TOOL SELECTION

TOOL SELECTION

For every wire size there Is a series of tools available from DeWeyl with different bond lengths (BL). Unless the bond pad is the limiting factor, bond lengths of 2½ to 3 times wire diameter are recommended. The longer the bond length, the less critical the bond schedule.

BOND LENGTH & FOOT WIDTH

The correct bond length for a given job should be as large as the pad and adjacent obstacles will allow. The foot width is restrained by the distance between bonds, yet must be large enough to accommodate some degree of off-center wire flow as well as maximize the bonding area.

FRONT RADIUS AND BACK RADIUS

The **front radius** effects the rate of transition from the round wire to the flattened area of the bond. In general more gradual transition yields stronger and more consistent bonds, yet larger front radii either decrease the bond length or increase the tip size.

The **back radius** affects the “heel” of the bond. As the back radius is increased the heel is strengthened. The stronger heel aggravates the tail-pulling problem where the wire is broken too far away from the heel. Incorrect termination of the second bond leaves too much tail on the pad and not enough wire under the tool’s foot to successfully begin the next bonding sequence. Some back radius Is recommended, however, since a back radius of zero produces a “heel-crack” and an unreliable bond.

HOLE SIZE

Most bonding wedges Include a wire feed hole designed to lead the wire directly under the bonding foot. The diameter of the hole is normally about 250% of the wire diameter (apply's to small wire .00025 to .0015 only). In most cases this ratio is limiting enough to Insure proper wire centering, yet large enough to prevent excessive drag. As the width of the bond foot is decreased, however, a smaller hole (200% of wire diameter) may become necessary to satisfy the more critical wire centering problem.

WIRE FEED ANGLE

The wire feed angle is varied to accommodate obstacles near the pad which might foul the wire during the bonding operation. Larger wire feed angles increase the length of the hole and increase the drag potential. Two things are done to offset this effect. First, the entry of the hole is countersunk thus dramatically increasing the hole diameter through most of its length and incidentally creating a better target for manual threading. Second, the back edge of the shank near the tip is tapered or machined out. The latter solution implies a modification of the tool’s vibration characteristics discussed below. 30°, 45°, and 60° wire feed tools are available. 60° wedges are particularly applicable within high walled ceramic packages where pads are inaccessible to standard 30° and 45° wedges.

TIP-TO-SHANK RATIOS

Ultrasonic bonding wedges vibrate at ultrasonic frequencies effectively translating mechanical energy from the transducer and the transducer horn to the bonding environment. The amplitude of the tool’s vibration at its foot is a ratio of the input (shank) diameter to the output (foot) diameter. Therefore, bonding wedges are designed with varying tip-to-shank dimensional ratios.

A diminished tip dimension as in the case of the DeWeyl 60° Hi-Gain wedge vibrates at a high amplitude which rapidly dampens in contact with the bond surface.

A standard 30° wedge with the same input amplitude, will vibrate at a comparatively lower amplitude but dampens more slowly, presenting the hazard of over-working a delicate bond. In general, larger wire requires more energy to bond than small. Hence stiffer wedges work best as wire size increases.

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The Wire Feed Hole

The Wire Feed Hole Is Important

The feed hole on the bonding wedge is likely the most critical aspect of the wedge configuration. The feed hole has the responsibility of guiding the wire accurately to the center of the bond foot. The feed hole's most significant contribution is how it defines the looping performance for our customers.

Looping Performance

What do we mean by looping performance? Our customers use our product to attach wires between two points. This wire needs to have an arc shape in order to prevent shorting on other circuitry within the electronic device. If a wire is laid flat, it would sag down and touch other electrical points in the customer's product. If the wire is shaped into an arc similar to the shape of a bridge spanning a stream, then the wire is stronger, just like the bridge is stronger. This wire shape is what we call the loop profile. The loop profile can be very low or it can very high for a variety of different reasons. The loop profile will be dictated by the length of the wire, the diameter of the wire and the height difference between the first and second bond. Our customers have to consider all these factors when deciding which wedge to utilize.

Feed Hole Diameter

There is a very simple guideline to start with when selecting the diameter of the feed hole. Generally speaking, the feed hole diameter will be twice the diameter of the bonding wire. A .001" diameter wire will use a .002" diameter hole. Customers deviate from this general guideline for a variety of reasons.

Feed Hole Problems

The feed hole plays such a critical role that it can also be the cause of many performance problems. These problems can be very difficult for our customers to resolve quickly because the symptoms can be caused from several different sources. These problems include poor wire feeding, poor looping, wire damage, poor wire termination and difficulty threading the wire. This is why accuracy on the feed hole diameter, the feed hole length, and the funnel depth are extremely critical.

Feed Hole Wirelock

The feed hole gains control over the wire by producing "wire lock.” Wire lock is when the wire cannot slide through the feed hole. The wire is thus "locked" inside the feed hole. Wire lock takes place when the angle of the wire moves significantly away from the angle of the feed hole. In other words, the wire angle and the hole angle need to be at the same angle in order for the wire to freely pass through the feed hole. If the angles of the wire and hole are not the same, then there will be friction on the wire. The greater the angle differential the greater the friction. Eventually the friction is high enough to achieve wire lock. Then the tool is in control of the wire and in control of the loop profile. A couple of feed hole aspects can cause significant wire lock problems. The two primary aspects would be the hole diameter in relationship to the wire diameter, as well as the feed hole length.

