035 / 89	0.0005 / 13	0.0005 / 13
02205D	0.0022 / 56	0.0005 / 13	0.0030 / 76	0.0003 / 8	0.0003 / 8
03010B	0.0030 / 76	0.0010 / 25	0.0045 / 114	0.0005 / 13	0.0005 / 13
03510B	0.0035 / 89	0.0010 / 25	0.0050 / 127	0.0005 / 13	0.0005 / 13
04010B	0.0040 / 102	0.0010 / 25	0.0055 / 140	0.0005 / 13	0.0005 / 13
04510B	0.0045 / 114	0.0010 / 25	0.0060 / 152	0.0005 / 13	0.0005 / 13
05010B	0.0050 / 127	0.0010 / 25	0.0065 / 165	0.0005 / 13	0.0005 / 13
06010B	0.0060 / 152	0.0010 / 25	0.0075 / 191	0.0005 / 13	0.0005 / 13
08010B	0.0080 / 203	0.0010 / 25	0.0095 / 241	0.0005 / 13	0.0005 / 13
08010C	0.0080 / 203	0.0010 / 25	0.0095 / 241	0.0010 / 25	0.0010 / 25
09020C	0.0090 / 229	0.0020 / 51	0.0121 / 307	0.0010 / 25	0.0010 / 25
12020C	0.0120 / 305	0.0020 / 51	0.0151 / 384	0.0010 / 25	0.0010 / 25

Dimensions in inches unless otherwise specified.

1184 Series
Protruding Radius Single-Point TAB Tool







Specify:
Series - Face/Outside Radius/Protruding Radius Spec. - Length - Options

Example:
1184-06010B-750-TiC-SDF-20D
1184-02008D-437

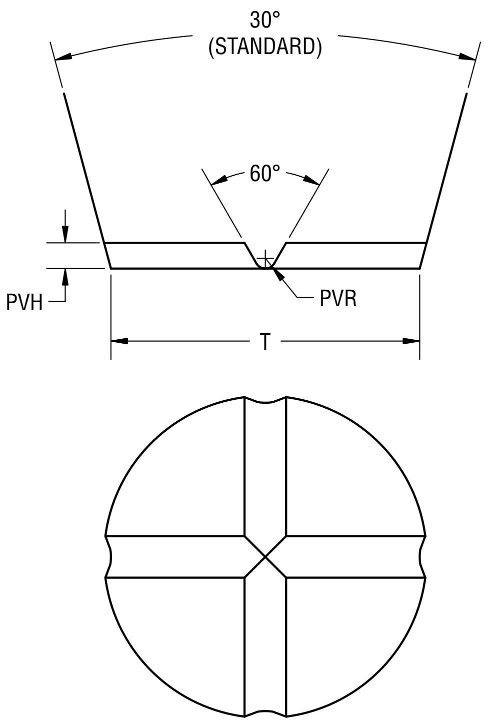
Material:
Tungsten Carbide Standard
-TiC = Titanium Carbide
-BKCER = Cermet Tip
-DT = Diamond Tip

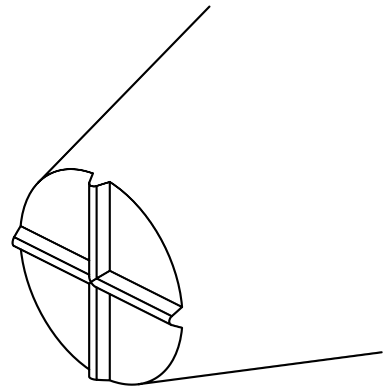
Options:
-SDF = Tool makes a "+" pattern
-SDFA = Tool makes a "x" pattern
-20D = 20° Cone Angle (30° standard)
Bottlenecks may be designed

Lengths:
-375 = 0.375 in./9.52mm
-437 = 0.437 in./11.1mm
-625 = 0.625 in./15.88mm
-750 = 0.750 in./19.05mm
-828 = 0.828 in./21.03mm
-1.0 = 1.000 in./25.4mm
Other = Specify

DASH NUMBER	FACE in. / µm ±0.0002 / 5	OR in. / µm ±0.0002 / 5	T 30° in. / µm ±0.0003 / 8	PRR in. / µm ±0.0001 / 3	PRH in. / µm ±0.0001 / 3
01705D	0.0017 / 43	0.0005 / 13	0.0024 / 61	0.0003 / 8	0.0003 / 8
02008D	0.0020 / 51	0.0008 / 20	0.0032 / 81	0.0003 / 8	0.0003 / 8
02205D	0.0022 / 56	0.0005 / 13	0.0030 / 76	0.0003 / 8	0.0003 / 8
03008D	0.0030 / 76	0.0008 / 20	0.0042 / 107	0.0003 / 8	0.0003 / 8
03510B	0.0035 / 89	0.0010 / 25	0.0050 / 127	0.0005 / 13	0.0005 / 13
04510B	0.0045 / 114	0.0010 / 25	0.0060 / 152	0.0005 / 13	0.0005 / 13
05010B	0.0050 / 127	0.0010 / 25	0.0065 / 165	0.0005 / 13	0.0005 / 13
06010B	0.0060 / 152	0.0010 / 25	0.0075 / 191	0.0005 / 13	0.0005 / 13
07010B	0.0070 / 178	0.0010 / 25	0.0085 / 216	0.0005 / 13	0.0005 / 13
08010B	0.0080 / 203	0.0010 / 25	0.0095 / 241	0.0005 / 13	0.0005 / 13
08010C	0.0080 / 203	0.0010 / 25	0.0095 / 241	0.0010 / 25	0.0010 / 25
09020C	0.0090 / 229	0.0020 / 51	0.0121 / 307	0.0010 / 25	0.0010 / 25
12020C	0.0120 / 305	0.0020 / 51	0.0151 / 384	0.0010 / 25	0.0010 / 25

Dimensions in inches unless otherwise specified.





Specify:
Series - Tip Dia./Protruding "V" Height & Radius - Length - Options

Example:
1186-060052-437-TiC-SDF
1186-095052-750-SDFA-20D

Material:
Tungsten Carbide Standard
-TiC = Titanium Carbide
-BKCER = Cermet Tip
-DT = Diamond Tip

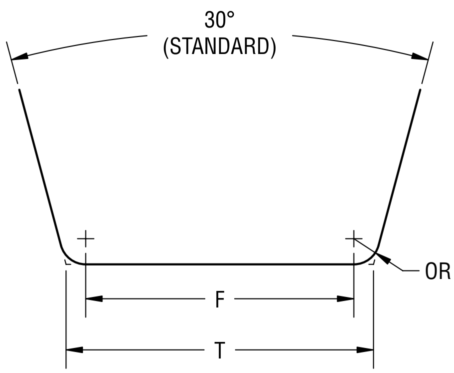
Options:
-SDF = Tool makes a "+" pattern
-SDFA = Tool makes a "x" pattern
-20D = 20° Cone Angle (30° standard)
Bottlenecks may be designed

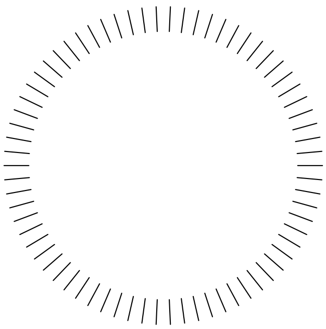
Lengths:
-375 = 0.375 in./9.52mm
-437 = 0.437 in./11.1mm
-625 = 0.625 in./15.88mm
-750 = 0.750 in./19.05mm
-828 = 0.828 in./21.03mm
-1.0 = 1.000 in./25.4mm
Other = Specify

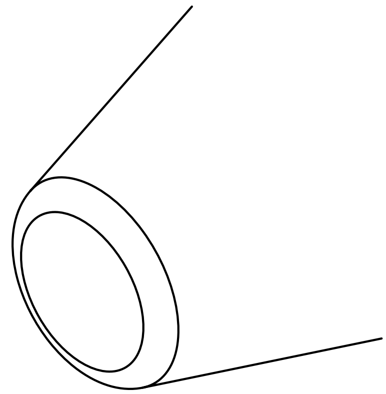
DASH NUMBER	T 30° in. / µm ±0.0003 / 8	PVH in. / µm ±0.0001 / 3	PVR in. / µm ±0.0001 / 3
020020	0.0020 / 51	0.0002 / 5	0.0000 / 0
032030	0.0032 / 81	0.0003 / 8	0.0000 / 0
050030	0.0050 / 127	0.0003 / 8	0.0000 / 0
050032	0.0050 / 127	0.0003 / 8	0.0002 / 5
050052	0.0050 / 127	0.0005 / 13	0.0002 / 5
060052	0.0060 / 152	0.0005 / 13	0.0002 / 5
075052	0.0075 / 191	0.0005 / 13	0.0002 / 5
095052	0.0095 / 241	0.0005 / 13	0.0002 / 5
095104	0.0095 / 241	0.0010 / 25	0.0004 / 10
120104	0.0120 / 305	0.0010 / 25	0.0004 / 10
150104	0.0150 / 381	0.0010 / 25	0.0004 / 10

Dimensions in inches unless otherwise specified.

1152 & 1552 Series
Tamping Tools







Specify:
Series - Face/Outside Radius - Length - Finish - Options

Example:
1552-090040-750P-20D
1152-050020-437P-TiC
For -TiC, -BKCER, or -DT use 1152 series

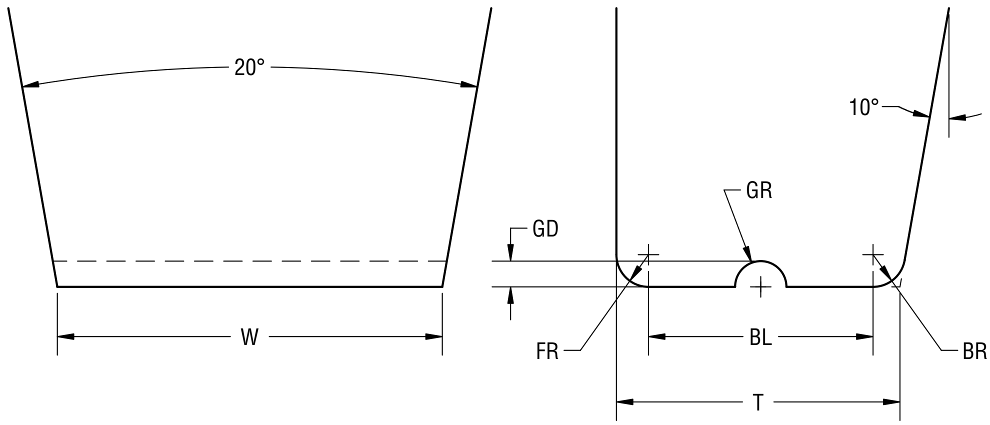
Material:
1552 = Standard Ceramic
1152 = Tungsten Carbide
-TiC = Titanium Carbide
-BKCER = Cermet Tip
-DT = Diamond Tip
Note: Polished Finish not available on DT, as EDM'ed only

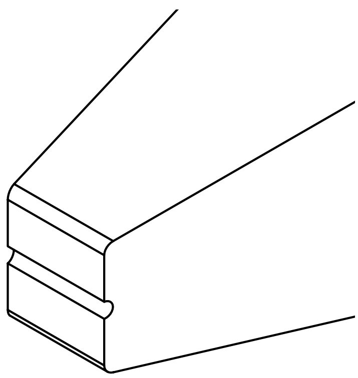
Options:
-20D = 20° Cone Angle (30° standard)
-15D = 15° Cone Angle
Bottlenecks may be designed
P = Polished Finish
GM = Gaiser Matte Finish
RF = Rough Matte Finish

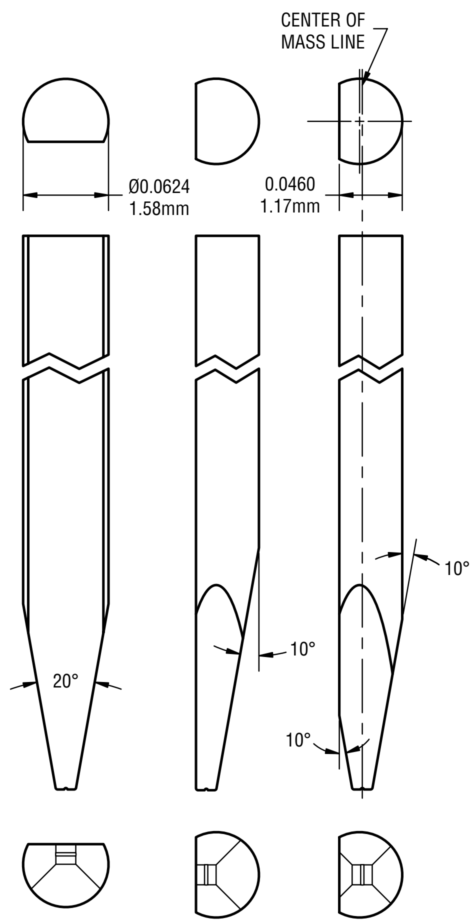
Lengths:
-375 = 0.375 in./9.52mm
-437 = 0.437 in./11.1mm
-625 = 0.625 in./15.88mm
-750 = 0.750 in./19.05mm
-1.0 = 1.000 in./25.4mm
Other = Specify

1552 CERAMIC	1152 CARBIDE	FACE in. / µm (ref)	OR in. / µm ±0.0003 / 8	T 30° in. / µm ±0.0003 / 8	T 20° in. / µm ±0.0003 / 8
N/A	-005003	0.0005 / 13	0.0003 / 8	0.0010 / 25	0.0010 / 25
N/A	-010003	0.0010 / 25	0.0003 / 8	0.0015 / 38	0.0015 / 38
N/A	-014003	0.0014 / 36	0.0003 / 8	0.0018 / 46	0.0019 / 48
-030003	-030003	0.0030 / 76	0.0003 / 8	0.0034 / 86	0.0035 / 89
-040020	-040020	0.0040 / 102	0.0020 / 51	0.0070 / 178	0.0074 / 186
N/A	-050000	0.0050 / 127	0.0000 / 0	0.0050 / 127	0.0050 / 127
-050003	-050003	0.0050 / 127	0.0003 / 8	0.0054 / 137	0.0055 / 140
-050020	-050020	0.0050 / 127	0.0020 / 51	0.0081 / 206	0.0084 / 214
-052005	-052005	0.0052 / 132	0.0005 / 13	0.0060 / 152	0.0060 / 152
-055003	-055003	0.0055 / 140	0.0003 / 8	0.0060 / 152	0.0060 / 152
-080040	-080040	0.0080 / 203	0.0040 / 102	0.0140 / 356	0.0147 / 373
-090040	-090040	0.0090 / 229	0.0040 / 102	0.0150 / 381	0.0157 / 399
-093025	-093025	0.0093 / 236	0.0025 / 64	0.0130 / 330	0.0135 / 343
N/A	-100000	0.0100 / 254	0.0000 / 0	0.0100 / 254	0.0100 / 254
-100003	-100003	0.0100 / 254	0.0003 / 8	0.0105 / 267	0.0105 / 267
-100010	-100010	0.0100 / 254	0.0010 / 25	0.0115 / 292	0.0117 / 297
-100040	-100040	0.0100 / 254	0.0040 / 102	0.0160 / 406	0.0167 / 424
-120040	-120040	0.0120 / 305	0.0040 / 102	0.0180 / 457	0.0187 / 475
-130025	-130025	0.0130 / 330	0.0025 / 64	0.0167 / 424	0.0172 / 437
-130040	-130040	0.0130 / 330	0.0040 / 102	0.0190 / 483	0.0197 / 500
-150040	-150040	0.0150 / 381	0.0040 / 102	0.0210 / 533	0.0217 / 551

N/A = Not available in ceramic. Dimensions in inches unless otherwise specified.







