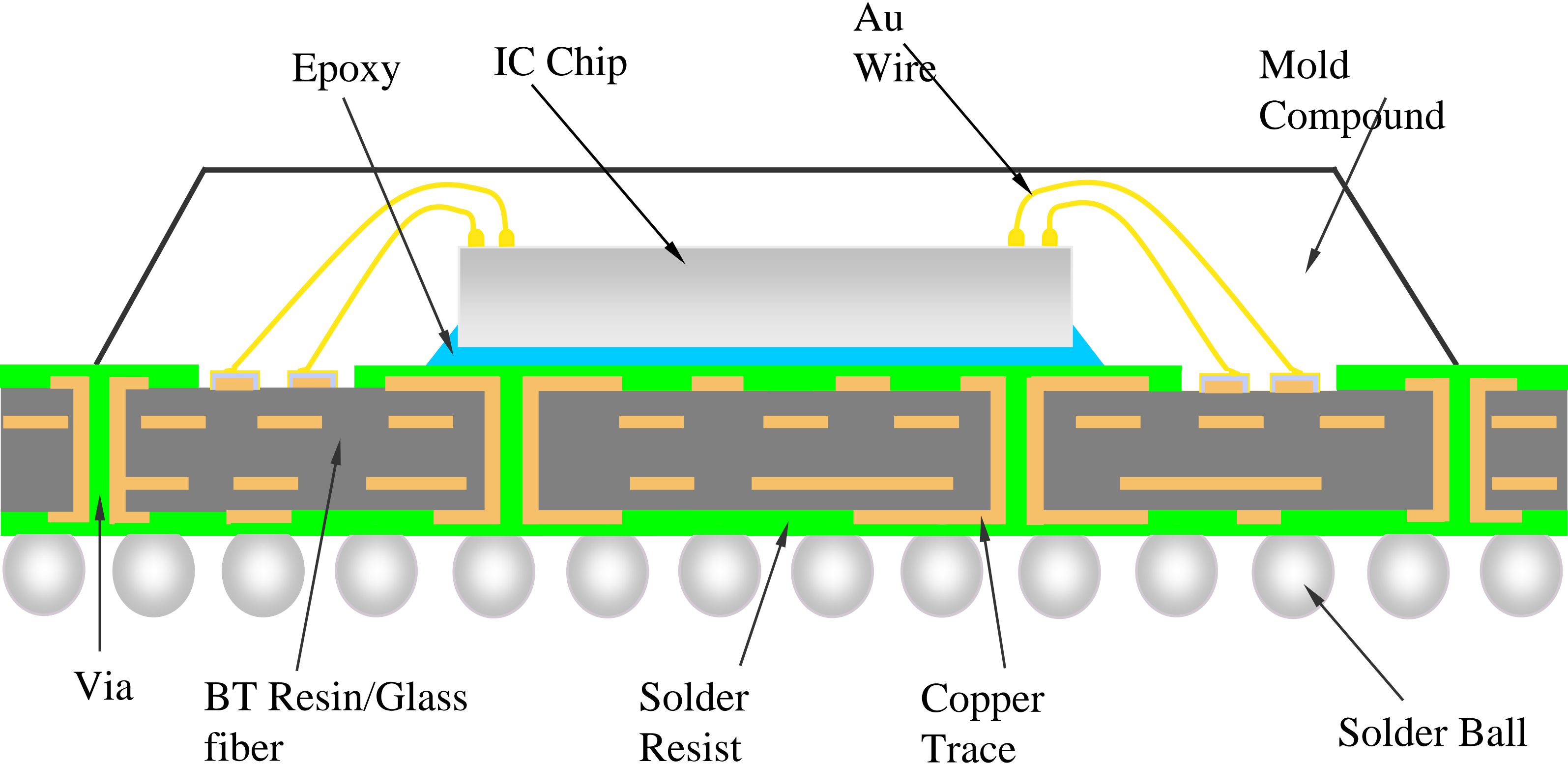
Wire Bonding Technology

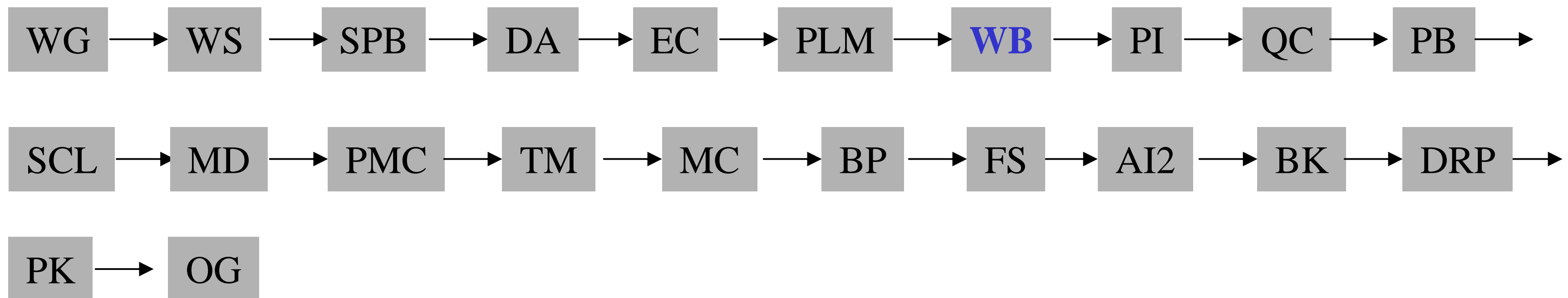
BGA-Ball Grid Array



Process flow

* *BGA manufacturing process introduction*

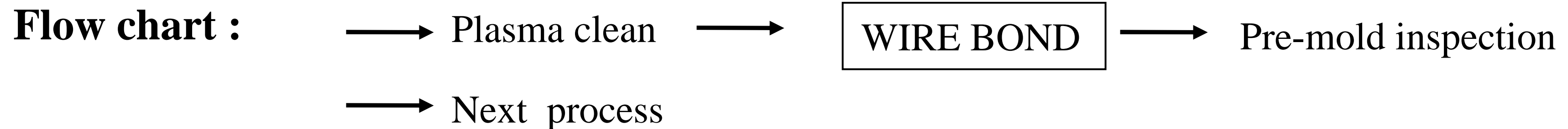
Flow chart :



* *Wire bond*

Purpose : Build up electronic connection between the die and the lead .

Flow chart :



Wire Bonder introduction

K&S Ball bonder series: 8020/ 8028/ 8028S/ 8028PPS

Wire Bonder Capability for K&S 8028PPS