Feed Hole Length

One of the other factors that contributes to wire lock performance is the length of the feed hole. The length of the feed hole is altered when the depth of the funnel is altered or if the "T" dimension of the tool is modified.

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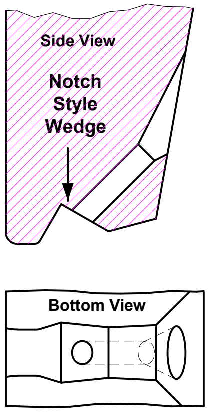
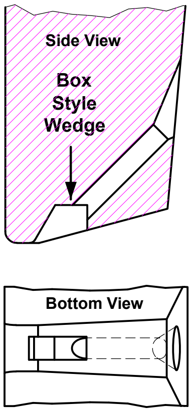
Wedge Tip Styles

Manual Wedge



Automatic Wedge



The DeWeyl product catalog offers a significant variety of tools. The general difference between "Automatic" bonding wedges and "Manual" bonding wedges hinges on the difference between "notch" and "box" style wedges.

The Notch Style Wedge

We make several variations of the notch style tool. The notch style wedge is designed for use on manual wire bonders. The notch style wedge can be modified with more aggression than the box style.

For example, we can offer a narrower "W" dimension on a notch style because the walls of the box are missing from a notch style tool. Our "CS" series is the best choice for manual wire bonders and is especially useful for our microwave technology customers.

Why is the notch style a poor choice for automatic wire bonding equipment? If you look closely at the sketch of the notch tool you will see how the wire is free to move side to side once it exits the feed through hole. It is this characteristic that prevents the notch tool from being selected for automatic bonding applications. When a manual bonding operator looks through the microscope to place the wire bond he/she will target the wire to the bond pad. Thus, if the wire shifts side to side it does not pose any significant problem with regards to placement accuracy.

However, automatic wire bonders cannot see when the wire shifts from side to side. The auto bonder can only assume knowledge of the center of the wedge and thus attempt to place that wedge center on the center of the bonding pad. Thus, excellent wire centering is needed when operating an automatic wire bonder.

Notch style wedges: AS, CS, KS, CSH, KSH, R, RCS, RCSH

The Box Style Wedge

This tool is best suited for automatic and semi-automatic wire bond equipment. Thanks to the tool design, the wire is contained from side to side movement until just before the bond foot area. This wire control helps keep the wire centered on the tool and offers enhancements to placement accuracy.

We offer many styles of boxed tools. Two examples would be the "CL" series and the other is the "CN" series. The "CL" series offers a bit more looping freedom than the "CN" style. Look closely at the "CN" catalog page and you will notice how the exit of the "CN" style is more restrictive than the "CL" style tool. This restriction can generate more drag on the wire during looping when compared to the "CL" series. Depending on the application, this extra wire drag will either be helpful or problematic.

Box style wedges: AL, AN, CL, CN, KN, KNL, CLH, CNH, KNH, KNLH, RKNH, RNH,

Please contact the DeWeyl factory for application specific recommendations.

Parameters

Ultrasonic bonding wedges are designed to carry high frequency mechanical vibrations together with the wire to discrete positions on a pad where pressure and ultrasonic "scrubbing" create a metallurgical bonding environment.

The satisfaction of all these requirement simultaneously for a full range of applications implies a wide variety of wedge configurations, which vary primarily to allow tool and wire clearance of obstacles on or near the pad. Wedge configurations possess three main design elements: the bonding foot; the hole and wire feed angle; and the tlp·to-shank ratio.

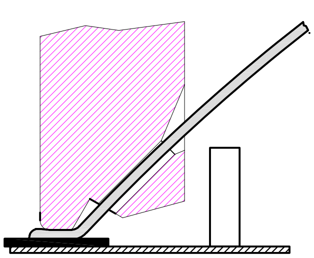
No definite values for the parameters of force, time, and power can be given for an optimum bonding schedule because of different wire bonding surfaces, semiconductor die, and package characteristics.

The general guideline for establishing optimum bonding is that the bonding parameters be adjusted so that reducibility is maximum yet high bond pull strength is maintained.

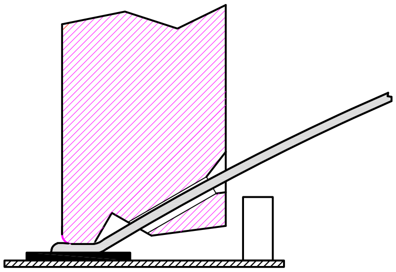
Dimensional Variables

Bonding wedge dimensions vary primarily to permit access of the tool and wire to tightly confined points on the pad.

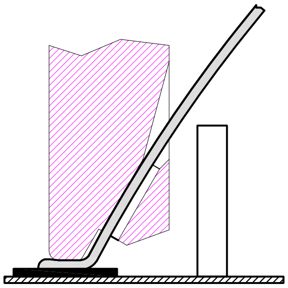
The overall tip length and width, and the tip clearance dimensions are important considerations In the selection of a wedge for a given task .