2T01 **2T02**

Material:
Tungsten Carbide Standard
-TiC = Titanium Carbide
-BKCER = Cermet Tip
-DT = Diamond Tip

Options:
see Wedge Modifications

Lengths:
-375 = 0.375 in./9.52mm
-S = 0.437 in./11.1mm
-625 = 0.625 in./15.88mm
-3/4 = 0.750 in./19.05mm
-L = 0.828 in./21.03mm
-1.0 = 1.000 in./25.4mm
Other = Specify

Specify:
Series - Bond Length/Bond Foot Width/Radius & Groove Spec. - Shank Length - Options

Example:
2T01-35070C-S-TiC
2T02-45075C-3/4-20D

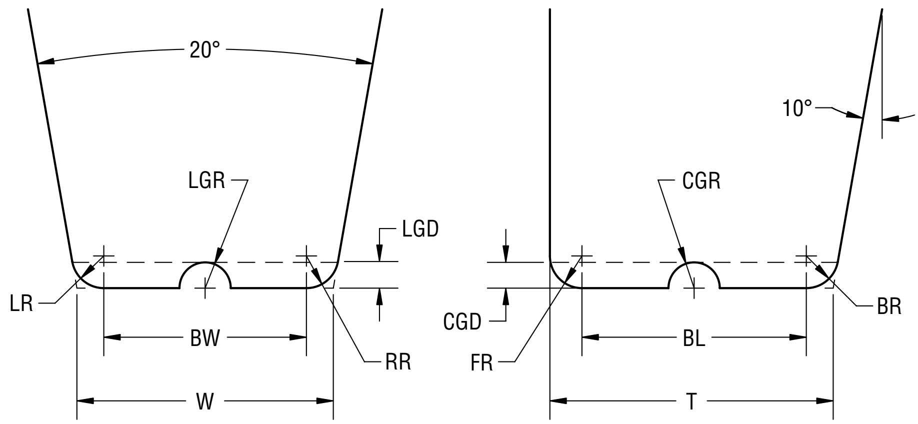
2T01 & 2T02 Series
Single Cross Groove Single-Point TAB Tool

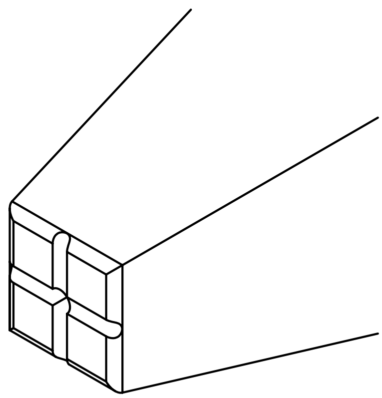
DASH NUMBER	BL in. / µm ±0.0002 / 5	W in. / µm ±0.0002 / 5	FR = BR in. / µm ±0.0002 / 5	GR in. / µm ±0.0001 / 3	GD in. / µm ±0.0001 / 3
15025A	0.0015 / 38	0.0025 / 64	0.0005 / 13	0.0003 / 8	0.0003 / 8
15035A	0.0015 / 38	0.0035 / 89	0.0005 / 13	0.0003 / 8	0.0003 / 8
15040A	0.0015 / 38	0.0040 / 102	0.0005 / 13	0.0003 / 8	0.0003 / 8
20020B	0.0020 / 51	0.0020 / 51	0.0005 / 13	0.0004 / 10	0.0004 / 10
20025B	0.0020 / 51	0.0025 / 64	0.0005 / 13	0.0004 / 10	0.0004 / 10
20030B	0.0020 / 51	0.0030 / 76	0.0005 / 13	0.0004 / 10	0.0004 / 10
20035B	0.0020 / 51	0.0035 / 89	0.0005 / 13	0.0004 / 10	0.0004 / 10
20040B	0.0020 / 51	0.0040 / 102	0.0005 / 13	0.0004 / 10	0.0004 / 10
20050B	0.0020 / 51	0.0050 / 127	0.0005 / 13	0.0004 / 10	0.0004 / 10
20080B	0.0020 / 51	0.0080 / 203	0.0005 / 13	0.0004 / 10	0.0004 / 10
25020B	0.0025 / 64	0.0020 / 51	0.0005 / 13	0.0004 / 10	0.0004 / 10
25030B	0.0025 / 64	0.0030 / 76	0.0005 / 13	0.0004 / 10	0.0004 / 10
25040B	0.0025 / 64	0.0040 / 102	0.0005 / 13	0.0004 / 10	0.0004 / 10
25050B	0.0025 / 64	0.0050 / 127	0.0005 / 13	0.0004 / 10	0.0004 / 10
25067B	0.0025 / 64	0.0067 / 170	0.0005 / 13	0.0004 / 10	0.0004 / 10
25080B	0.0025 / 64	0.0080 / 203	0.0005 / 13	0.0004 / 10	0.0004 / 10
25100B	0.0025 / 64	0.0100 / 254	0.0005 / 13	0.0004 / 10	0.0004 / 10
30030B	0.0030 / 76	0.0030 / 76	0.0005 / 13	0.0004 / 10	0.0004 / 10
30040B	0.0030 / 76	0.0040 / 102	0.0005 / 13	0.0004 / 10	0.0004 / 10
30060B	0.0030 / 76	0.0060 / 152	0.0005 / 13	0.0004 / 10	0.0004 / 10
30080B	0.0030 / 76	0.0080 / 203	0.0005 / 13	0.0004 / 10	0.0004 / 10
35060B	0.0035 / 89	0.0060 / 152	0.0005 / 13	0.0004 / 10	0.0004 / 10
35100B	0.0035 / 89	0.0100 / 254	0.0005 / 13	0.0004 / 10	0.0004 / 10
40060B	0.0040 / 102	0.0060 / 152	0.0005 / 13	0.0004 / 10	0.0004 / 10
57067B	0.0057 / 145	0.0067 / 170	0.0005 / 13	0.0004 / 10	0.0004 / 10
70070B	0.0070 / 178	0.0070 / 178	0.0005 / 13	0.0004 / 10	0.0004 / 10
80080B	0.0080 / 203	0.0080 / 203	0.0005 / 13	0.0004 / 10	0.0004 / 10
25120C	0.0025 / 64	0.0120 / 305	0.0010 / 25	0.0008 / 20	0.0007 / 18
30120C	0.0030 / 76	0.0120 / 305	0.0010 / 25	0.0008 / 20	0.0007 / 18
35060C	0.0035 / 89	0.0060 / 152	0.0010 / 25	0.0008 / 20	0.0007 / 18
35070C	0.0035 / 89	0.0070 / 178	0.0010 / 25	0.0008 / 20	0.0007 / 18
35080C	0.0035 / 89	0.0080 / 203	0.0010 / 25	0.0008 / 20	0.0007 / 18
35100C	0.0035 / 89	0.0100 / 254	0.0010 / 25	0.0008 / 20	0.0007 / 18
35120C	0.0035 / 89	0.0120 / 305	0.0010 / 25	0.0008 / 20	0.0007 / 18
40040C	0.0040 / 102	0.0040 / 102	0.0010 / 25	0.0008 / 20	0.0007 / 18
40050C	0.0040 / 102	0.0050 / 127	0.0010 / 25	0.0008 / 20	0.0007 / 18
40060C	0.0040 / 102	0.0060 / 152	0.0010 / 25	0.0008 / 20	0.0007 / 18
40080C	0.0040 / 102	0.0080 / 203	0.0010 / 25	0.0008 / 20	0.0007 / 18
40100C	0.0040 / 102	0.0100 / 254	0.0010 / 25	0.0008 / 20	0.0007 / 18
40120C	0.0040 / 102	0.0120 / 305	0.0010 / 25	0.0008 / 20	0.0007 / 18
40210C	0.0040 / 102	0.0210 / 533	0.0010 / 25	0.0008 / 20	0.0007 / 18
45075C	0.0045 / 114	0.0075 / 191	0.0010 / 25	0.0008 / 20	0.0007 / 18
45100C	0.0045 / 114	0.0100 / 254	0.0010 / 25	0.0008 / 20	0.0007 / 18
45120C	0.0045 / 114	0.0120 / 305	0.0010 / 25	0.0008 / 20	0.0007 / 18
50025C	0.0050 / 127	0.0025 / 64	0.0010 / 25	0.0008 / 20	0.0007 / 18
50050C	0.0050 / 127	0.0050 / 127	0.0010 / 25	0.0008 / 20	0.0007 / 18
50120C	0.0050 / 127	0.0120 / 305	0.0010 / 25	0.0008 / 20	0.0007 / 18
55060C	0.0055 / 140	0.0060 / 152	0.0010 / 25	0.0008 / 20	0.0007 / 18
55080C	0.0055 / 140	0.0080 / 203	0.0010 / 25	0.0008 / 20	0.0007 / 18
55120C	0.0055 / 140	0.0120 / 305	0.0010 / 25	0.0008 / 20	0.0007 / 18
60220C	0.0060 / 152	0.0220 / 559	0.0010 / 25	0.0008 / 20	0.0007 / 18
90060C	0.0090 / 229	0.0060 / 152	0.0010 / 25	0.0008 / 20	0.0007 / 18

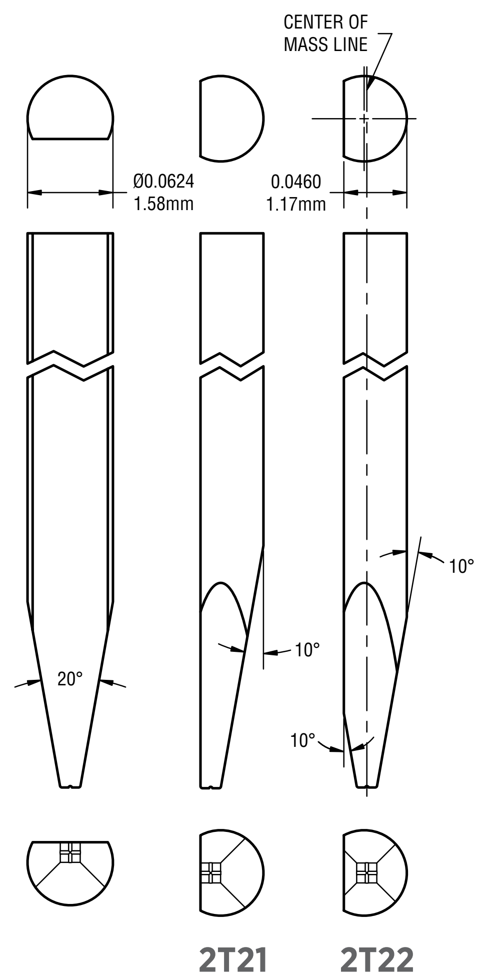
Dimensions in inches unless otherwise specified.

2T21 & 2T22 Series

Double Cross Groove Single-Point TAB Tool







Material:
Tungsten Carbide Standard
-TiC = Titanium Carbide
-BKCER = Cermet Tip
-DT = Diamond Tip

Options:
see Wedge Modifications

Lengths:
-375 = 0.375 in./9.52mm
-S = 0.437 in./11.1mm
-625 = 0.625 in./15.88mm
-3/4 = 0.750 in./19.05mm
-L = 0.828 in./21.03mm
-1.0 = 1.000 in./25.4mm
Other = Specify

Specify:
Series - Bond Length/BW/Radius & Groove Spec. - Shank Length - Options

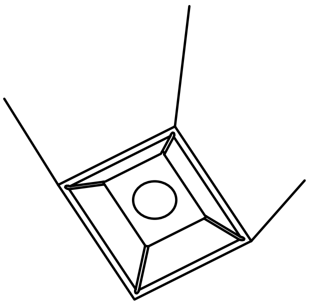
Example:
2T21-35050C-S-TiC
2T22-45075C-3/4-20D

2T21 & 2T22 Series

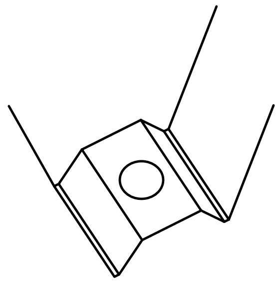
Double Cross Groove Single-Point TAB Tool