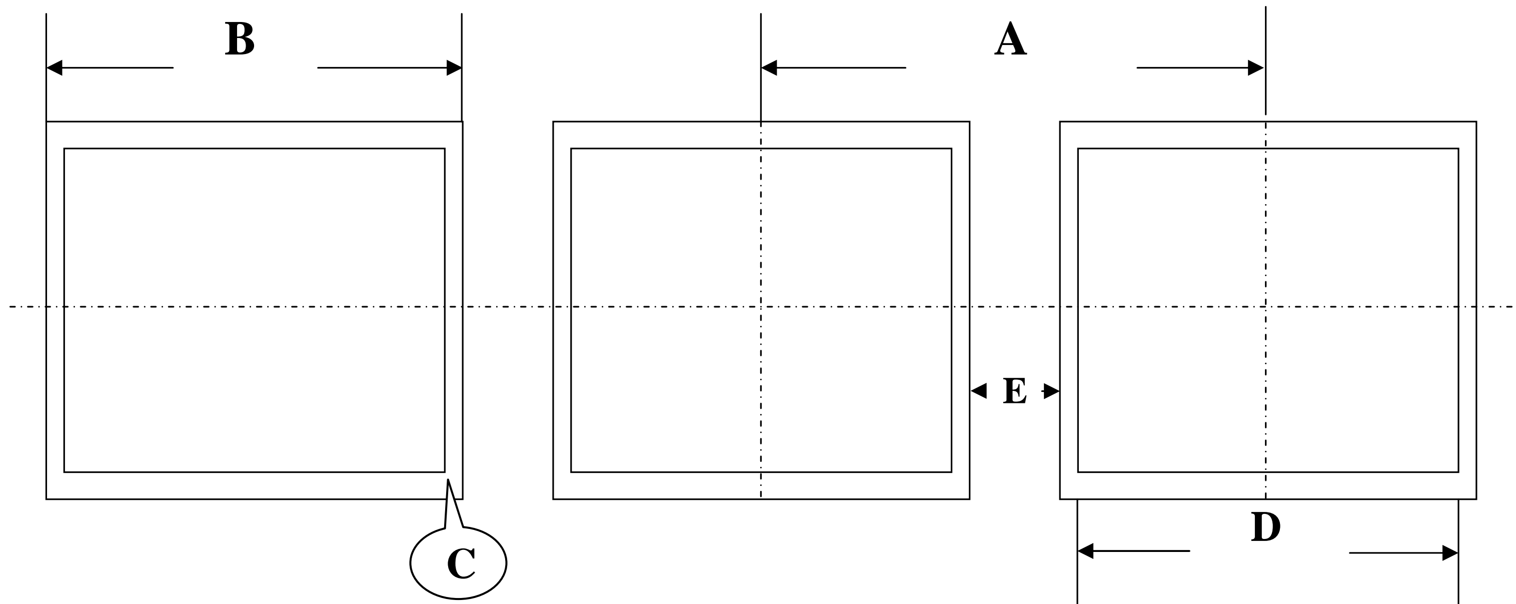
Bonding Area (X*Y)	50 mm (X) by 65 mm (Y) (2.0” (X) by 2.56” (Y))
Wire Capacity	3500 wire per process program
Wire Length	0.51 to 7.62 mm (0.020” to 0.300”)
Loop Height	0.10 to 0.64 mm (0.004” to 0.025”)
Bond Height Differential	2.3 mm (0.090”)
Wire Diameter	20 to 38 micron (0.8 to 1.5 mil)
Bond Pad Size	Minimum 50 micron
Substrate Material	Normal

Wire Bonding Characteristic **for K&S 8028PPS** :