45° Hole Angle

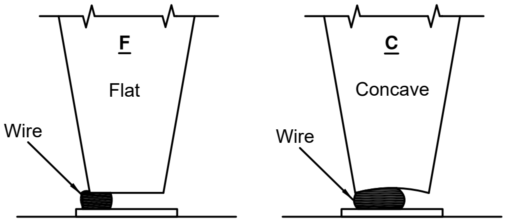


30° Hole Angle



60° Hole Angle

Profile



-- FIG. 5 --

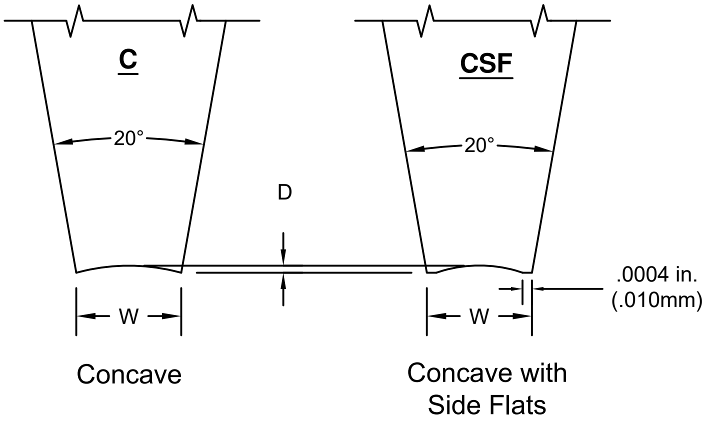
The face of the bonding foot may be flat concave, the latter being the most widely accepted configuration. The concave face creates an Inward force component which keeps the wire toward the center of the foot. Flat faced wedges present the possibility of off-center bonds In which wire material Is squeezed off to the side.

Wire Diameter:
Wire size is selected on the basis of device requirements and bonding pad size. One mil AL, 1 % Si wire is used In most devices; however, usage of 1¼ mil diameter Is growing.

Elongation: Low elongation (½ - 1 ½) is normally required so the wire may be broken after the second bond. Too great elongation results in excessive rebonding.

Tensile Strength: Relatively hard wire is needed for small diameter wire (< 2 mil) with tensile strength ranging from 15-19 grams for 1 mil and 19-21 for ¼ mil. Higher tensile strength (harder) may fracture silicon (cratering), under the bond. Lower tensile strength (softer) wire reduces the range of bonding schedules.

Concave Bonding Wedges



The Concave Bonding Wedge is offered for customers using small diameter aluminum bonding wire. Small diameter wire is generally viewed as wire that runs between .001" dia. Up to .002". Aluminum wire (small) is offered in the following diameters. .001", .00125", .0015" and .002". Anything over .002" diameter is usually considered a large wire application.

Additionally, the Concave Bonding Wedge is used for bonding aluminum wire, because the arch at the back of the bond foot offers additional material thickness, and thus strength for the wire. Aluminum wire is very brittle and needs this additional thickness to minimize the chance that the aluminum wire could easily break at the heel of the bond foot.

Concave With Side Flats

This tool is identical to the "Concave" tool and is used for the same reasons. However, occasionally we will have a customer using gold wire with the concave style tip. As a result, the outside edges of the wedge may contact the bonding surface when the bonding wire is deformed. To prevent the tool contact on the edges, we offer side flats to give extra clearance, thus eliminating the tool contact to the bonding surface.

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THE CSF BONDING TOOL

Greatly extended tool life and improved “pull strength” are the principal attributes of the newly developed CSF Bonding Tool. Extensive testing at numerous semiconductor plants indicate an expected tool life 300% to 500% above that experienced using concave tools. Comparative pull test data show an increase in average bond strength with an accompanying decrease in standard deviation.

Photograph No. 1 illustrates the highly polished side flats which minimize edge erosion and protect both tool and die in the event of accidental contact.

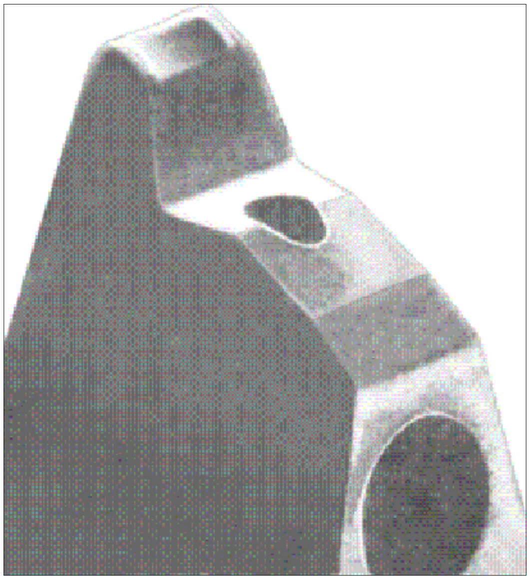

Photo 1. DeWeyl CSF Ultrasonic Bonding Tool This photo shows are CS-Series with a A6 option

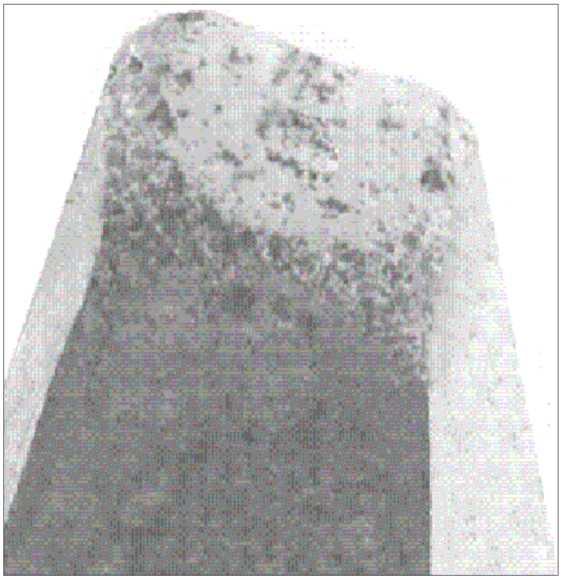

Photo 2. Typical concave Ultrasonic Bonding Tool after 100,000 bonds

THE CSF BONDING TOOL

- EXTENDED TOOL LIFE
- HIGHER BOND STRENGTHS
- LESS BONDER DOWN TIME
- LOWER COST PER BOND

Photograph No. 2 shows a standard concave tool after 100,000 bonds. The sharp edges have started the normal breakdown process. Micro-chipping will swiftly progress to ultimate tool failure—the typical wear-out mode of both concave and flat tool geometries.