DASH NUMBER	BL in. / µm ±0.0002 / 5	BW in. / µm ±0.0002 / 5	FR=BR=LR=RR in. / µm ±0.0002 / 5	W in. / µm ±0.0002 / 5	CGR=LGR in. / µm ±0.0001 / 3	CGD=LGD in. / µm ±0.0001 / 3
15015B	0.0015 / 38	0.0015 / 38	0.0005 / 13	0.0023 / 58	0.0004 / 10	0.0004 / 10
20020B	0.0020 / 51	0.0020 / 51	0.0005 / 13	0.0028 / 71	0.0004 / 10	0.0004 / 10
20032	0.0020 / 51	0.0032 / 81	0.0005 / 13	0.0040 / 102	0.0004 / 10	0.0004 / 10
20040B	0.0020 / 51	0.0040 / 102	0.0005 / 13	0.0048 / 122	0.0004 / 10	0.0004 / 10
25025B	0.0025 / 64	0.0025 / 64	0.0005 / 13	0.0033 / 84	0.0004 / 10	0.0004 / 10
25050B	0.0025 / 64	0.0050 / 127	0.0005 / 13	0.0058 / 147	0.0004 / 10	0.0004 / 10
30030B	0.0030 / 76	0.0030 / 76	0.0005 / 13	0.0038 / 97	0.0004 / 10	0.0004 / 10
30060B	0.0030 / 76	0.0060 / 152	0.0005 / 13	0.0068 / 173	0.0004 / 10	0.0004 / 10
35040B	0.0035 / 89	0.0040 / 102	0.0005 / 13	0.0048 / 122	0.0004 / 10	0.0004 / 10
40040B	0.0040 / 102	0.0040 / 102	0.0005 / 13	0.0048 / 122	0.0004 / 10	0.0004 / 10
40060B	0.0040 / 102	0.0060 / 152	0.0005 / 13	0.0068 / 173	0.0004 / 10	0.0004 / 10
45040B	0.0045 / 114	0.0040 / 102	0.0005 / 13	0.0048 / 122	0.0004 / 10	0.0004 / 10
45045B	0.0045 / 114	0.0045 / 114	0.0005 / 13	0.0053 / 135	0.0004 / 10	0.0004 / 10
50050	0.0050 / 127	0.0050 / 127	0.0005 / 13	0.0058 / 147	0.0004 / 10	0.0004 / 10
55040B	0.0055 / 140	0.0040 / 102	0.0005 / 13	0.0048 / 122	0.0004 / 10	0.0004 / 10
30030C	0.0030 / 76	0.0030 / 76	0.0010 / 25	0.0047 / 119	0.0008 / 20	0.0007 / 18
30050C	0.0030 / 76	0.0050 / 127	0.0010 / 25	0.0067 / 170	0.0008 / 20	0.0007 / 18
30120C	0.0030 / 76	0.0120 / 305	0.0010 / 25	0.0137 / 348	0.0008 / 20	0.0007 / 18
35050C	0.0030 / 76	0.0050 / 127	0.0010 / 25	0.0067 / 170	0.0008 / 20	0.0007 / 18
40040C	0.0040 / 102	0.0040 / 102	0.0010 / 25	0.0057 / 145	0.0008 / 20	0.0007 / 18
40060C	0.0040 / 102	0.0060 / 152	0.0010 / 25	0.0077 / 196	0.0008 / 20	0.0007 / 18
40090C	0.0040 / 102	0.0090 / 229	0.0010 / 25	0.0107 / 272	0.0008 / 20	0.0007 / 18
45045C	0.0045 / 114	0.0045 / 114	0.0010 / 25	0.0062 / 158	0.0008 / 20	0.0007 / 18
50050C	0.0050 / 127	0.0050 / 127	0.0010 / 25	0.0067 / 170	0.0008 / 20	0.0007 / 18
55070C	0.0055 / 140	0.0070 / 178	0.0010 / 25	0.0087 / 221	0.0008 / 20	0.0007 / 18
55080	0.0055 / 140	0.0080 / 203	0.0010 / 25	0.0097 / 246	0.0008 / 20	0.0007 / 18
60060C	0.0060 / 152	0.0060 / 152	0.0010 / 25	0.0077 / 196	0.0008 / 20	0.0007 / 18
60080C	0.0060 / 152	0.0080 / 203	0.0010 / 25	0.0097 / 246	0.0008 / 20	0.0007 / 18
80080C	0.0080 / 203	0.0080 / 203	0.0010 / 25	0.0097 / 246	0.0008 / 20	0.0007 / 18

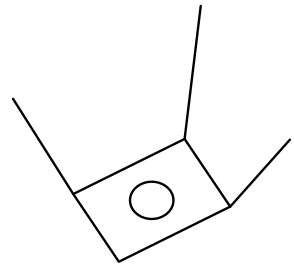
*Flat Face Only.
Other part numbers are available.
Dimensions in inches unless otherwise specified.



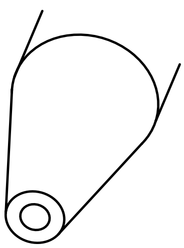
3600 Series
Four-sided Die Collet



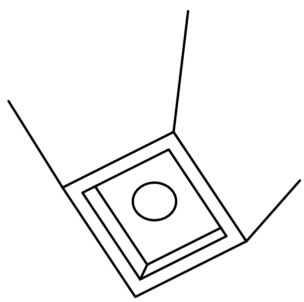
3700 Series
Two-sided Die Collet



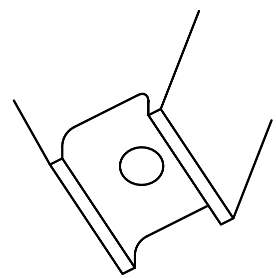
3800 Series
Square/Rectangle, Flat Face
Vacuum Pick-up Tool



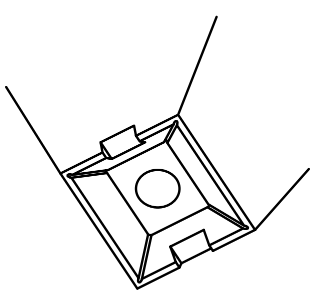
3900 Series
Conical/Round, Flat Face
Vacuum Pick-up Tool



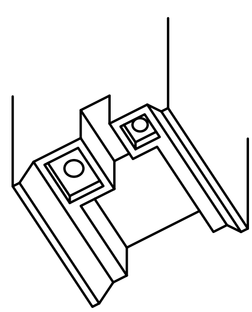
3300 & 3300-ETE Series
Surface/Perimeter Pick-up Collet



3200-ETE Series
Two-sided Surface Pick-up
Collet



Custom Configuration
Modified Collet,
Special Reliefs Added



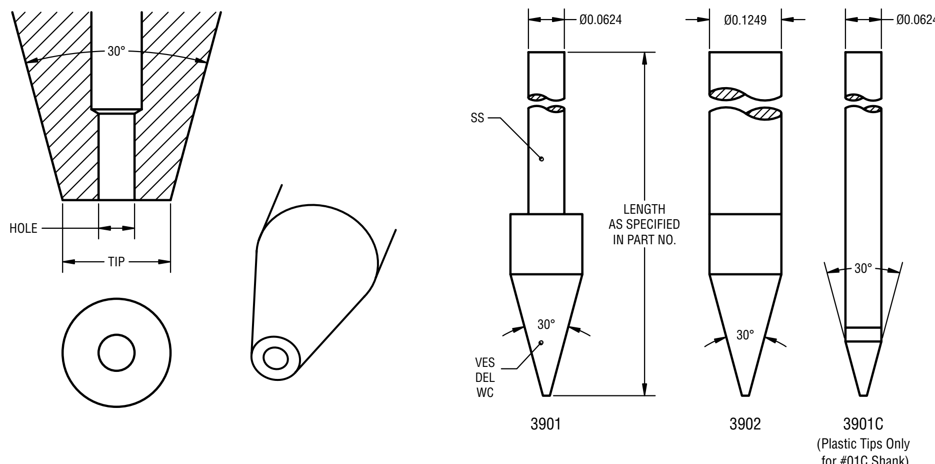
Custom Configuration
for MEMS Device

Conical vacuum pickup tools are typically used for die pick-and-place into epoxy. The plastic materials are most commonly specified as opposed to metal as they are less likely to damage die or sensitive devices.

The lowest cost material is Delrin®. Delrin® has a limited temperature service range and can hold a static charge. Vespel® has a higher service temperature and is "anti-static". Gaiser's ESD01 material is truly static dissipative. Other useful physical properties are shown on the adjacent table.

	Delrin	Vespel	ESD01
Continuous Service Temp (°F)	180	300 (ideal) 500 (max NR)	420
Max Temp (°F) (Excursions/Brief Peaks)	250	900	N/A
Melting Temp (°F)	327-335	Does not melt (decomposes at >500 in O_2)	Approximately 584
Rockwell Hardness (M)	94	69-79	87
Electric Property	Insulator Non-conductive	Insulator Non-conductive "Anti-Static"	ESD Rated Static Dissipative 10^6-10^9 Volume Resistivity

3900 Series - Conical, Flat Face Tip



TYPICAL TIP CONFIGURATIONS	
HOLE DIAMETER in. / µ	TIP DIAMETER in. / µ
0.005 / 127	0.010 / 254
0.006 / 152	0.012 / 305
0.008 / 203	0.016 / 406
0.008 / 203	0.020 / 508
0.010 / 254	0.020 / 508
0.010 / 254	0.025 / 635
0.015 / 381	0.030 / 762
0.020 / 508	0.040 / 1016
Other = Specify	

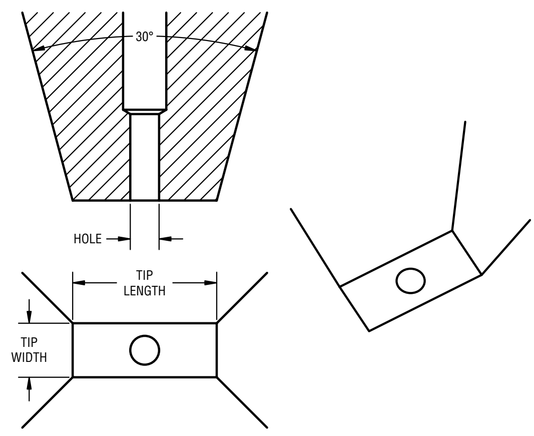
Specify:
Series/Shank Style - Hole Size - Tip Size - *Shank Length - Material

Example:
3901-006-012-625-DEL
*Specify length for 01, 02, & 60 shanks only
VES, DEL, ESD01, or WC material. Polish face standard for WC material

3800 Series - Square/Rectangle, Flat Face Tip

Specify:
Series/Shank Style - Hole - Tip Length - Tip Width - *Length - Material

Example:
3802-010-025-035-750-VES
*Specify length for 01, 02, & 60 shanks only
VES or WC only. Polish face standard for WC material



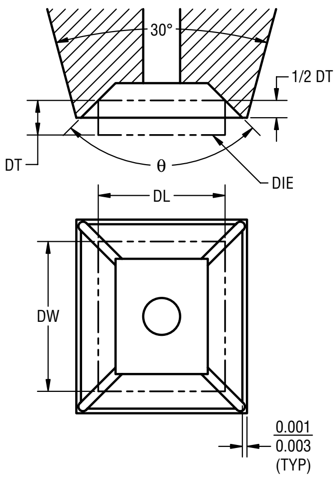
Two and four sided collets are used to attach die to a substrate using eutectic or epoxy attach methods. Die collets are designed to pick up the die by the edges, not the face. The inside of the collets have slanted sides, usually 90° but can be user specified as needed. This insures accurate placement using Scrub or simple Pick and Place.

The four-sided "inverted pyramid" collet has the advantage of absolute control of positioning of the die because it is contained on all four sides.

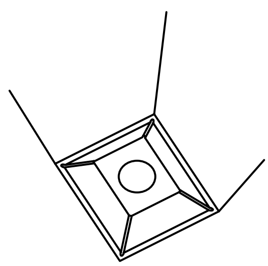
The two-sided "channel" design allows for the die to extend beyond the collet opening. This type of collet is used to place die close to walls, another die, or laser diodes with sensitive facets on two sides of the die.

Both collets are manufactured so 50% of the die thickness is engaged and 50% is exposed (of the die thickness specified in the part number). Under some conditions, either the eutectic or epoxy material may extrude up onto the collet face and contaminate it. To eliminate this problem, the collet should be ordered by calling out a thinner die size than is actually being used. The collet will be made smaller and allow for more of the die to be exposed away from the face.

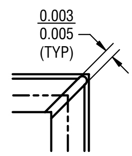
All die collets are available with Ø0.0625in./1.58mm or Ø0.125in./3.18mm shanks or as shown on pages 154 and 155. Tungsten carbide die collets can be heated to 450° C. For best eutectic resuts, a closed loop rapid heat up cycle is best. If a particular shank is not listed, Gaiser can manufacture it per customer specifications.

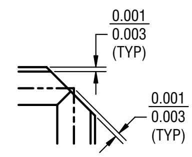


3600 Series
Four-Sided Die Collets



Corner Reliefs

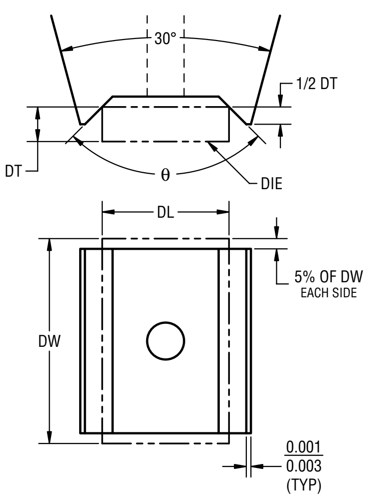




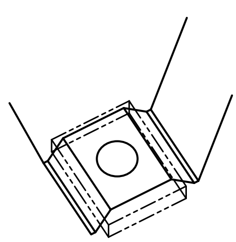
***Internal Corner Reliefs**
Standard for Small Collets

***External Corner Reliefs**
Standard for Large Collets (0.060 x 0.060 or larger die size)

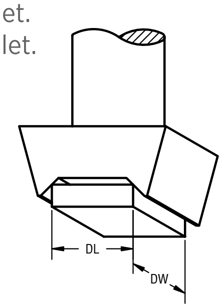
*corner relief feature automatically optimized by Gaiser based on die size and dimesional aspect ratios



3700 Series
Two-Sided Die Collets



On the 3700 two-sided die collet, the DW is contacted, (touched) by the collet. The DL is not contacted by the collet. The vacuum leaks at the DL side.



The DL is specified first in the part number.
The DW is specified second.

Specify: Series/Shank Style - Shank Length - Inside Wall Angle - Die Length - Die Width - Die Thickness - Options

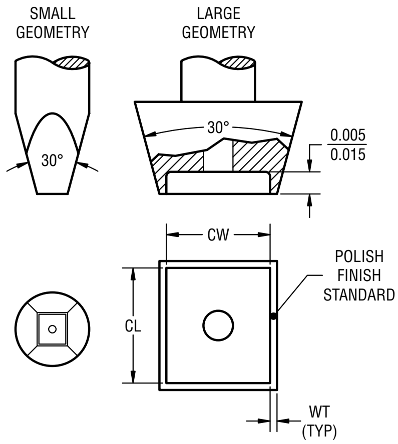
Example: 3602-750-90-055-065-005
3702-500-90-055-095-010

Material: WC (Tungsten Carbide only)

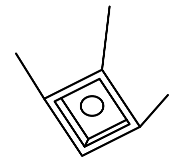
Dimensions in inches unless otherwise specified.