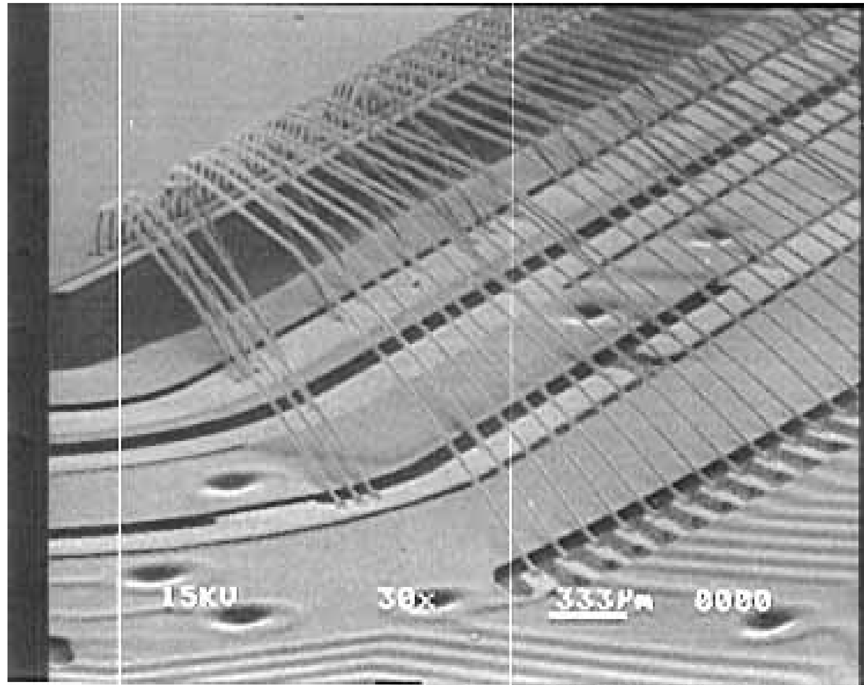
Characteristic	micron	Mils	# of wire diameters
Loop Height Variation	+/- 25.4	+/- 1.0	+/- 1.0
Wire Straightness (+/- 1% wire length for wires > 100 mils)	+/- 25.4	+/- 1.0	+/- 1.0
Ball Concentricity	5.0 TIR	0.2 TIR	0.5 TIR
Ball Size Repeatability (Squashed)	+/- 3.5	+/- 0.14	N/A
Bond Placement Repeatability	+/- 3.5	+/- 0.14	N/A
Crescent Bond Squash (one sigma) Length Range: 1 to 3 wire diameters Width Range: 2 to 5 wire diameters			
Bond Pull Cpk >= 1.67			
Ball Shear Cpk >= 1.33			

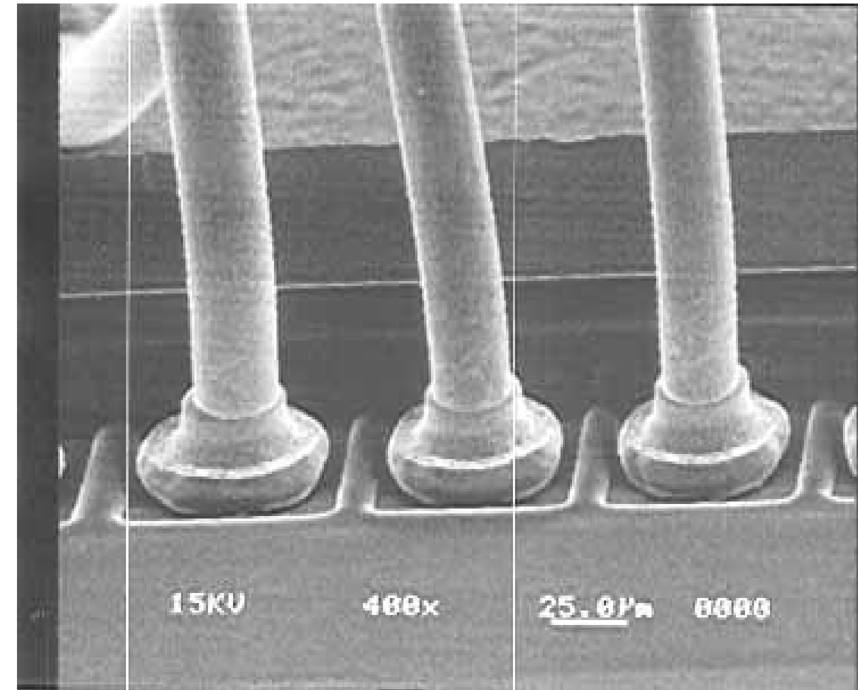
BPO & BPP Introduction:

A: Bond Pad Pitch(鋁墊中心點與鋁墊中心點的距離)
B: Bond Pad Size(鋁墊大小)
C: Passivation(保護層)
D: Bond Pad Opening(鋁墊開窗大小)
E: Space(鋁墊與鋁墊間隔/距離)