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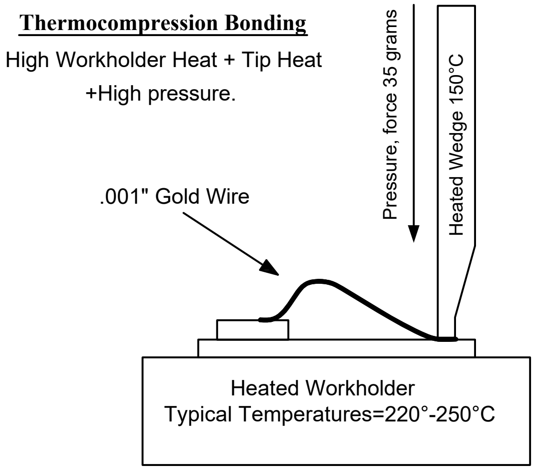
Thermocompression Bonding

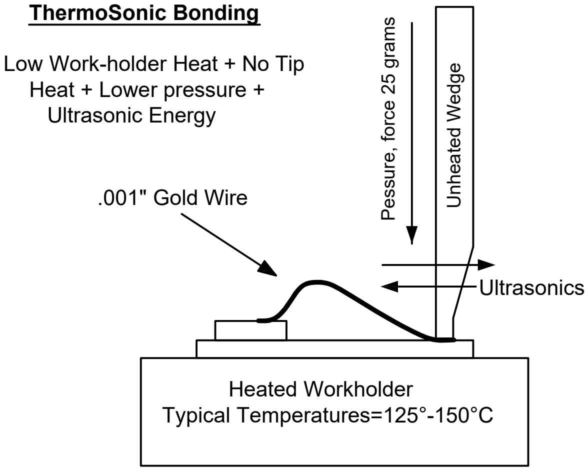


The microwave industry primarily uses a method called "thermocompression bonding" on gold wire.

Thermocompression bonding is used for bonding gold wire with heat, pressure and time. No ultrasonic energy is applied to the bond wire. This bonding process requires elevated temperatures during the bonding process when compared to "thermosonic bonding".

The heat is supplied by a heated workholder, which holds the part being bonded. The bonding wedge is usually heated as well. The bonding machine supplies the pressure as it pushes down the wedge onto the wire. The time or duration is how long the bonding wedge sits on the wire.

ThermoSonic Bonding

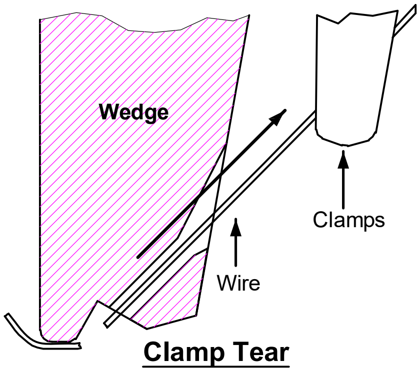


Thermosonic bonding is used for bonding gold wire with less heat, less pressure and less time, when compared to the thermocompression technique. This bonding process allows reduced temperatures during the bonding process.

The addition of ultrasonic energy is what allows all of the reductions in heat and pressure. The lower heat is still supplied by a heated workholder, which holds the part being bonded. The bonding wedge is usually unheated. The bonding machine supplies the lower pressure as it pushes down the wedge onto the wire. The time or duration is how long the bonding wedge sits on the wire and this time requirement is typically reduced as well.

The ultrasonic energy results from a mechanical vibration of the wedge at a standard frequency of 63khz. New high frequency systems offer frequencies of 110-120Khz. The ultrasonic vibration of the wedge is what allows all the reduction in forces and temperatures, and scrubs the bonding wire into the metal interface.

Wire Termination Methods



Clamp Tear

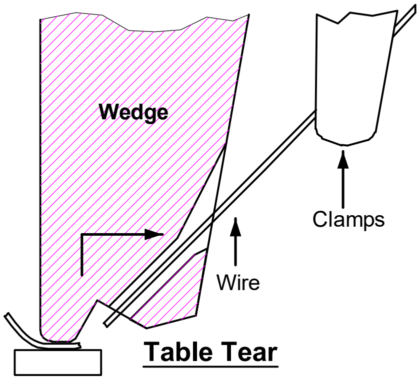


Table Tear

There are two basic methods that wire bonding equipment use to terminate the wire bond. The first is called clamp tear and the second is called table tear.

Clamp Tear

Just like it sounds, the wire bonding machine uses a set of clamp blades to clamp on to the wire immediately after the last wire bond contact is made and the clamps actually move back and pull on the wire with enough force to break the wire. This wire clamp movement must be done while the bonding wedge is in contact with the wire. The tool is pressing down on the wire while the clamps are pulling on the wire.