Note: See page 154 for optional outside Vertical Walls

Surface/Perimeter Pick-up Collets
3300, 3300-ETE, & 3200-ETE Series



3300 Series

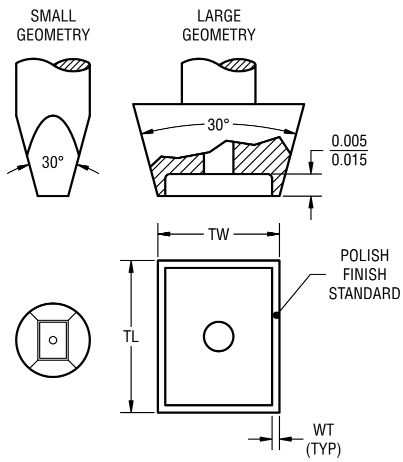


Surface/Perimeter Pick-up
Tool
Cavity Dimensions Specified

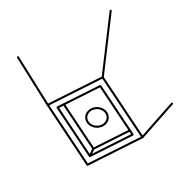
Specify:
Series/Shank Style-*Shank length-Cavity Length-Cavity Width-Wall Thickness

Example: 3302-1.0-050-040-003
*Specify length for 01, 02, & 60 shanks only
Polish finish Standard, GM=Gaiser Matte optional finish
WC only

For the 3300 Series, the inside cavity dimensions are specified in the part number.



3300-ETE Series

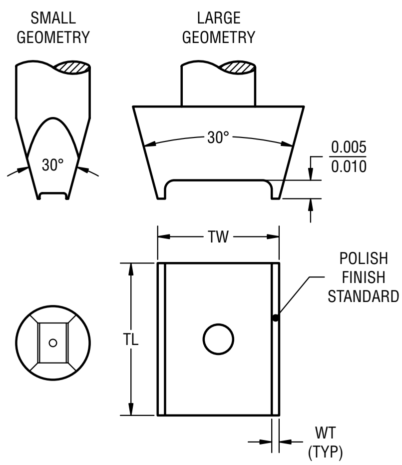


Surface/Perimeter Pick-up Tool
Outer Edge-to-Edge Dimensions Specified

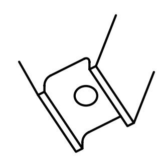
Specify:
Series/Shank Style-*Shank length-Tip Length-Tip Width-Wall Thickness

Example: 3302-ETE-1.0-050-040-003
*Specify length for 01, 02, & 60 shanks only
Polish finish Standard, GM=Gaiser Matte optional finish
WC only

For the 3300-ETE Series, the outer edge-to edge dimensions are specified in the part number.



3200-ETE Series



Surface, Two-Sided, Perimeter Pick-up Tool
Outer Edge-to-Edge Dimensions Specified

Specify:
Series/Shank Style-*Shank length-Tip Length-Tip Width-Wall Thickness

Example: 3202-ETE-1.0-050-040-003
*Specify length for 01, 02, & 60 shanks only
Polish finish Standard, GM=Gaiser Matte optional finish
WC only

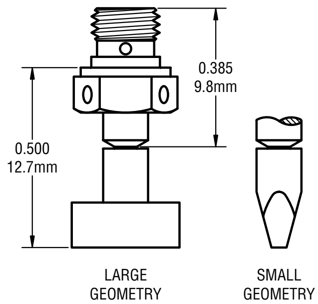
For the 3200-ETE Series, the outer edge-to edge dimensions are specified in the part number.

Notes: See page 154 for optional outside Vertical Walls
For special cavity depth, specify CD=XXX

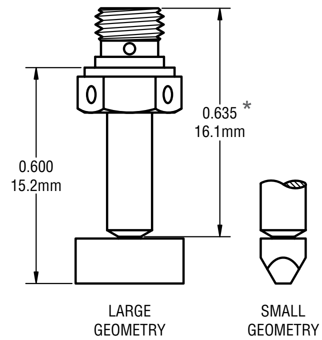
CoorsTek

The #32A Shank
For the Palomar 3500, 6500, & LDA

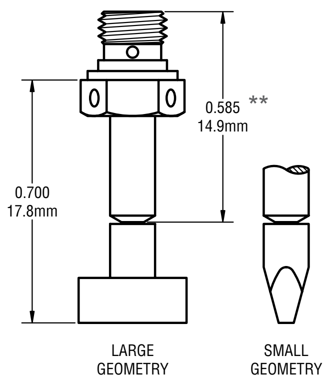
0.500 TOOL DROP



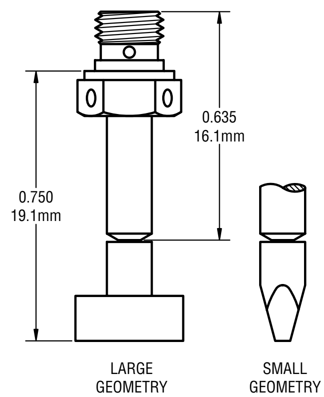
0.600 TOOL DROP

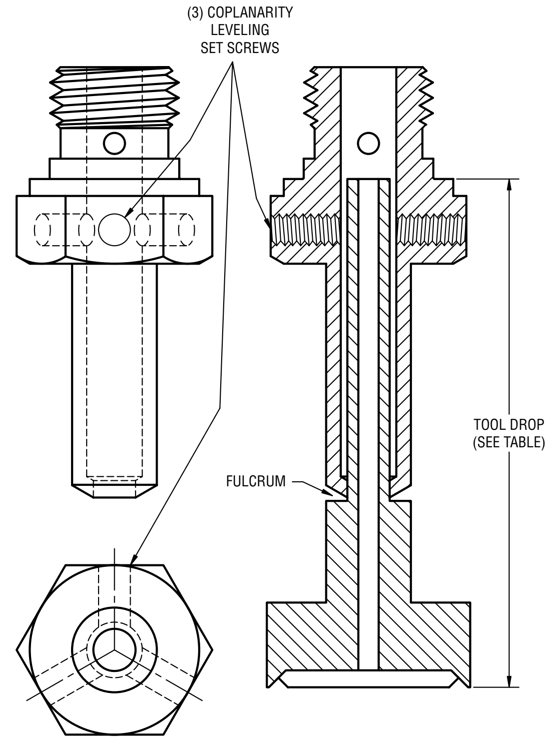


0.700 TOOL DROP



0.750 TOOL DROP





TOOL DROP DESIGNATION	TOOL DROP DIMENSION in. / mm
-750TD	0.750 / 19.05
-700TD	0.700 / 17.8
-600TD	0.600 / 15.2
-500TD	0.500 / 12.7

Above Configurations for the 3632A, 3732A, 3332A, 3332A-ETE, & 3232A-ETE Series

*different shank body used for the 3900 Series

**different shank body used for the 3800 & 3900 Series

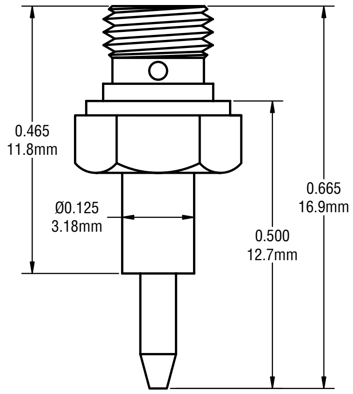
Specify:

3632A - Tool Drop - Inside Wall Angle - Die Length - Die Width - Die Thickness
3732A - Tool Drop - Inside Wall Angle - Die Length - Die Width - Die Thickness
3832A - Tool Drop - Hole Diameter - Tip Length - Tip Width - Tip Material
3932A - Tool Drop - Hole Diameter - Tip Diameter - Tip Material
3332A - Tool Drop - Cavity Length - Cavity Width - Wall Thickness
3332A - ETE - Tool Drop - Tip Length - Tip Width - Wall Thickness
3232A - ETE - Tool Drop - Tip Length - Tip Width - Wall Thickness

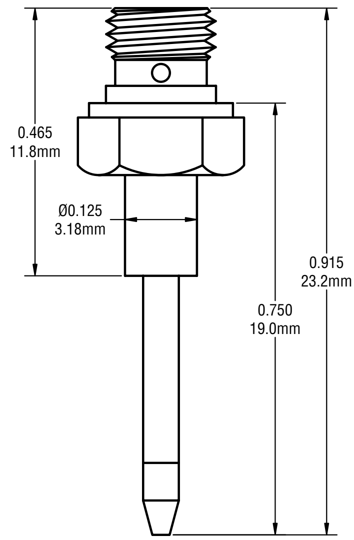
Example:
3632A-750TD-90-040-060-005
3732A-750TD-90-050-120-004
3832A-500TD-010-040-050-VES
3932A-600TD-015-030-DEL
3332A-700TD-050-040-003
3332A-ETE-750TD-056-046-003
3232A-ETE-750TD-056-046-003

CoorsTek

#32 Shank



#32 Deep Reach



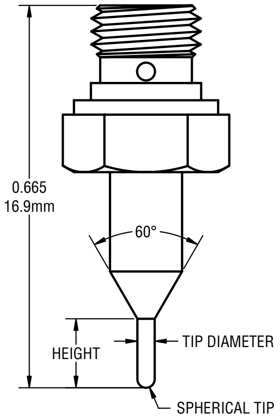
TYPICAL TIP CONFIGURATIONS	
HOLE DIAMETER in. / µm	TIP DIAMETER in. / µm
0.005 / 127	0.010 / 254
0.006 / 152	0.012 / 305
0.008 / 203	0.016 / 406
0.010 / 254	0.020 / 508
0.012 / 305	0.024 / 610
0.015 / 381	0.030 / 762
0.020 / 508	0.040 / 1016
0.025 / 635	0.050 / 1270
0.030 / 762	0.060 / 1524

Specify:
Series/Shank Style - Hole Diameter - Tip Diameter - Material

Example: 3932-006-012-VES

Epoxy Daub Tools

#32 Shank
(For the Palomar Machines)



TYPICAL TIP CONFIGURATIONS	
TIP DIAMETER in. / mm	HEIGHT in. / mm
0.005 / 0.13	0.015 / 0.38
0.010 / 0.25	0.050 / 1.27
0.015 / 0.38	0.070 / 1.78
0.020 / 0.51	0.080 / 2.03
0.025 / 0.64	0.100 / 2.54
0.030 / 0.76	0.120 / 3.05
0.035 / 0.89	0.140 / 3.56
0.040 / 1.02	
0.045 / 1.14	
0.050 / 1.27	
0.055 / 1.40	
0.060 / 1.52	0.200 / 5.1
0.065 / 1.65	
0.070 / 1.78	
0.075 / 1.90	
0.080 / 2.03	

Specify:
Series/Shank Style - Tip Diameter - Height of Diameter - *Shank Length - **Material

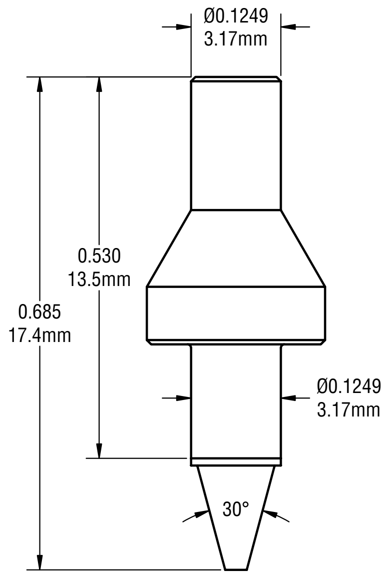
Example: 3D32-030-120-SS

*Specify length for 01, 02, & 60 shanks only
**Material is standard as Stainless Steel ("-SS")
Note: For tip diameters less than 0.010 in./0.25mm, the tip height should not exceed three times the tip diameter.
Dimensions in inches unless otherwise specified.

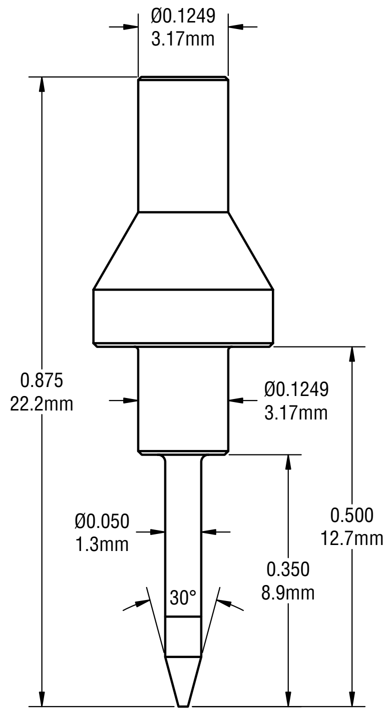
CoorsTek

The #05 Shank

For Conical Vacuum Pick-up Tools
For the Newport/MRSI 505, 5005, 605, & M5



#05 Shank



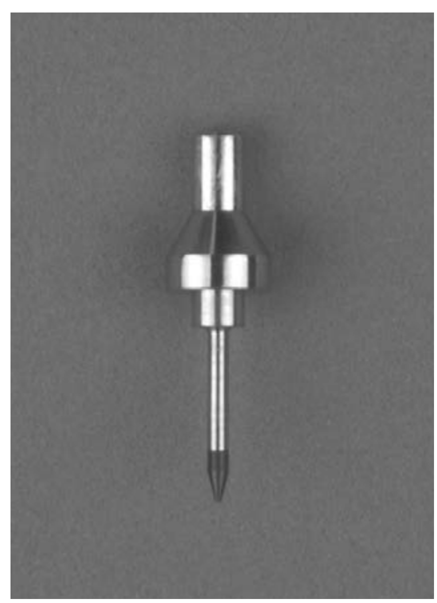
#05 Shank Deep Reach

TYPICAL TIP CONFIGURATIONS	
HOLE DIAMETER in. / µm	TIP DIAMETER in. / µm
0.005 / 127	0.008 / 203
0.005 / 127	0.010 / 254
0.006 / 152	0.010 / 254
0.006 / 152	0.012 / 305
0.008 / 203	0.013 / 330
0.008 / 203	0.016 / 406
0.010 / 254	0.020 / 508
0.015 / 381	0.030 / 762
0.020 / 508	0.040 / 1016
0.030 / 762	0.040 / 1016
0.040 / 1016	0.050 / 1270
0.060 / 1524	0.080 / 2032
0.070 / 1778	0.100 / 2540