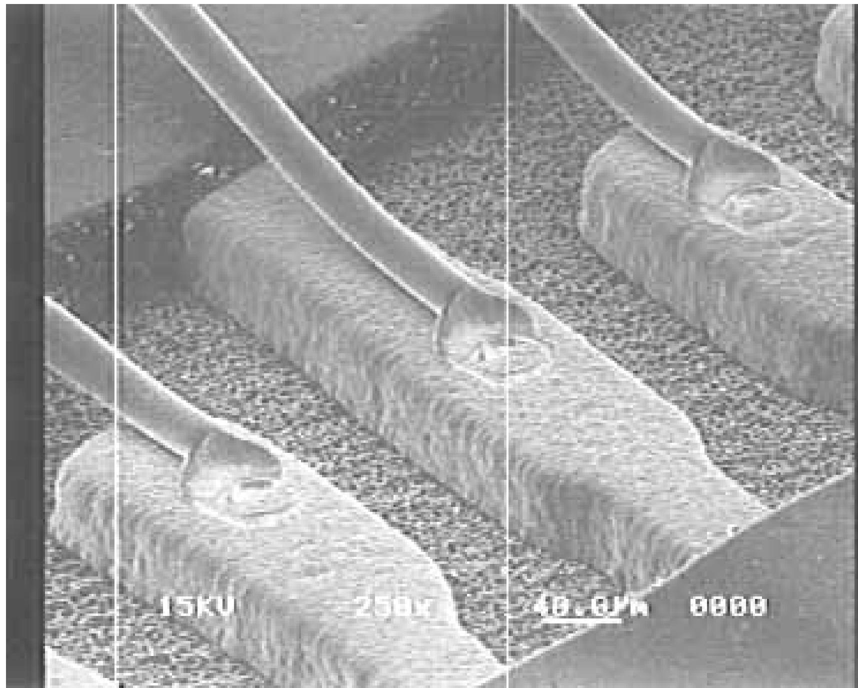
1st bond

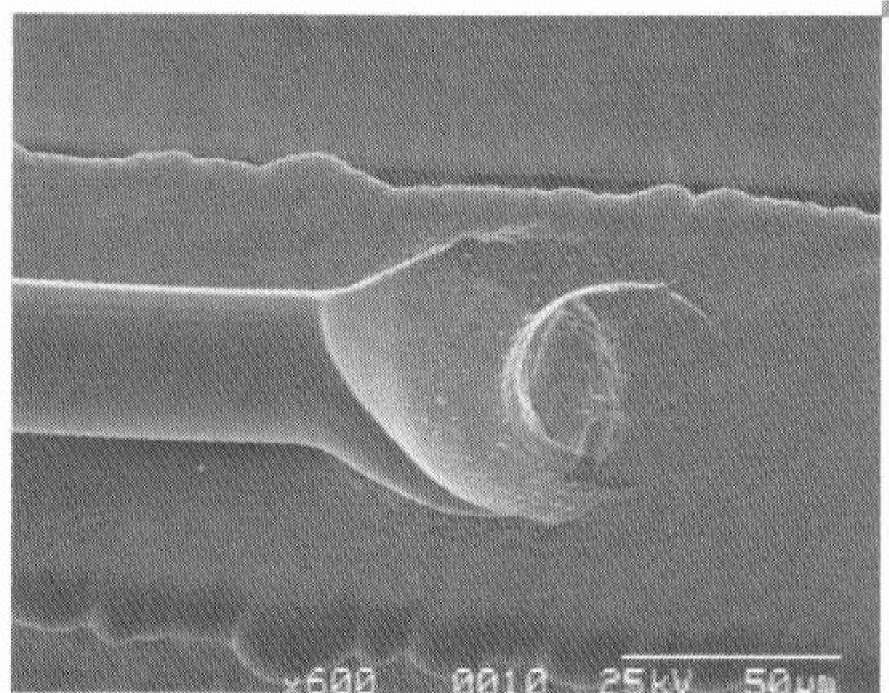




Main parameter: Current, Time, Force, C/V, FAB

2nd Bond





Main parameter: Current, Time, Force, C/V

Ball Bonding Cycle

The capillary is ready for the 1st bond.

The capillary completes the 1st bond(ball bond)

The capillary moves up after making the 1st bond.

The capillary presses the wire against the lead surface making the 2nd bond after moving from the 1st bond to the lead-site.

The capillary ascends after finishing the 2nd bond.

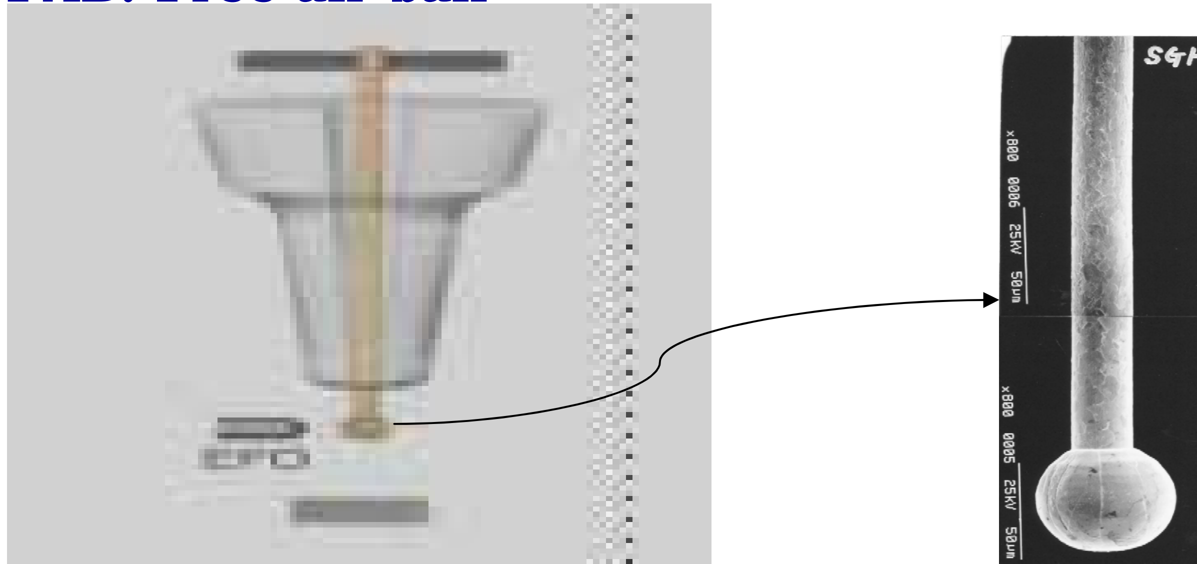
The wire-clamp grips the wire.