This sequence is very important. If the wedge is not holding the pressure down on the wire, the clamp pull force would likely lift up the already bonded wire connection. How does the wire know where to break? The wire will break at its weakest point. Where is that weakest point? If we assume that the correct bonding wedge is used, the weakest location will be at the back radius of the tool. This semi-sharp portion of the tool is designed to weaken the wire strength and allow for the wire to break at a predictable location. Many manual machines and a some automatic wire bonders use this technique to terminate the wire.

Table Tear

This method still utilizes a set of clamp blades, however the clamps only clamp on the wire and do not have a motion to pull back on the wire. Instead, the wire bonding machine lifts up the wedge after the last bond is complete. This lift elevation is extremely low and is measured in just a few thousandths of an inch. After the tool lifts from the surface, the table moves such that the tool steps back and as a result breaks the wire.

Once again, how does it know where to break? The back of the bond foot has been weakened by the back radius design of our wedge. As a result of the semi-sharp back radius, the wire breaks at the desired location.

Since this wire termination method requires some motorized table movement, it is almost exclusively used on automatic wire bonders. The automatic equipment engineers like to use this method out of consideration for bonding speed. They can perform a table tear method faster than trying to perform a clamp tear sequence, because every fraction of a second is considered.

VERTICAL FEED / DEEP ACCESS

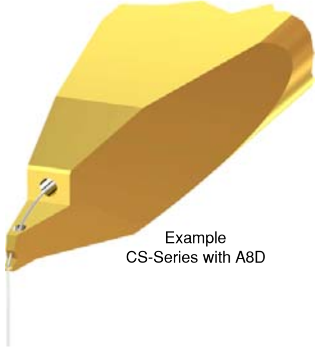
OPTIONS FOR DEEP ACCESS APPLICATIONS
DeWeyl Tool has the wedge technology solution for all application needs. The following highlights a few of our many product offerings. Please refer to the Tool Options page for other design solutions to common problem situations that can occur during normal bonding applications.

VERTICAL FEED / DEEP ACCESS
DeWeyl Tool continues to offer the industry's first high technology bonding wedge for deep access applications, as well as for standard wire feed angles. Our Vertical Feed/Deep Access bonding wedges offer significant solutions in maintaining maximum looping and tail control.

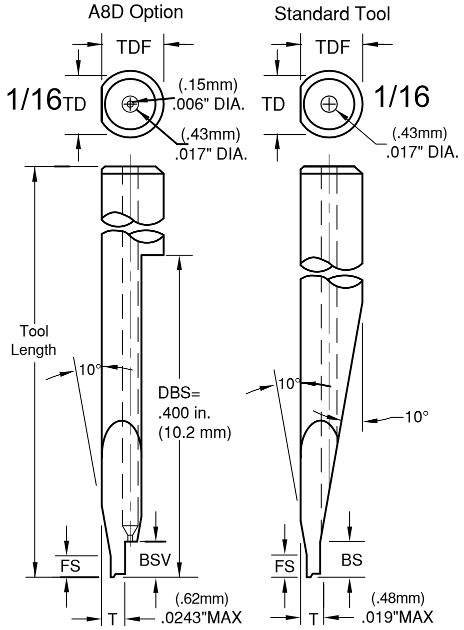
Our product line includes a wide selection of Vertical Feed/Deep Access bonding tool solutions for manual, semi-automatic and automatic bonding equipment. A minimum of three material choices are available for your consideration: Tungsten Carbide, Titanium and Ceramic. Additionally, our vertical feed bonding wedges are offered with 45 degree, 52 degree and 60 degree feed hole angles.

DeWeyl Tool understands that today’s complex Vertical Feed applications require gold bonding of .0007” diameter wire. Our extensive micro-machining experience has allowed the development of wedges for eve .0005” diamter wire, utilizing bond lengths of .0005” and fed holes of .001”.

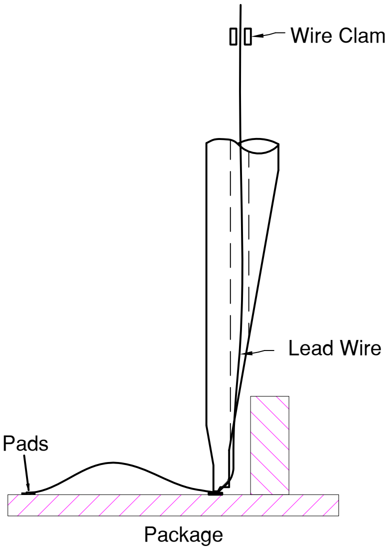
The DeWeyl Vertical Feed tools, along with their basic design specifications, are indicated accordingly within our online and PDF catalogs. Please visit the appropriate wedge style category for your specific needs, or consult your local representative or the DeWeyl factory to discuss your application requirements.



A8D Option for Vertical Feed/Deep Access Applications



Example:
C-Series (left) A8D OPTION, (right) Standard Vertical Feed



DeWeyl has developed an exclusive design for the Vertical Feed/Deep Access applications identified as the "A8D" option. This feature maintains maximum control during the looping and feeding operations of your equipment, and is highly recommended for maximum Vertical Feed/Deep Access performance. Please pay particular attention to the "Problem and Solution" drawings on the Tool Options page.

Note: The A8D option is not suitable for use with **F&K Delvotec** and **Hesse Mechatronics** machines.