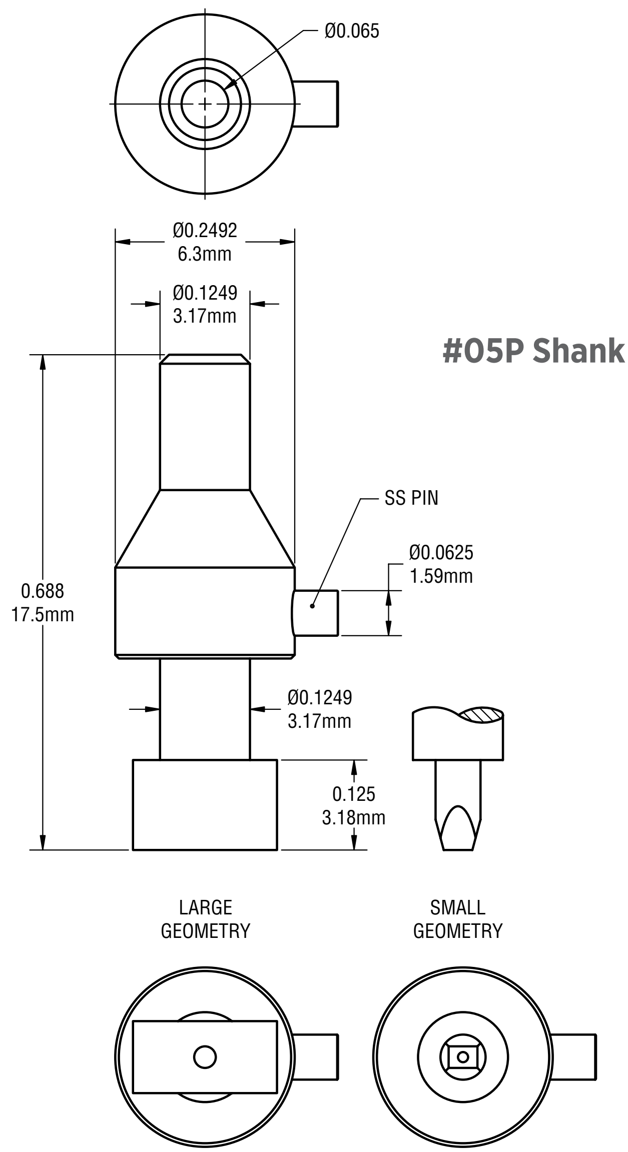
Specify:
Series/Shank Style - Hole Diameter - Tip Diameter - Material

Example: 3905-010-020-VES

Material:
VES = Vespel
DEL = Delrin
WC = Tungsten Carbide
ESD01 = Static Dissipative ESD Material



The #05P Pin Type Shank
For Rectangular/Square Tip Geometries
For the Newport/MRSI 505, 5005, 605, & M5

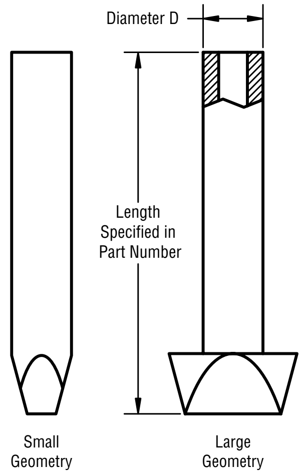


Custom configurations available - Contact factory

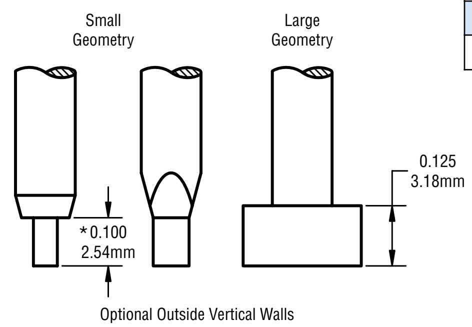
Specify:
3605P - Inside Wall Angle - Die Length - Die Width - Die Thickness
3705P - Inside Wall Angle - Die Length - Die Width - Die Thickness
3805P - Hole Diameter - Tip Length - Tip Width - Tip Material
3905P - Hole Diameter - Tip Diameter - Tip Material
3305P - Cavity Length - Cavity Width - Wall Thickness
3305P - ETE - Tip Length - Tip Width - Wall Thickness
3205P - ETE - Tip Length - Tip Width - Wall Thickness

Note: Pin orientation is on same side as smaller tip side as shown
(on same axis as longer tip side as shown)
Not recommended for 3900 series, for 3900 series see adjacent page

#01, #02 Shank



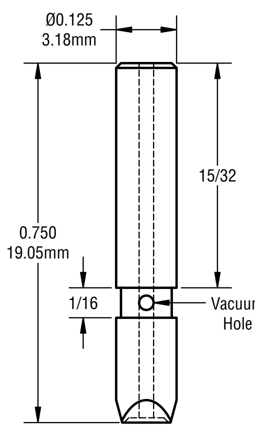
SHANK NUMBER	DIAMETER D in. / mm
01	0.0625 / 1.58
02	0.125 / 3.18



MACHINE	SHANK NUMBER	LENGTH in. / mm
Esec	01	0.3150 / 08.00
West Bond 7300	01	Specify
K&S 642	02	0.750 / 19.05
Mech El 703	02	0.750 / 19.05
Mullen 8-140	02	0.750 / 19.05
SEC 4000	02	1.00 / 25.4

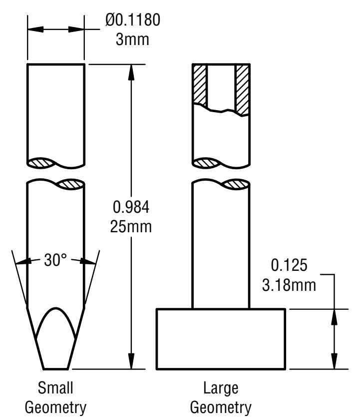
Note: Vertical wall height is 0.100 inch for small geometry - for very small die this dimension is reduced for structural integrity

#03 Shank



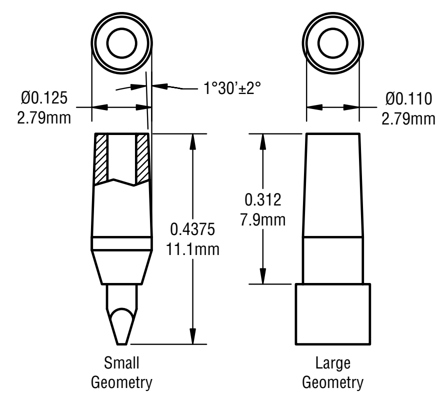
for K&S 643 and 648 die bonders

#04 Shank



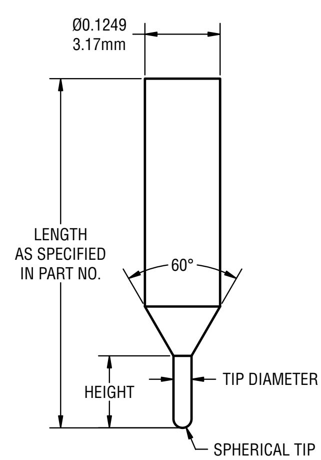
for Tresky bonder

#12 Shank



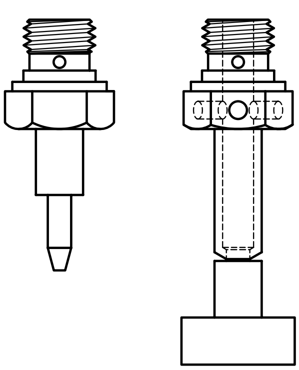
for AMI Automatic die bonders

Daub Tools-3DXX Series



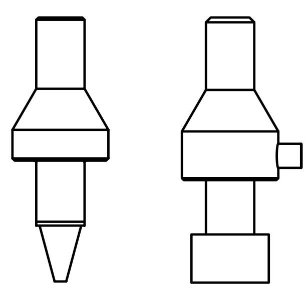
(3D02 shown above - available to all shank styles) see page 151 for typical Daub Tool tip configurations

#32 & #32A Shank



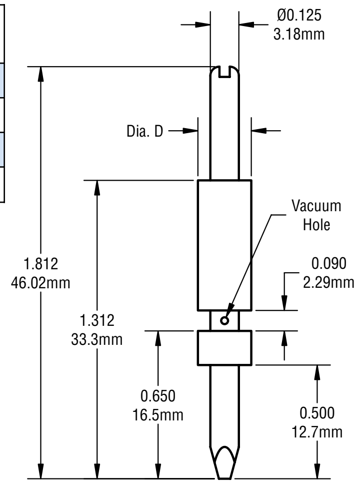
for Palomar Machines
see pages 150 & 151

#05 & #05P Shank



for Newport/MRSI Machines
see pages 152 & 153

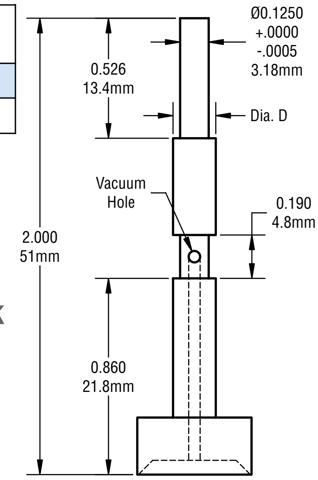
SHANK NUMBER	DIAMETER D in. / mm
21	0.125 / 3.18
22	0.187 / 4.75
23	0.234 / 5.94
24	0.312 / 7.92



#21, #22, # 23, & #24 Shank

for Mullen/Unitek die bonders Model 8-157 heated

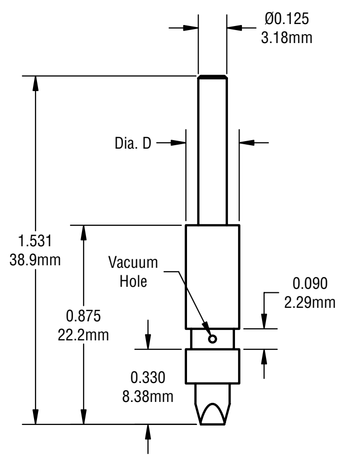
SHANK NUMBER	DIAMETER D in. / mm
29	0.125 / 3.18
62	0.312 / 7.92



#29 & #62 Shank

for Mullen/Unitek die bonders Model 8-140 heated

SHANK NUMBER	DIAMETER D in. / mm
25	0.125 / 3.18
26	0.187 / 4.75
27	0.234 / 5.94
28	0.312 / 7.92
63	0.500 / 12.7

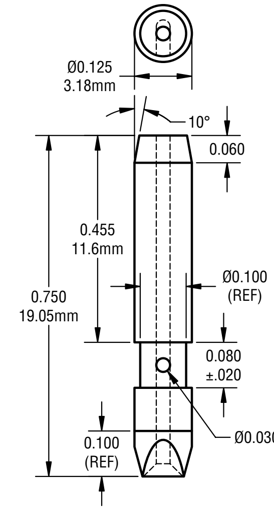


#25, #26, # 27, #28, & #63 Shank

for Mullen/Unitek die bonders Model 8-140 heated

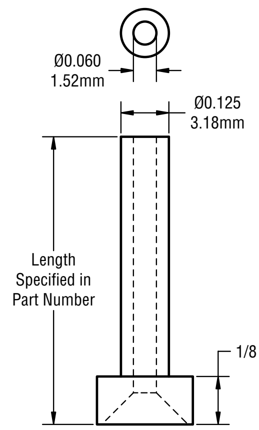
#45 Shank

Combination for Mech EI 703 and K&S 643 die bonders



#60 Shank

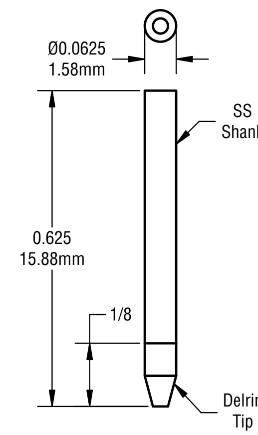
for the K&S 6300 bonder



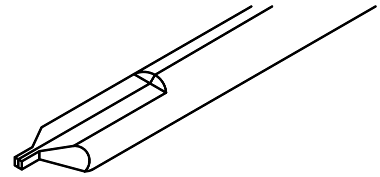
#61 Shank*

for Westbond pick-and-place bonders

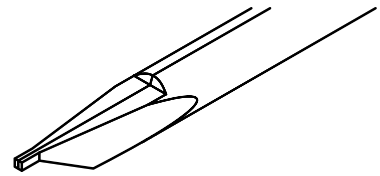
*Note: For other lengths or materials, use 3901C shank



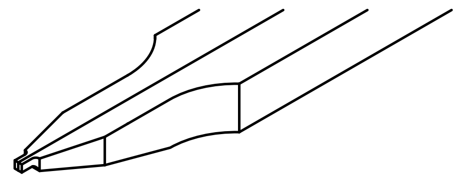
PGE-Dash Number-60D
Used in Unitek Welders as an equivalent to the UTM-C series



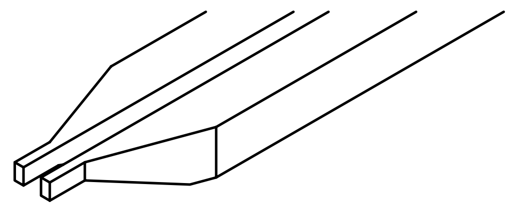
PGE-Dash Number-15D
Used in Unitek Welders as an equivalent to the UTM-L series



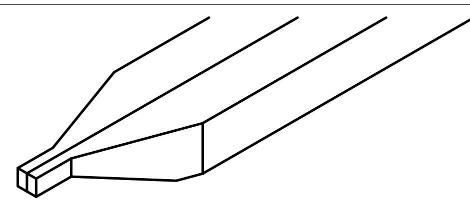
PGE-Dash Number-DUS
Used in Hughes Welders as an equivalent to the DUS series



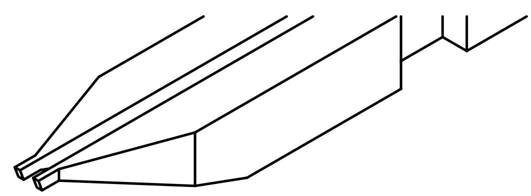
PGE-Dash Number-ESQ
Used in Hughes Welders as an equivalent to the ESQ series



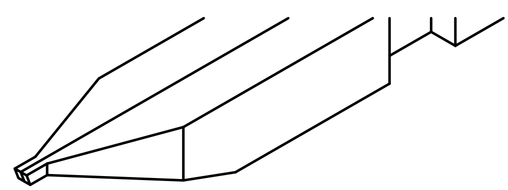
PGE-Dash Number-ESQA
Used in Hughes Welders as a fixed-gap optioned equivalent to the ESQ series



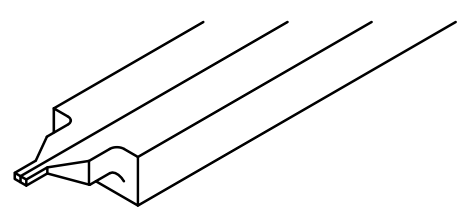
PGE-Dash Number-ESQ-20D
Used in Hughes Welders as an equivalent to the angled ESQ series



PGE-Dash Number-ESQA-20D
Used in Hughes Welders as a fixed-gap optioned equivalent to the angled ESQ series