The capillary and the clamped wire simultaneously rise off the lead, leaving the stitch

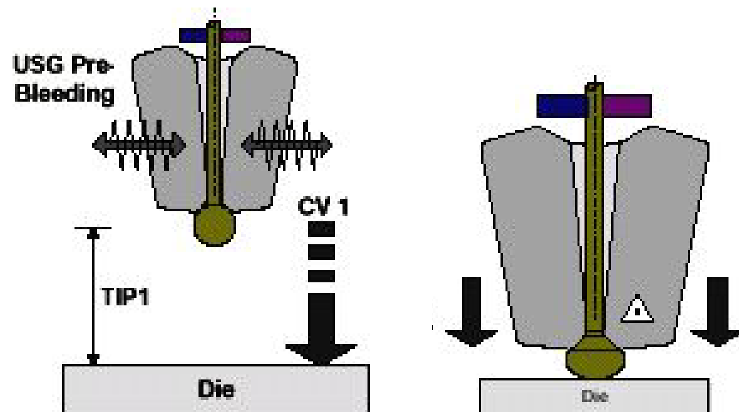
Electronic spark forms a ball while wire-clamp still keeps gripping the wire.

Bonding parameter introduction

FAB: Free air ball

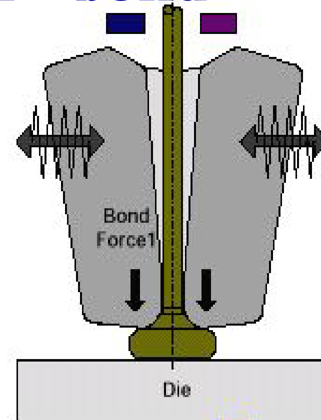


CV: constant velocity

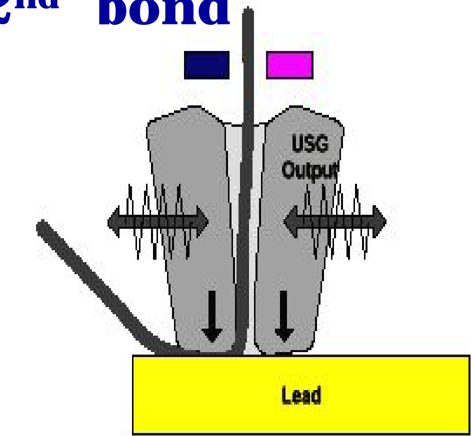


USG power/force/time

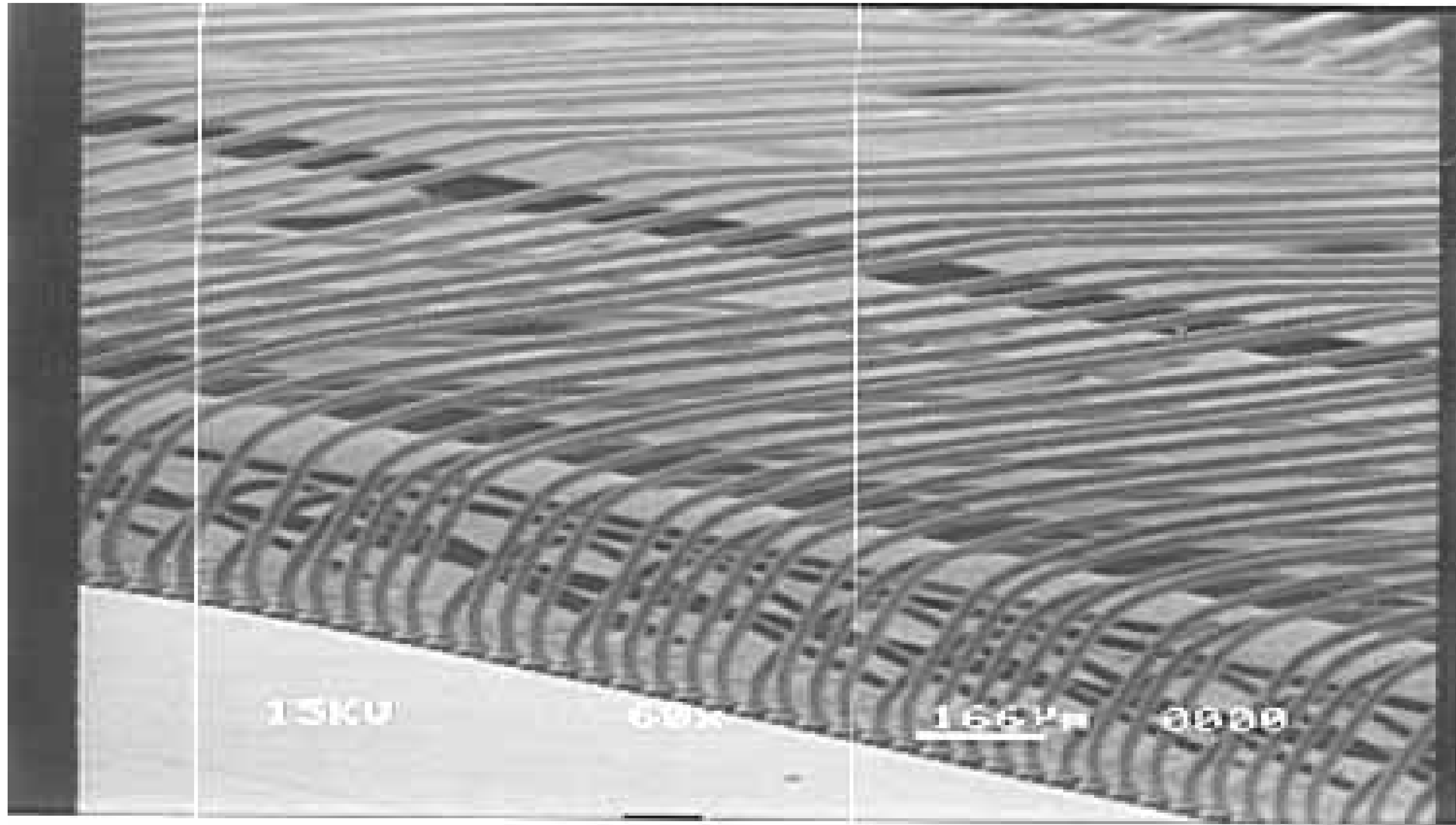