TECHNICAL DATA

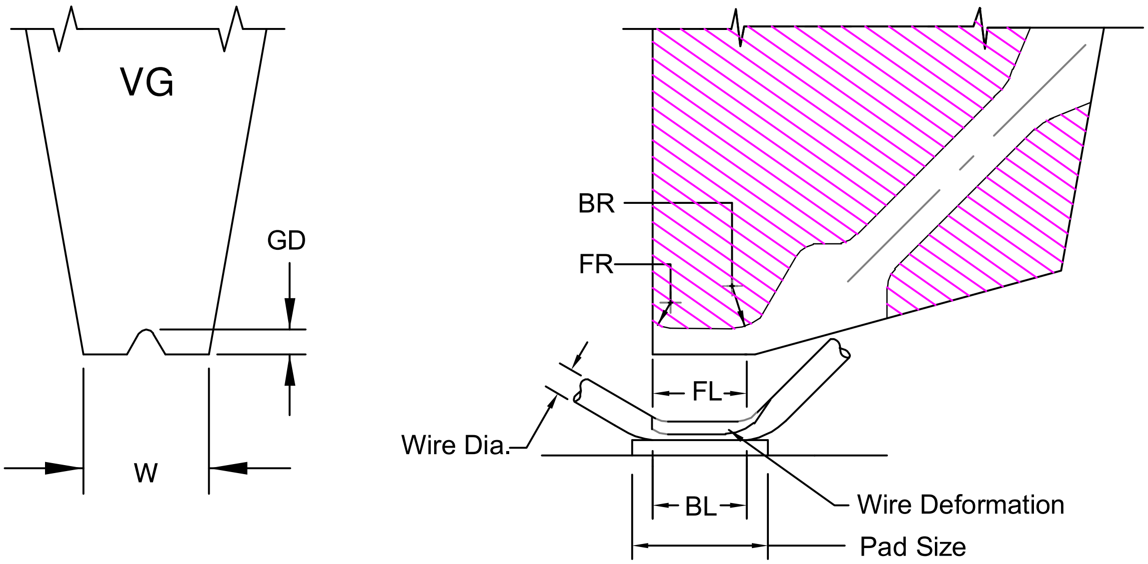
"V" GROOVE BOND LENGTH ILLUSTRATION

In this illustration we are showing a “V” Groove bonding foot for larger wire, .003 through .0160 Notice that the FL (Foot Length) and the BL (Bond Length) are the same dimension. When choosing a tool size use the following bonding formula:

70% of the FR (Front Radius) plus the BF (Bond Flat) plus 35% of the BR (Back Radius) equals the BL (Bond Length).

Example: .70 (.002 FR) + .0021 BF + .35 (.007 BR) = .006 BL

For this size bond length you may need a pad size of .0075 using 80% coverage of bond pad in wire direction. In this case the tool size you would choose from our dimension chart for .003 diameter wire would be 4560. Again, the sizes on our chart are the most common, but you may choose any size using this formula.



On "V" Groove Tools the Foot Length (FL) equals Bond Length (BL).

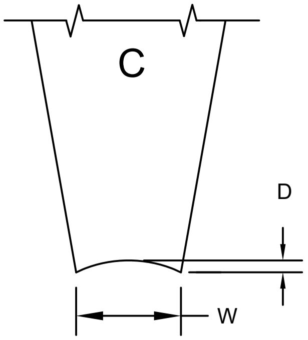
TECHNICAL DATA

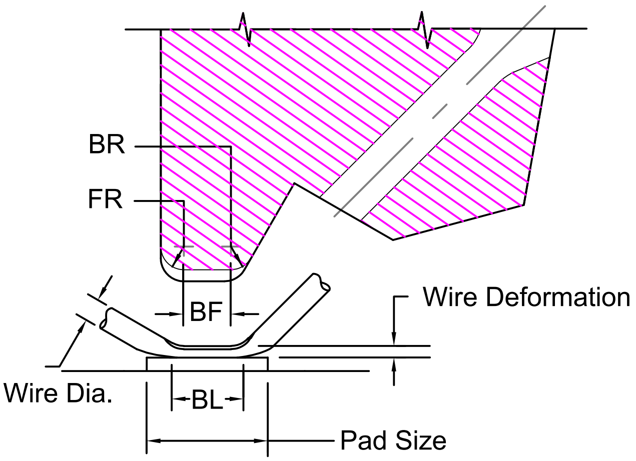
SMALL WIRE BOND LENGTH ILLUSTRATION

We are showing our style of Concave tool in the Small Wire Illustration with instruction on how to determine bond length and how the bond would look. Bond length is the bottom surface of the wire that is bonded to the chip. We calculate the bond length by adding the bond flat dimension plus **1/3 of the FR (Front Radius) dimension plus 1/3 of the BR (Back Radius)** dimension. So when trying to decide what tool size to choose, find the smallest pad size within the package and multiply 50% to 70% times the pad size in the wire direction. One concern here is to understand how much space you need for targeting your wire onto the bonding pad. Some operators need less space than others. If this is the case then you may want to use a larger % basis to determine a larger bond length. The tool sizes shown in our catalog are the most common but you may select any size that is not shown by using this formula.

Example: 50% x .002 (pad size) = .001 (bond length)

For .0007 wire your selection for tool size would be 1510.





Bond Flat (BF) + 1/3 Front Radius (FR) + 1/3 Back Radius (BR) = Bond Length (BL).