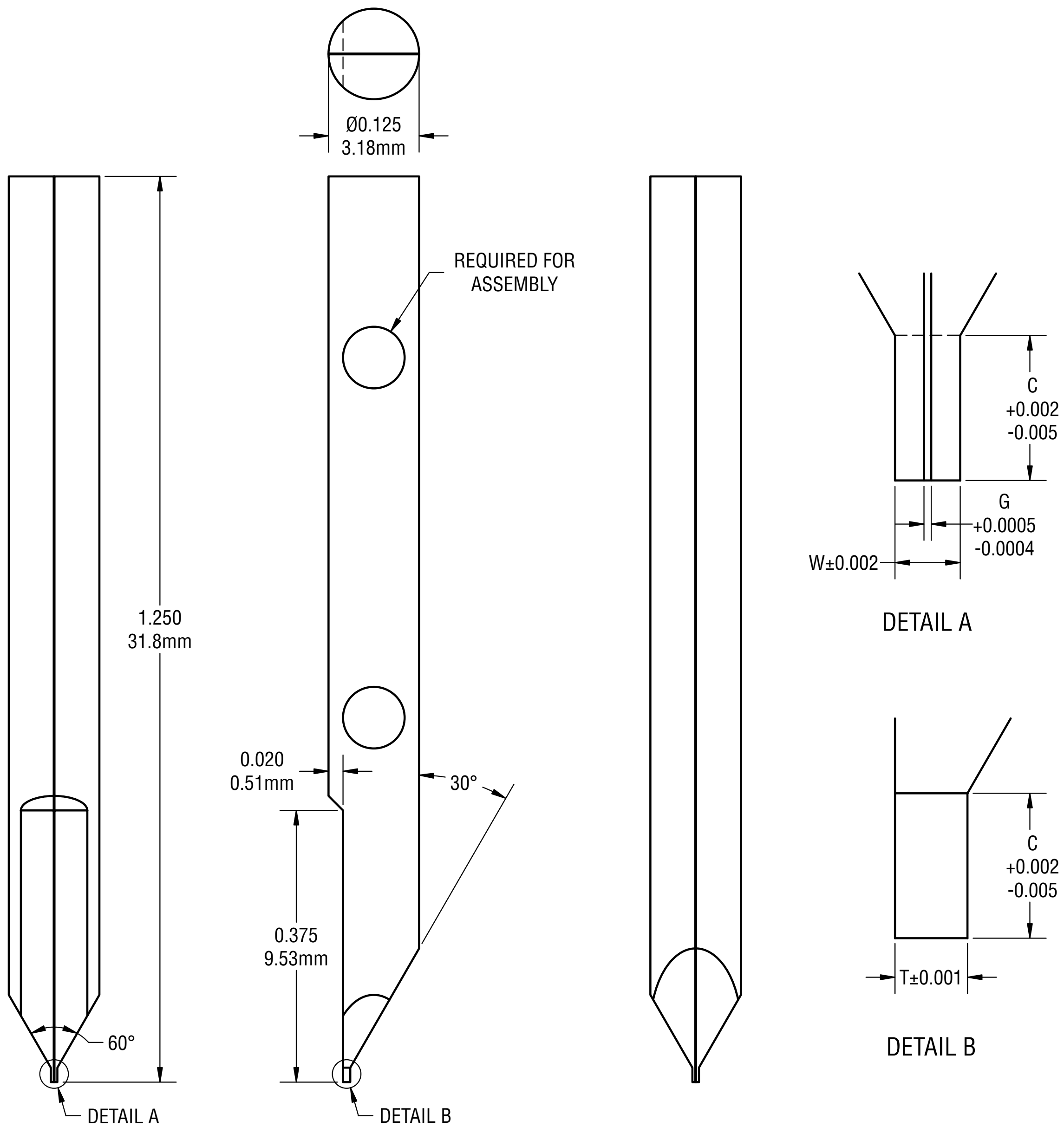


PGE-Dash Number-DUO
Used in Hughes Welders as an equivalent to the DUO series



CoorsTek

PGE-Dash Number-60D
For The Unitek Welder



DASH NUMBER	W	T	G	C
-09101	0.009	0.010	0.0010	0.020
-10051	0.010	0.005	0.0010	0.015
-10052	0.010	0.005	0.0020	0.015
-10102	0.010	0.010	0.0020	0.020
-15152	0.015	0.015	0.0020	0.050
-18202	0.018	0.020	0.0020	0.050
-20204	0.020	0.020	0.0040	0.050
-20307	0.020	0.030	0.0070	0.050

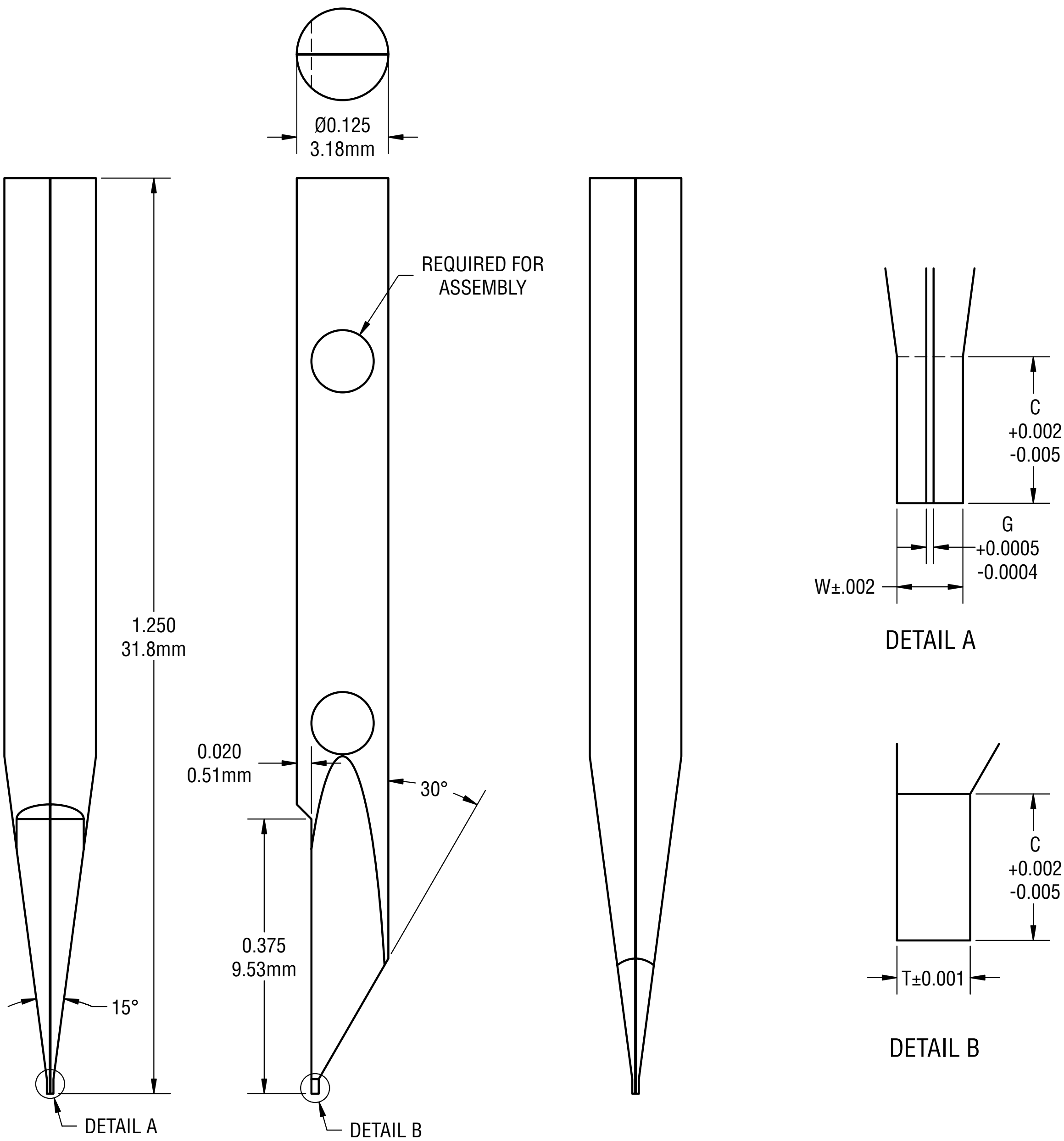
Dimensions in inches unless otherwise specified.

Specify:
Parallel Gap Electrode - Dash Number - Style

Example:
PGE-09101-60D

Material:
Molybdenum

PGE-Dash Number-15D
For The Unitek Welder



DASH NUMBER	W	T	G	C
-09101	0.009	0.010	0.0010	0.020
-10051	0.010	0.005	0.0010	0.015
-10052	0.010	0.005	0.0020	0.015
-10102	0.010	0.010	0.0020	0.020
-15152	0.015	0.015	0.0020	0.050
-18202	0.018	0.020	0.0020	0.050
-20204	0.020	0.020	0.0040	0.050
-20307	0.020	0.030	0.0070	0.050

Dimensions in inches unless otherwise specified.

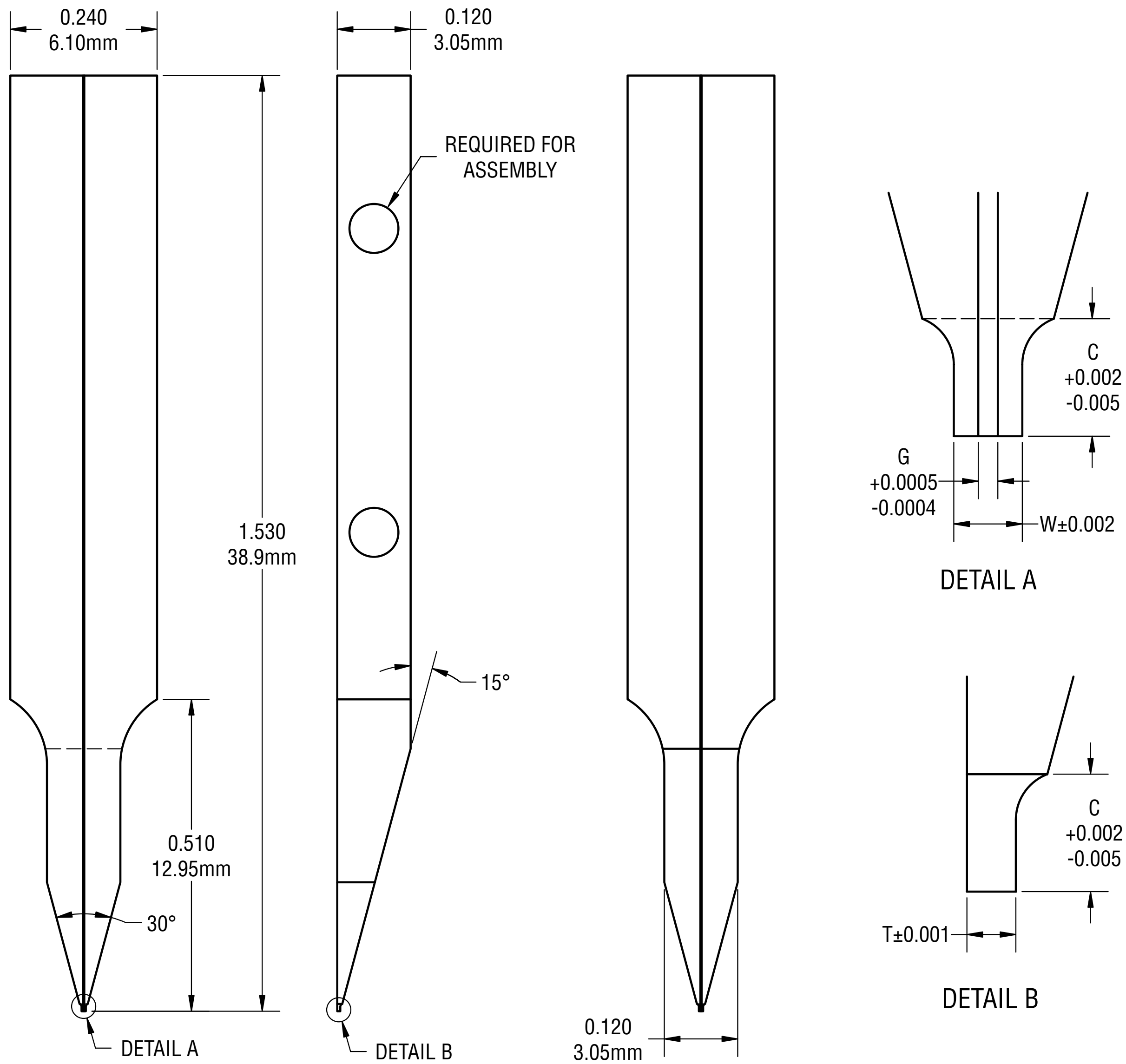
Specify:
Parallel Gap Electrode - Dash Number - Style

Example:
PGE-09101-15D

Material:
Molybdenum

PGE-Dash Number-DUS

For The Hughes Welder



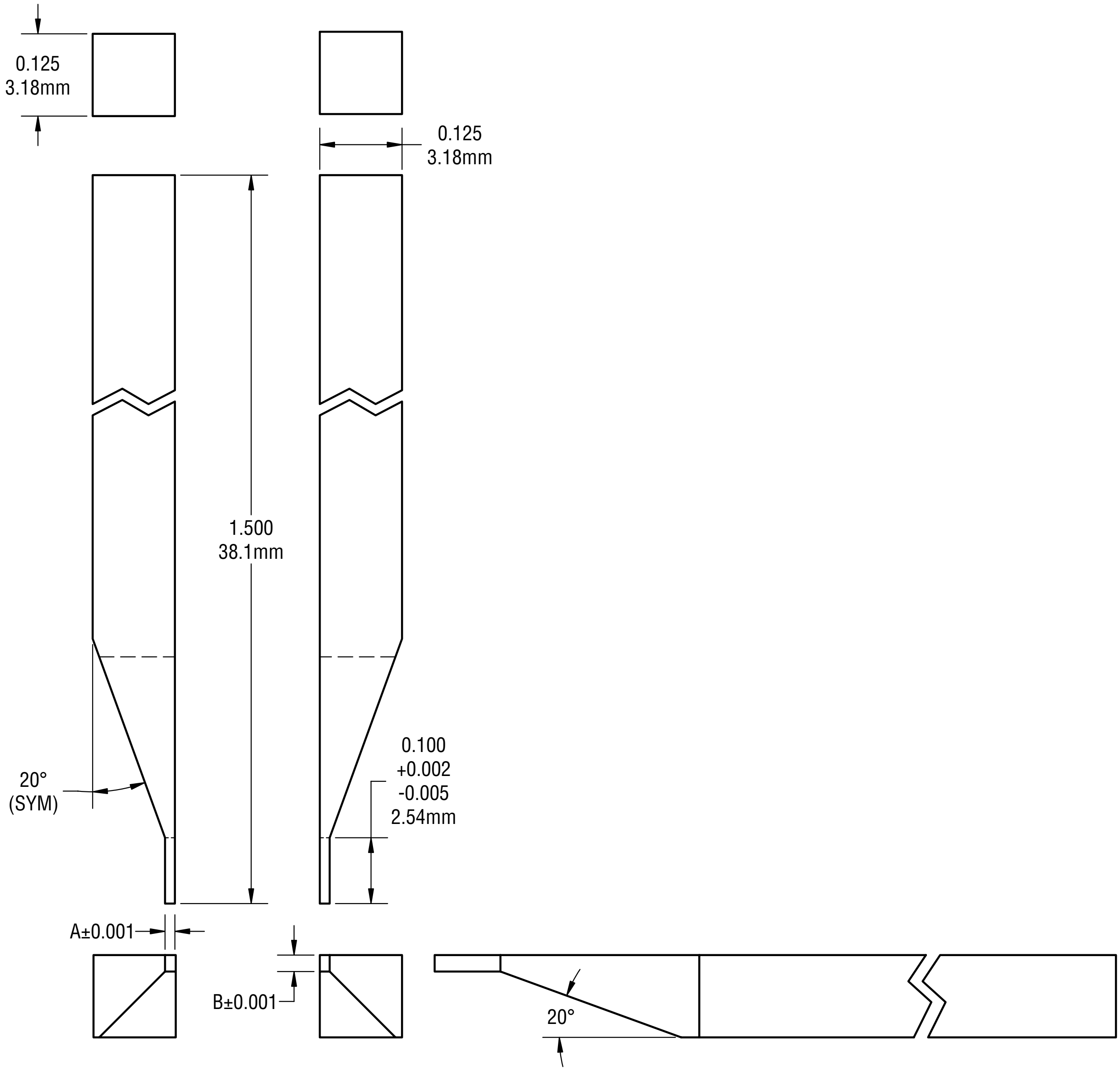
DASH NUMBER	W	T	G	C
-07052	0.007	0.005	0.0020	0.012
-10102	0.010	0.010	0.0020	0.020
-15203	0.015	0.020	0.0030	0.040
-20203	0.020	0.020	0.0030	0.040

Specify:
Parallel Gap Electrode - Dash Number - Style

Example:
PGE-07052-DUS

Material:
Molybdenum

Dimensions in inches unless otherwise specified.