1st bond



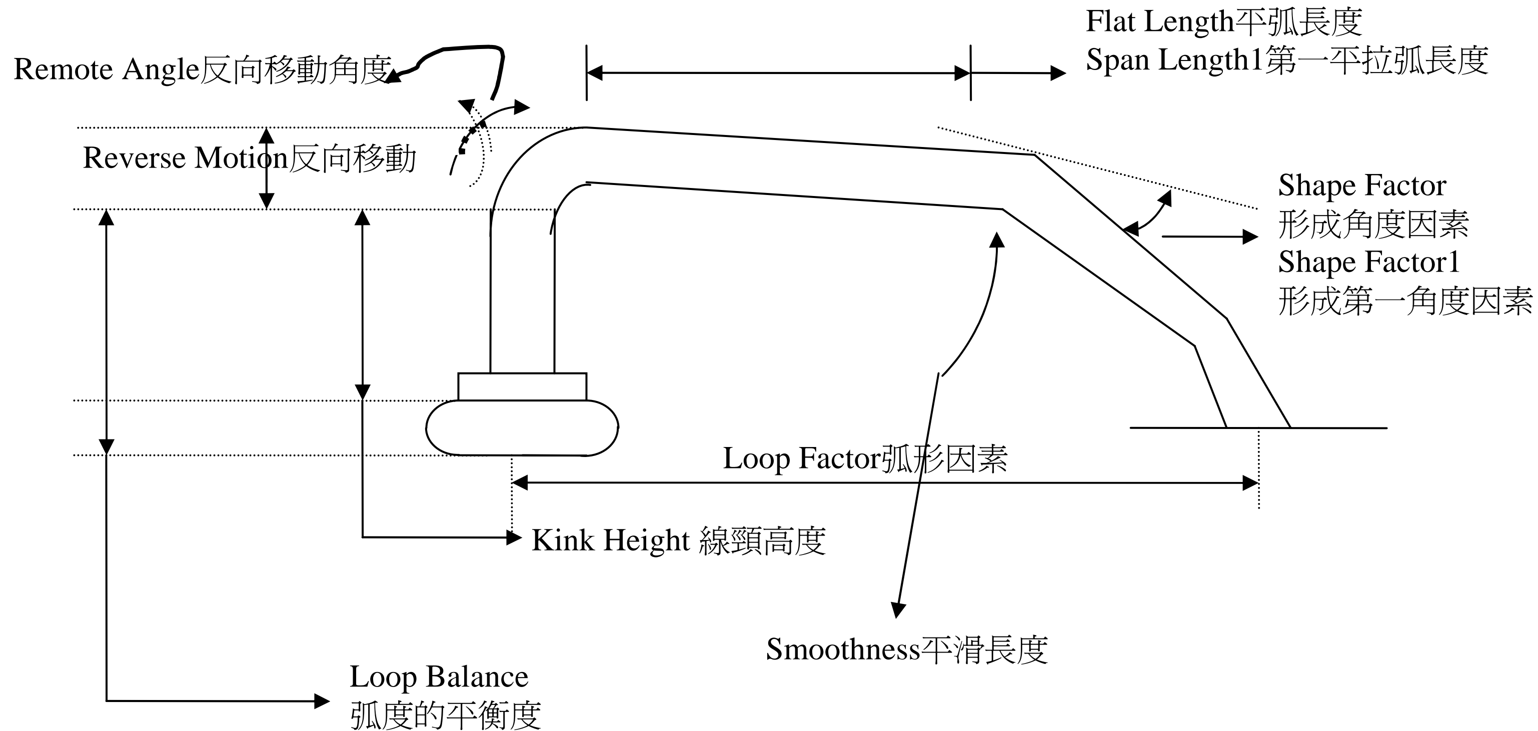
2nd bond



Looping profile



Looping parameter



各部位名詞動作解釋 :

Kink Height : 在銲球之上的高度,是在反向移動之前,這值設定後就非常近似實際的弧高,它也會根據金線的類型而有所不同,頸高計算從銲球頂端算起.

Reverse Motion : 這是程式化的XY距離,它與線頸高度相互組合使用,將產生這大約的弧度高度,正的值是對第二銲點的反向移動,當負數是對第二銲點的方向移動,這反向移動是爲了產生張力使線弧保持直線性,反向移動越大,弧形就越直.

Remote Angle : 此參數乃控制反向移動的角度,假如大於90度,這反向移動會增加,但可保持較好的直線性,低於90度對解決線頸歪斜有幫助,但實際使用爲75到120度.