Front Radius and Back Radius

The front radius and back radius of the bonding tool can sometimes seem like something rather insignificant. But actually, the proper selection of radii, especially the back radius, is very important to the strength of the wire bond system. The FR and BR need to be modified based on the type of wire being bonding, i.e. gold or aluminum. You must also consider the wire size when deciding the size of the radius. Generally speaking, gold wire will use a smaller back radius to help cut the wire cleanly. Aluminum wire is harder and more brittle. It needs to have a smoother radius to prevent cracking of the wire.

Front Radius **(FR)** The front radius of the bond tool needs consideration on the second bond. The first bond does not matter much with regard to the front radius. The front radius' main job is to offer a smooth and gentle transition between the bond flat and the wire diameter at the second bond contact. The most common choices for the **front radius on .001" diameter wire is FR= .001" for both aluminum and gold wire.**

Back Radius **(BR)** The back radius is the critical radius. If this is selected incorrectly an aluminum wire may break very easily or a gold wire may not terminate properly. The most common choices for the **back radius on .001" diameter wire** is **BR= .001" for aluminum wire and BR= .0005" for gold wire.**

ULTRASONIC GOLD WIRE AND RIBBON BONDING

Deep Access-Vertical Feed Applications

DeWeyl Tool Company continues to offer the industries first high technology bonding wedge for “deep access” applications as well as standard wire feed angles. DeWeyl's “deep access” or “vertical feed” bonding wedges offer significant solutions in maintaining maximum looping and tail control. DeWeyl vertical feed bonding wedges are offered with 45°, 52° and 60° feed hole angles. Common bonding wedge materials such as Tungsten Carbide and Titanium Carbide have exhibited specific performance limitations thus DeWeyl Tool Company developed the industries first ceramic tip-bonding wedge.

DeWeyl's ceramic tip bonding wedge offers a unique and enhanced surface texture. This surface texture allows optimum ultrasonic coupling with the wire structure. This results in a superb *tool to wire* interface and thus efficient ultrasonic energy transfer. The DeWeyl ceramic tip wedge offers impressive benefits for gold wire, aluminum wire and gold ribbon ultrasonic applications. Here are some of the reported advantages when using DeWeyl's ceramic tip wedge:

- INCREASED BOND ADHESION
- INCREASED PULL TEST RESULTS
- ULTRASONIC OUTPUT REDUCTION
- EXTENDED WEDGE LIFE
- IMPROVED BOND DEFINITION
- GOLD BONDING AT AMBIENT TEMPERATURES

In addition to the ceramic tip wedges, DeWeyl has developed an exclusive design for the “vertical feed” applications identified as the “A8D” option. This feature maintains maximum control during the looping and feeding operations of your equipment. It is highly recommended for maximum vertical feed/deep access performance.

Note: The A8D option is not suitable for use with **F&K Delvotec** and **Hesse Mechatronics** machines**.**

In order to take full advantage of the ceramic tip tool on ultrasonic gold wire applications we recommend using 0.5-2% wire elongation. This wire elongation will offer the best response to the ultrasonic energy. However, some applications may find acceptable performance from 1-3% wire elongation. Thick film applications may find additional advantages in using a cross-groove style bonding tip in addition to the ceramic material.

DeWeyl Tool Company understands that today's complex vertical feed applications require gold bonding of .0007” diameter wire. Our extensive micro-machining experience has allowed the development of wedges for even .0005” diameter wire, utilizing bond lengths of .0005” and feed holes of .001”. Please do not hesitate to consult your local representative or call the factory direct to discuss your application requirement. DeWeyl Tool Company has the wedge technology solution for your application.

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ULTRASONIC BONDING

PROCESS

Ultrasonic wedge bonding presents an alternative to thermo-sonic and thermo-compression bonding techniques.

The key difference between the two is that the latter employs heat energy, while ultrasonic bonding uses mechanical energy together with pressure and time to effect a bond.

The ultrasonic technique is applicable with materials of low heat tolerance, and particularly, to the bonding of aluminum wire. Ultrasonic bonding to date, is the most successful and proven method for work with aluminum.

In the ultrasonic bonding process, a metallurgical bond is achieved through the proper transmittal of ultrasonic energy under pressure to the bond Interface. Consistent and reliable bonding requires optimized parameters as Illustrated in the following paragraphs. The parameters to consider are power, clamping force (pressure), time, mating of tool geometry with wire, and bonding pad and package condition.

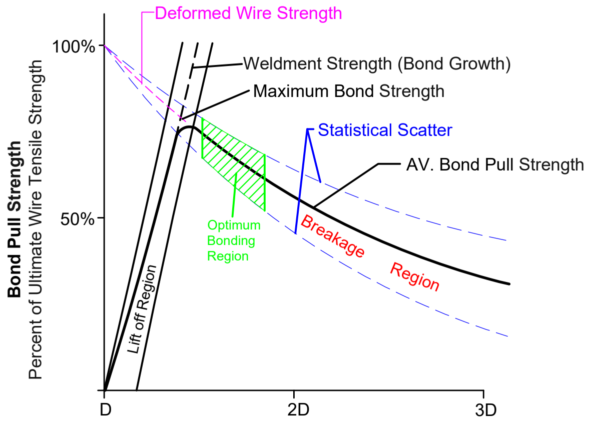
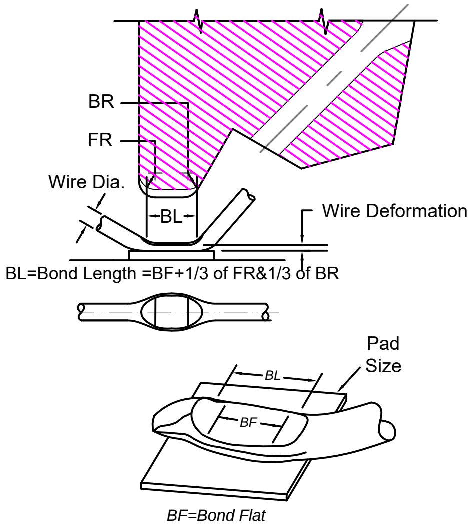