Note: Part is a mirror image pair as shown

Specify:
Parallel Gap Electrode - Dash Number - Style - Optional Material

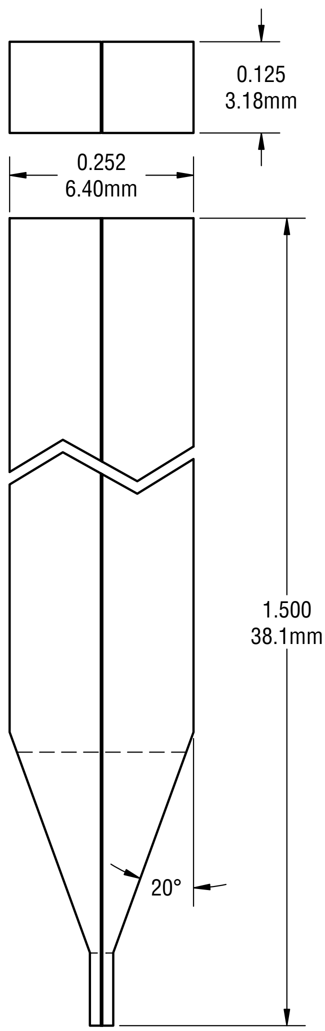
Example:
PGE-1015-ESQ
PGE-2545-ESQ-W

Material:
Molybdenum Standard
RWMA Class 2 Optional (Specify "-CU2" in part number)
Tungsten Optional (Specify "-W" in part number)

DASH NUMBER	A	B
-0815	0.008	0.015
-1015	0.010	0.015
-1525	0.015	0.025
-1825	0.018	0.025
-2323	0.023	0.023
-2545	0.025	0.045

Dimensions in inches unless otherwise specified.

PGE-Dash Number-ESQA
For The Hughes Welder

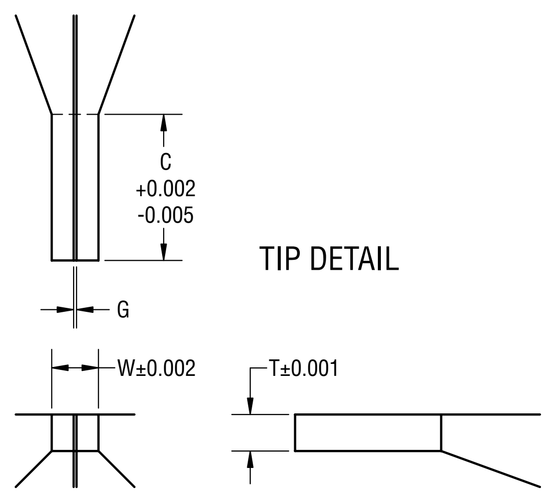


Features:
The PGE-Dash Number-ESQA series is a fixed-gap, assembled version of the conventional two piece design. The gap may be specified at 0.002 inch or 0.004 inch.
Gaiser exclusive long life insulator is used to separate the electrodes.

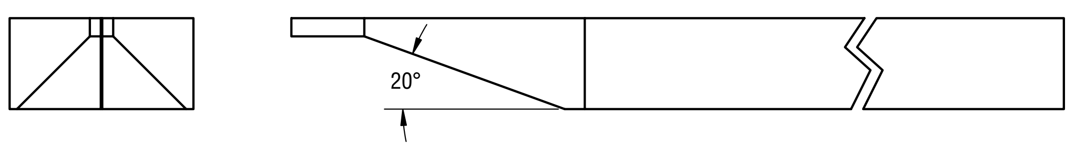
Specify:
Parallel Gap Electrode - Dash Number - Style

Example:
PGE-32252-ESQA

Material:
Molybdenum



TIP DETAIL



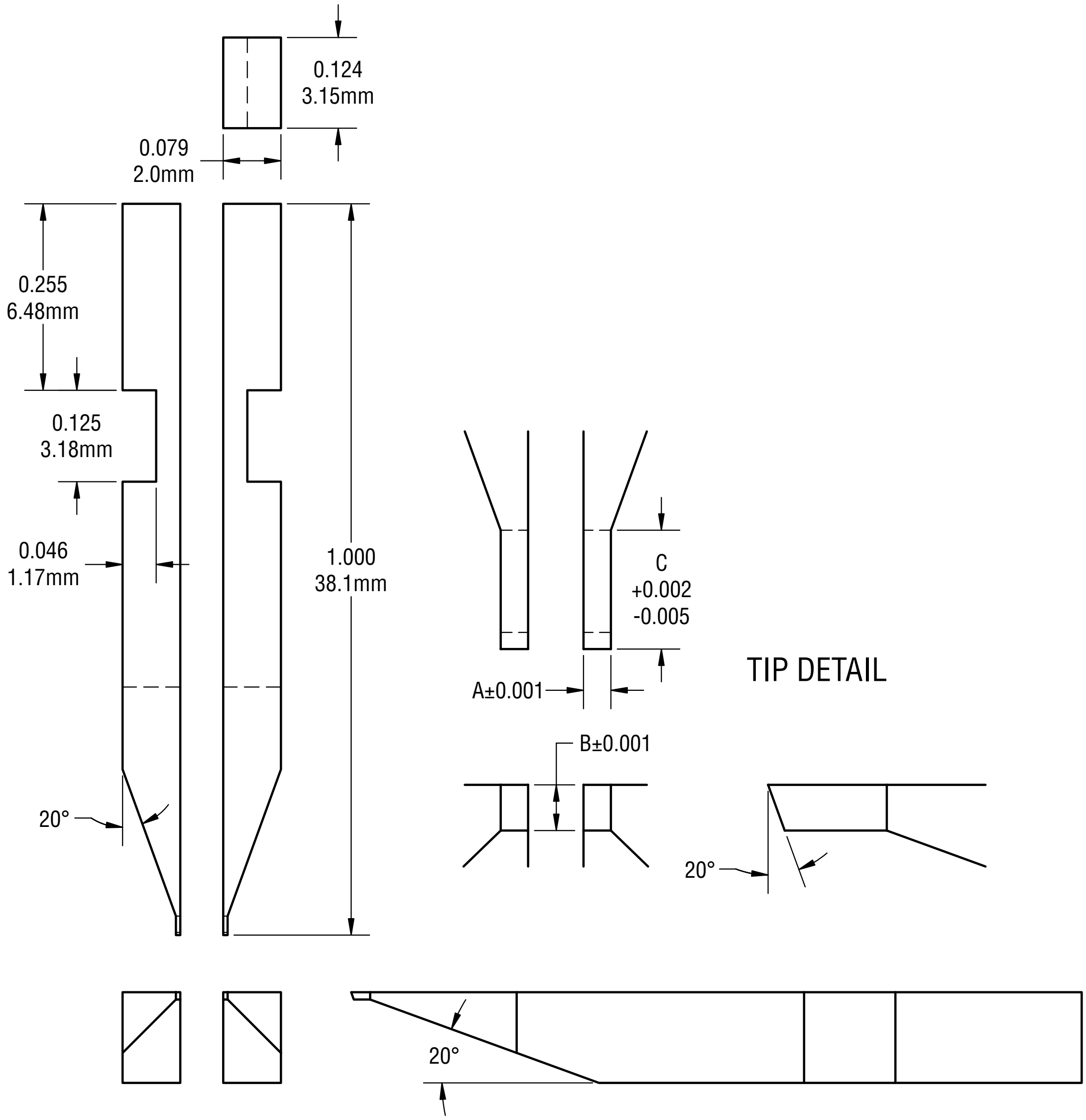
DASH NUMBER	W	T	G	C
-18152	0.018	0.015	0.002	0.100
-22152	0.022	0.015	0.002	0.100
-32252	0.032	0.025	0.002	0.100
-38252	0.038	0.025	0.002	0.100
-48252	0.048	0.025	0.002	0.100
-52452	0.052	0.045	0.002	0.100

DASH NUMBER	W	T	G	C
-20154	0.020	0.015	0.004	0.100
-24154	0.024	0.015	0.004	0.100
-34254	0.034	0.025	0.004	0.100
-40254	0.040	0.025	0.004	0.100
-50254	0.050	0.025	0.004	0.100
-54454	0.054	0.045	0.004	0.100

Dimensions in inches unless otherwise specified.

PGE-Dash Number-ESQ-20D

For the Hughes Welder



Note: Part is a mirror image pair as shown

Specify:
Parallel Gap Electrode - Dash Number - Style - Optional Material

Example:
PGE-0610-ESQ-20D
PGE-1019-ESQ-20D-W

Material:
Molybdenum Standard
RWMA Class 2 Optional (Specify "-CU2" in part number)
Tungsten Optional (Specify "-W" in part number)

DASH NUMBER	A	B	C
-0205	0.0025	0.005	0.017
-0408	0.004	0.008	0.022
-0610	0.006	0.010	0.026
-0815	0.008	0.015	0.033
-1019	0.010	0.019	0.039

Dimensions in inches unless otherwise specified.

PGE-Dash Number-ESQA-20D

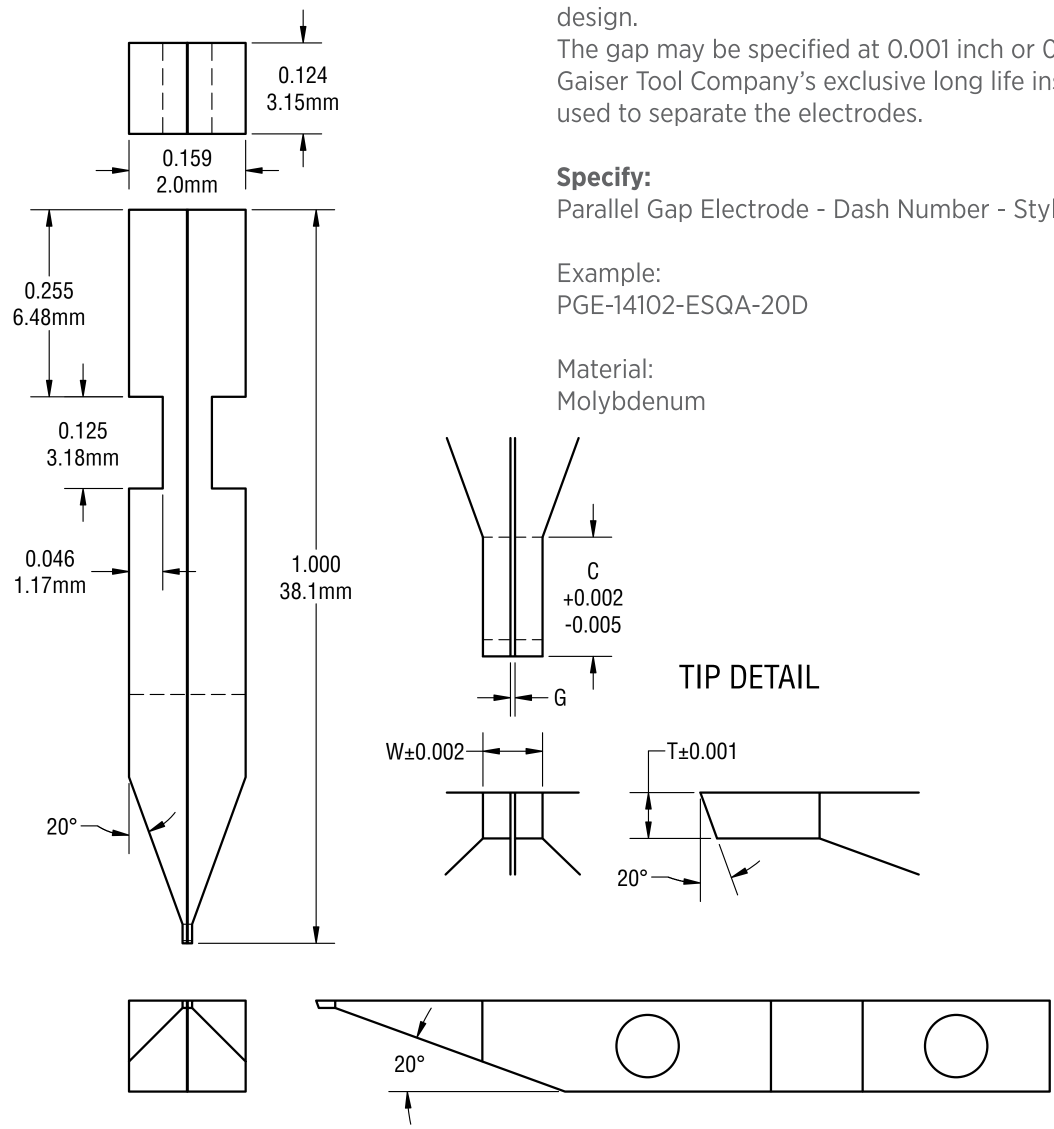
For The Hughes Welder

Features:
The PGE-Dash Number-ESQA-20D series is a fixed-gap, assembled version of the conventional two piece design.
The gap may be specified at 0.001 inch or 0.002 inch.
Gaiser Tool Company's exclusive long life insulator is used to separate the electrodes.