Loop Factor : 此參數是由機器自動計算送線的距離,正值將送多一點線,也就是弧形會比較鬆,負值會送少一點線,也就是弧形會比較緊.

Loop Balance : 此參數用以調整Y軸弧度高低變化的補償,原始設定值是100%,實際使用值爲95到105%,特別的應用可設定不同值作補償,100%以下用以調整上面的金線降低一些下面的金線提高一些(以M/D GATE爲上),反之則相反.

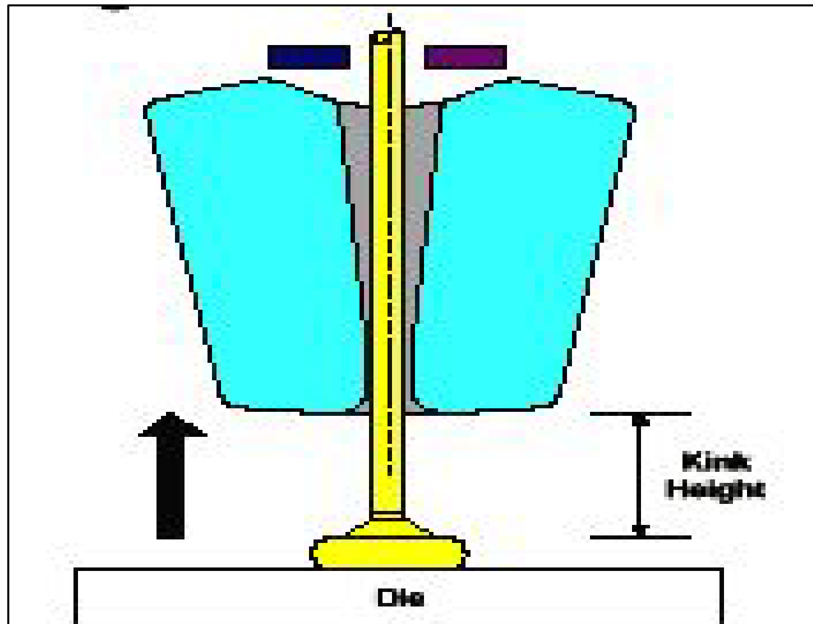
Flat Length : 這弧線中在彎向第二銲接點前的平弧的部分,平弧常被使用在拉長線且是低弧的部分,此爲WORK LOOP PROFILE內的部分.

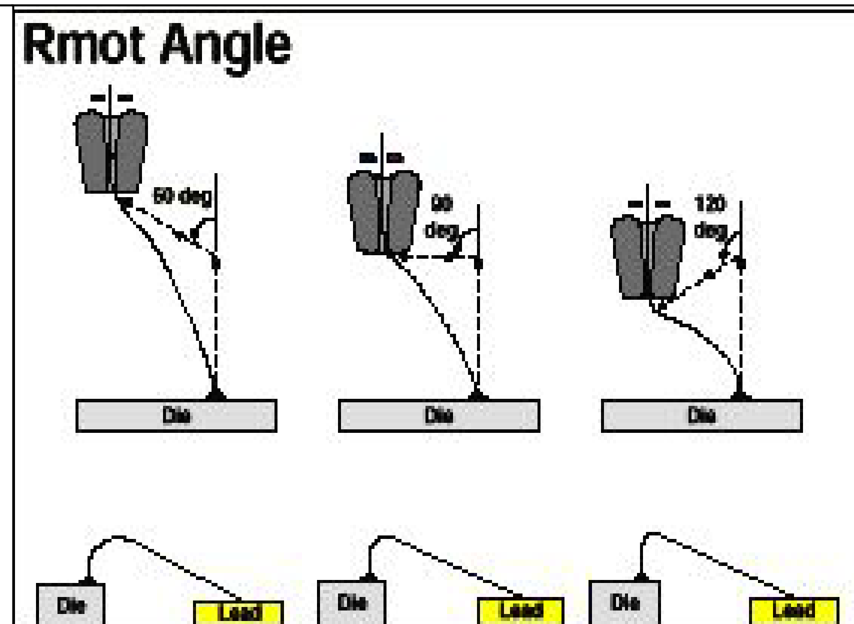
Shape Factor : 此參數和平弧長度一起被使用,它將控制第二轉折的高度,較高值將造成較高的弧度與折角,反之則有相反效果,常被使用在拉長線且是低弧的部分,此爲WORK LOOP PROFILE內的部分.