Fig. 1 - Bond Pull Strength vs.
Deformed Width or Ultrasonic Power

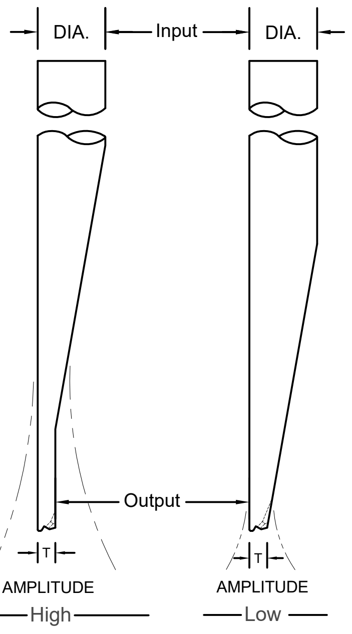
Figure 1 shows the relationship of the bond pull strength In percent of ultimate wire tensile strength to the deformed width of the bond (see Fig. 2). Three sets of curves of bond pull strength versus power, time, or clamping force can be obtained by varying one of these parameters while holding the other two constant at their optimum. Each curve Is similar to, and can be related to, the curve of bond pull strength versus wire deformed width.

As each parameter is increased, the weldment grows stronger in lift off strength through bond growth. At the same time, due to wire deformation, the transition from the wire into the weldment becomes weaker. The failure mode changes from weldment failure (lift off) to wire breakage failure. Maximum pull strength is at the intersection of the two failure modes. Lowest reproducibility is within the lift off failure mode and within the breakage failure mode after the deformed width exceeds two times the wire diameter. Highest reproducibility is within the breakage failure mode, directly after, but less than the maximum pull strength.

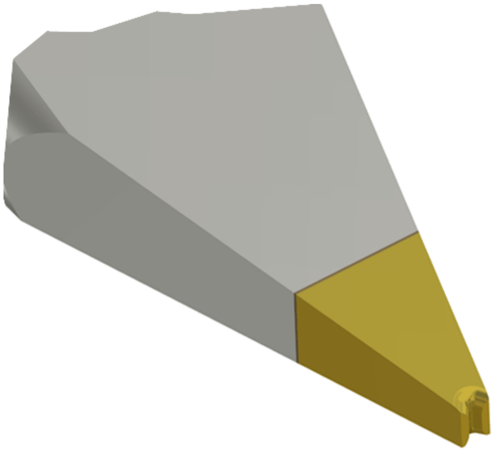
Fig. 2 - Plastic Deformation of Wire



AMPLITUDE



The Ceramic Advantage



Why Ceramic?

DeWeyl Tool developed the industry's first Ceramic tip bonding wedge, because common bonding wedge materials such as Tungsten Carbide and Titanium exhibited specific performance limitations.

The ceramic material is bonded to a tungsten carbide shank utilizing, once again, a process developed and mastered by DeWeyl Tool. And, while designed primarily for ultrasonic bonding of gold wire, many customers have reported tremendous tool life while bonding aluminum wire with very little aluminum build up on the bond flat. Please refer to the Recommendations page for further details.

BENEFITS

Our Ceramic tip wedge offers impressive benefits for both gold wire, aluminum wire and gold ribbon ultrasonic applications. It also has a proven track record on both production and R&D products. Here are some of the reported advantages when using our Ceramic tip wedge:

- Increased Bond Adhesion
- Increased Pull Test Results
- Ultrasonic Output Reduction
- Extended Wedge Life
- Improved Bond Definition
- Gold Bonding at Ambient Temperatures
- Improved Production Yields

ULTRASONIC EFFICIENCY

One of the most significant benefits of the DeWeyl Ceramic wedge is the excellent tool to wire interface. The ideal ultrasonic bonding wedge allows for zero tool slippage while in contact with the wire and during the application of ultrasonic energy. If the tool has zero slippage then the ultrasonic transfer of energy is operating at 100%. This is the value of the Ceramic wedge. The naturally porous structure of the Ceramic offers a surface texture that couples with the wire giving optimum ultrasonic transfer. This efficiency in transfer allows for a reduction in ultrasonic power and time levels, which results in a superb tool-to-wire interface and thus efficient ultrasonic energy transfer. Difficult applications due to low bonding temperature or contaminated bond surfaces are made easier with the use of the Ceramic tool.

ECONOMICAL

The standard angle feed Ceramic wedge (non vertical feed) costs only 8% more than the cost of titanium. And the cost of a vertical feed Ceramic tool is only 18% more expensive than the cost of titanium. The additional cost for ceramic becomes very economical when DeWeyl customers understand that the life expectancy of Ceramic is 2-3 times greater than other available materials. The net cost per bond thus is significantly lower with the Ceramic wedge.

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