Specify:
Parallel Gap Electrode - Dash Number - Style

Example:
PGE-14102-ESQA-20D

Material:
Molybdenum



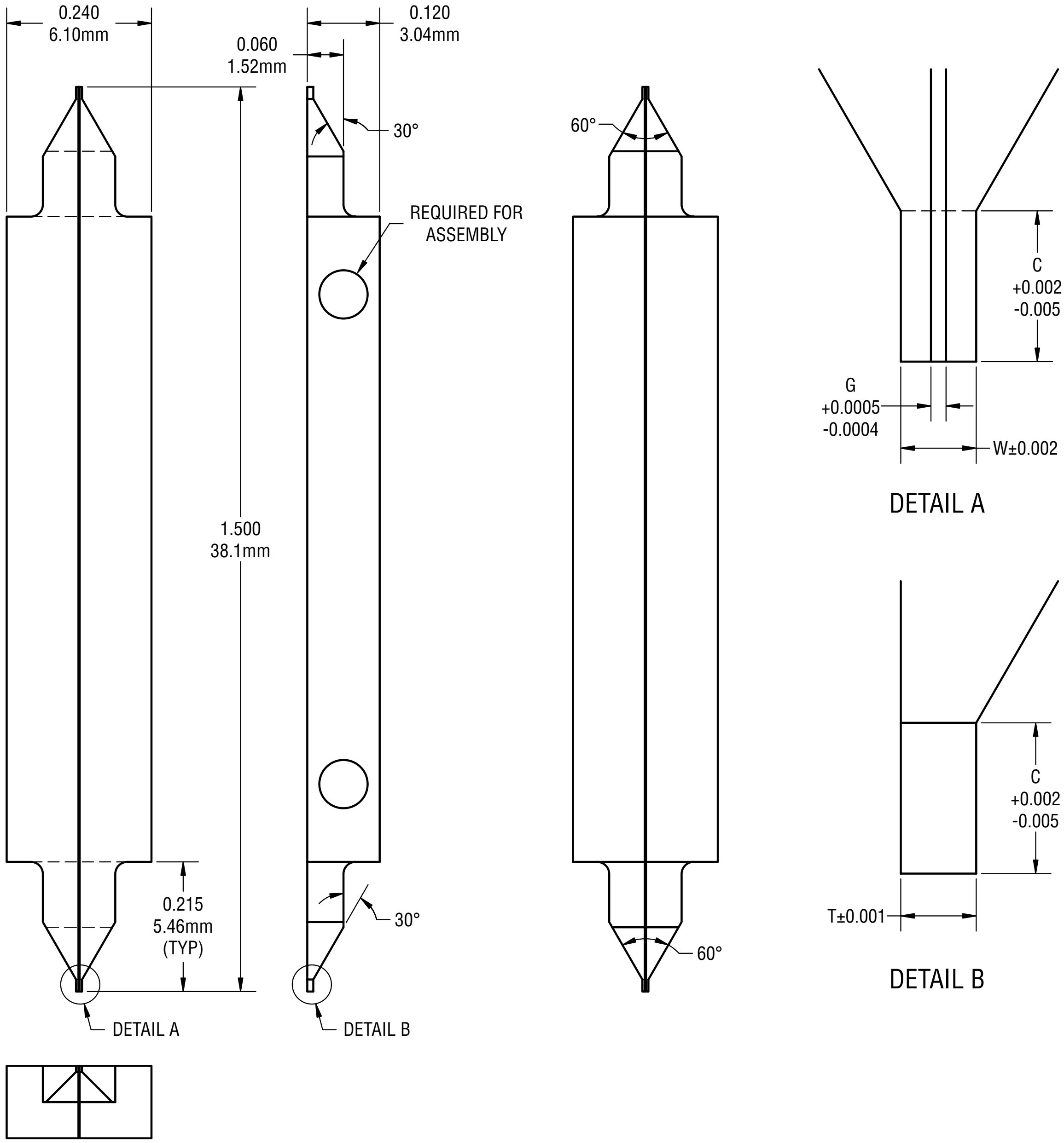
DASH NUMBER	W	T	G	C
-06051	0.006	0.005	0.001	0.017
-09081	0.009	0.008	0.001	0.022
-13101	0.013	0.010	0.001	0.026
-17151	0.017	0.015	0.001	0.033
-21191	0.021	0.019	0.001	0.039

DASH NUMBER	W	T	G	C
-07052	0.007	0.005	0.002	0.017
-10082	0.010	0.008	0.002	0.022
-14102	0.014	0.010	0.002	0.026
-18152	0.018	0.015	0.002	0.033
-22192	0.022	0.019	0.002	0.039

Dimensions in inches unless otherwise specified.

CoorsTek

PGE-Dash Number-DUO
For The Hughes Welder



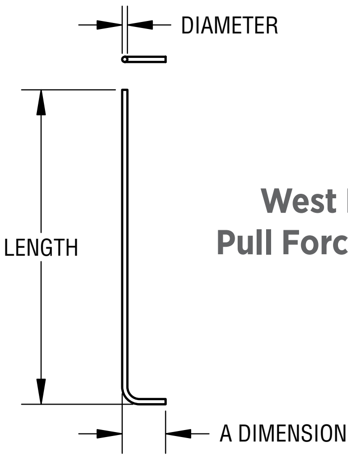
Specify:
Parallel Gap Electrode - Dash Number - Style

Example:
PGE-10102-DUO

Material:
Molybdenum

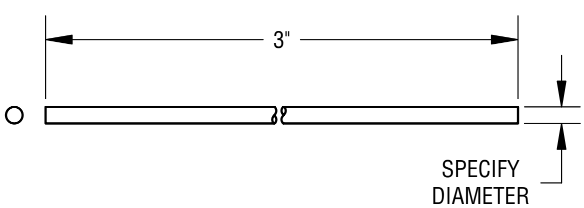
DASH NUMBER	W	T	G	C
-07052	0.007	0.005	0.0020	0.012
-10102	0.010	0.010	0.0020	0.020
-15203	0.015	0.020	0.0030	0.040
-33153	0.033	0.015	0.0030	0.060

Dimensions in inches unless otherwise specified.



West Bond Pull Force Hooks

West Bond Pull Force Hooks			
PART NUMBER	DIAMETER in. / µm	A in. / µm	LENGTH in. / mm
B-3958-1	0.003 / 76	0.010 / 254	1.25 / 31.8
B-3958-2	0.003 / 76	0.015 / 381	1.25 / 31.8
B-3958-3	0.003 / 76	0.020 / 508	1.25 / 31.8
B-3958-4	0.003 / 76	0.025 / 635	1.25 / 31.8
B-3958-5	0.004 / 102	0.010 / 254	1.25 / 31.8
B-3958-6	0.004 / 102	0.015 / 381	1.25 / 31.8
B-3958-7	0.004 / 102	0.020 / 508	1.25 / 31.8
B-3958-8	0.004 / 102	0.025 / 635	1.25 / 31.8
B-3958-9	0.003 / 76	0.006 / 152	1.25 / 31.8
B-3958-10	0.002 / 51	0.0045 / 114	1.25 / 31.8
B-3958-11	0.009 / 229	0.033 / 838	1.156 / 29.4
B-3958-12	0.005 / 127	0.015 / 381	1.25 / 31.8

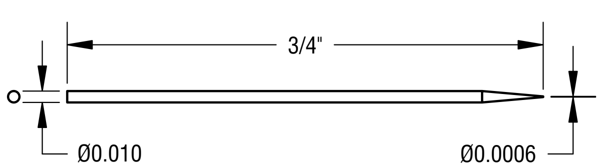


Cut Tungsten Wire

100 Pieces Per Set

Tungsten Wire	
Capillary Hole Diameter in. / µm	Suggested Wire Diameter for Unplugging in. / µm
0.0010 / 25	0.0009 / 23
0.0013 / 33	0.0011 / 28
0.0015 / 38	0.0013 / 33
0.0017 / 43	0.0015 / 38
0.0020 / 51	0.0017 / 43
0.0025 / 64	0.0022 / 56
0.0030 / 76	0.0027 / 69
0.0035 / 89	0.0029 / 74
0.0040 / 102	0.0035 / 89
0.0045 / 114	0.0041 / 104
0.0050 / 127	0.0044 / 112

Contact the factory for available sizes, sizes subject to change



1204 Unplugging Probe

25 Pieces Per Set

Dimensions in inches unless otherwise specified.

Common Abbreviations & Acronyms

Packages:

BGA	Ball Grid Array
CUEBGA	Copper via Metallization for Ball Grid Array Devices
DIP	Dual In-line Package
mBGA	Micro Ball Grid Array
MBGA	Metal Ball Grid Array
PGA	Pin Grid Array
PLCC	Plastic Leaded Chip Carrier
QFN	Quad Flat Non-leaded
QFP	Quad Flat Pack
SIP	Single In-line Package
SOIC	Small Outline Integrated Circuit
SOJ	Small Outline J-bend
SOP	Small Outline Package
TSOP	Thin Small Outline Package

Other:

ASIC	Application Specific Integrated Circuit
BPO	Bond Pad Opening
BPP	Bond Pad Pitch
COB	Chip on Board
CSP	Chip Scale Package
EFO	Electronic Flame Off
FAB	Free Air Ball
HDI	High Density Interconnects
I/O	Input/Output
IC	Integrated Circuit
LED	Light Emitting Diode
LTCC	Low-Temperature Co-fired Ceramics
MCM	Multi Chip Module
MCP	Multi Chip Packaging
MEMS	Micro Electro Mechanical Systems
MMS	Micro Module System(s)
PCB	Printed Circuit Board
SEM	Scanning Electron Microscope
SMT	Surface Mount Technology
SOC	System on Chip
Tg	Temperature of Glassification
VLSI	Very Large Scale Integrated Circuit

CoorsTek

Common Conversions & Terms

capillaries wedges tab tools die attach other

Common English/Metric Unit Conversions			
Known Units	Factor	Desired Units	Examples
Inches (in.) or (")	Multiply by 25,400	Microns (µ) or (µm)	0.0018 inch x 25,400 = 45.72 microns Therefore: 0.0018 in. = 46µm = 1.8 mil 0.0059 inch x 25,400 = 149.86 microns Therefore: 0.0059 in. = 150µm = 5.9 mil
Inches (in.) or (")	Multiply by 25.4	Millimeters (mm)	0.437 inch x 25.4 = 11.0998 mm Therefore: 0.437 in. = 11.1 mm 0.010 inch x 25.4 = 0.254 mm Therefore: 0.010 in. = 0.25 mm = 10 mil
Microns (µ) or (µm)	Divide by 25,400	Inches (in.) or (")	100 microns ÷ 25,400 = 0.003937 inch Therefore: 100µm = 0.0039 in. = 3.9 mil 25 microns ÷ 25,400 = 0.000984 inch Therefore: 25µm = 0.0010 in. = 1 mil
Millimeters (mm)	Divide by 25.4	Inches (in.) or (")	0.05 mm ÷ 25.4 = 0.001968 inch Therefore: 0.05 mm = 0.002 in. = 2 mil 1 mm ÷ 25.4 = 0.03937 inch Therefore: 1 mm = 0.039 in.

English/Metric Equivalencies & Special Terms	
Equivalencies	Special Terms
1 inch = 25,400 microns	1 mil = 1/1,000 in. = 0.001 in. = 1 thou = 25µm
1 inch = 25.4 millimeters	1 tenth = 1/10,000 in. = 0.0001 in. = 2.5µm
1 inch = 2.54 centimeters	1 thou = 1/1,000 in. = 0.001 in. = 1 mil = 25µm
1 micron = 0.00003937 inch	1 micron = 1µ = 1µm (µ = µm)
1 millimeter = 0.03937 inch	1 inch = 1 in. = 1" (inch = in. = ")
1 centimeter = 0.3937 inch	1.0 mil = 0.001 in. = 0.001" = 25µm = 0.025 mm

Note: Engineering data is representative. Property values vary somewhat with method of manufacture, size, and shape of part. Any suggested applications are not made as a representation or warranty that the material will ultimately be suitable for such applications. The customer is ultimately responsible for all design and material suitability decisions. Data contained herein is not to be construed as absolute and does not constitute a representation or warranty for which CoorsTek assumes legal responsibility. Any warranty or representation for which CoorsTek is responsible shall be subject to a separately negotiated agreement.

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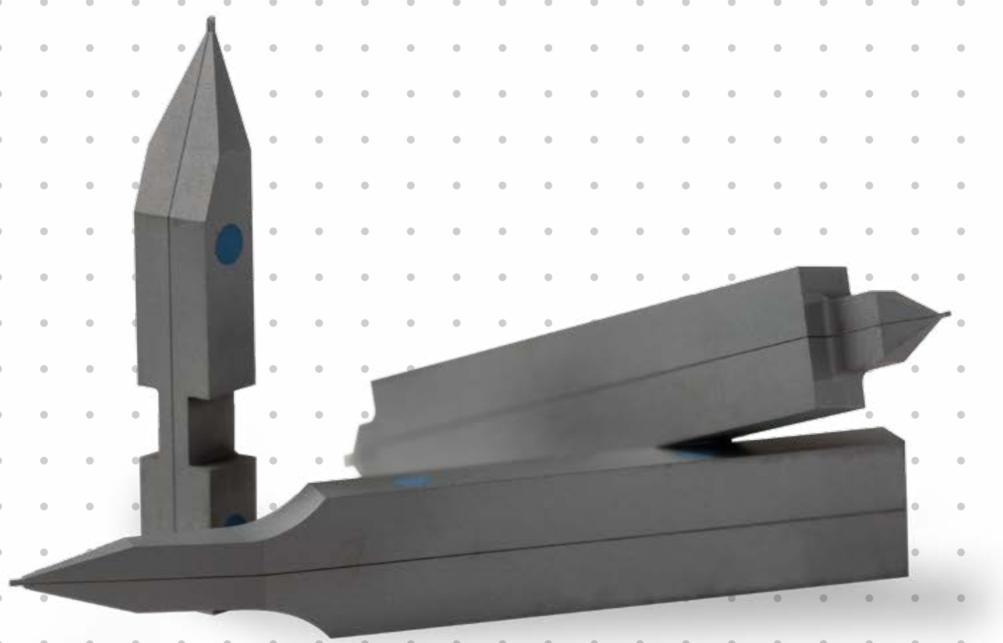
www.gaisertool.com



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