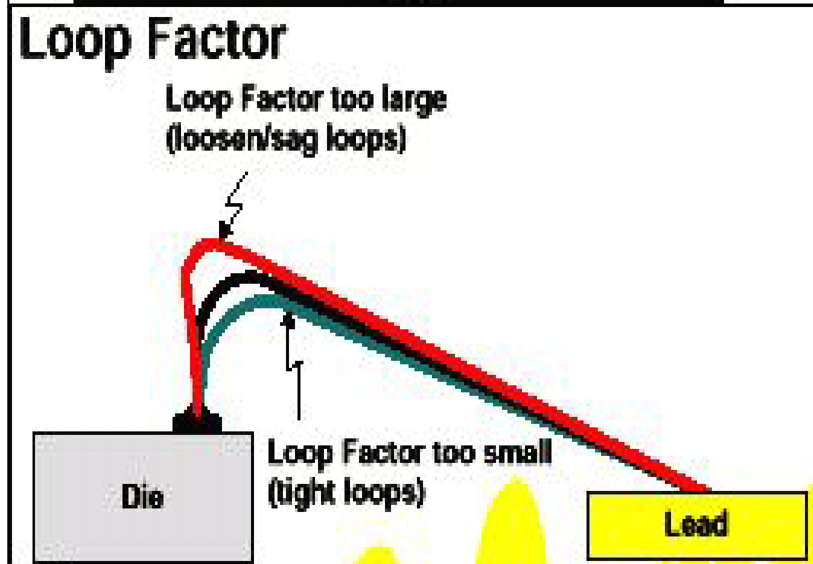
Span Length1 : 這是線弧在轉折到第二銲接點前的平拉弧部分,非常類似平弧作用,但使用的長度是線長的百分比,常與角度因素與圓滑長度結合使用,常被使用在拉長線且是高弧的部分,此爲BGA LOOP ROFILE內的部分.

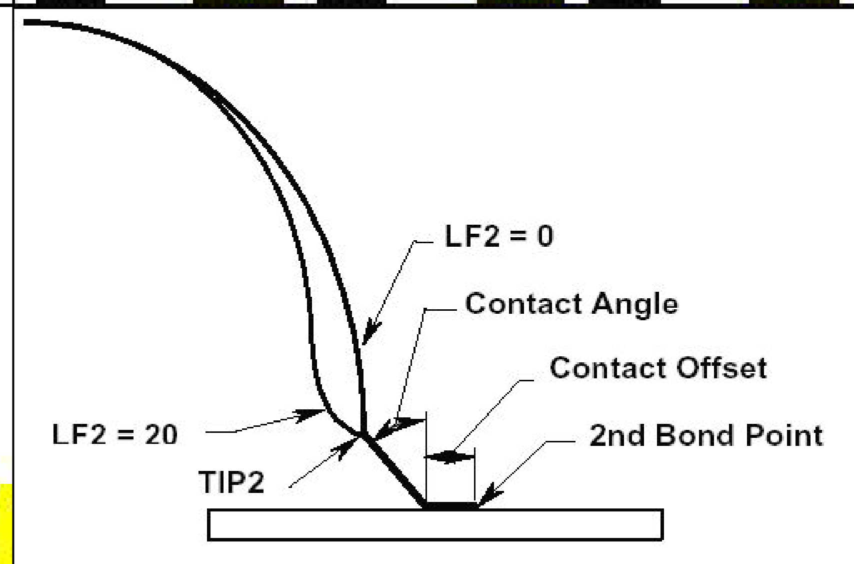
Shape Factor1 : 它和第一平拉弧長度有相同的定義,它常和第一平拉弧長度與平滑長度搭配使用,常被使用在拉長線且是高弧的部分,此爲BGA LOOP ROFILE內的部分.

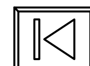
Smoothness : 此參數用以改變平拉弧轉折下來的圓滑性,通常角度越尖端其值越小,但有可能造成線頸歪斜此爲BGA LOOP ROFILE內的部分,正確的使用法則 --- 平滑長度 = < 第一平拉弧長度.


Kink
Height
Die


Rmot Angle
60 deg
90
deg
120
deg
Die
Die
Die
Die
Lead
Die
Lead
Die
Lead


Loop Factor
Loop Factor too large
(loosen/sag loops)
Loop Factor too small
(tight loops)
Die
Lead


LF2 = 0
Contact Angle
Contact Offset
LF2 = 20
2nd Bond Point
TIP2



Produce a new program