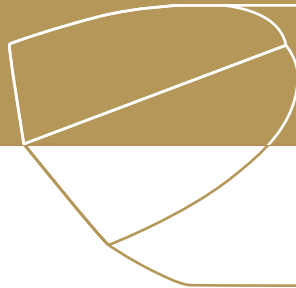


Test Probes for contacting lead-free Solder and Surfaces



INGUN offers contacting reliability when is used lead-free solder

Long before the introduction of lead-free laws and regulations INGUN put special emphasis on reliable contacting of lead-free soldered PC-Boards. The lead-free contacting solutions presently available on the market have been a proven standard at INGUN for well over 4 years!

Close cooperation with our global customers allows us to promptly use information from diverse contacting applications and areas to guarantee continued reliable contact, e.g. in the case of the production changeover to lead-free solder materials. Subsequently, production-orientated test runs as well as individual tests on customer sites encouraged us some years back to continuously develop our Test Probe plating and, in addition to the already available tip-styles, to also develop new and more passive tip-styles to meet the demands of the partly much harder and more abrasive lead-free solder materials.



Feedback from a leading Sub-Contractor:

"On the basis of internal studies we noticed that after the changeover to " lead-free" there were no changes of "First Pass Yield" when using the Test Probes recommended by INGUN. We are still able to guarantee a reliable contact on all production lines after the changeover."

The problem:

During the changeover to lead-free PC-Boards the testing demands increased and became more various. Apart from the previous standard types of hot-tinned PC-Board surfaces there are now a multitude of new surfaces of which their test points must not necessarily be covered with solder. Due to the very thin coating surfaces the tip-style and the spring force must be fine-tuned to ensure a reliable contact.

The INGUN recommendation:

Due to the unsurpassable number of variants INGUN has the matching and suitable solution for every testing task when contacting lead-free solder materials. The recommendations displayed here are not a must and can vary depending on the customer requirements. However, they are recommendations which are based on numerous internal and external investigations and examinations – some of which have been successfully used for years on production lines worldwide.

Overview of tip-styles for contacting lead-free solder materials and surfaces:



Recommendation matrix:

Solder Materials / Surfaces to be contacted	Pad / Contacting Surface	Via	Component Pins	General Remarks
SnAgCu-Alloy (lead-free)	91	07, 97, 98, 38	04, 14, 09*	Aggressive tip-styles with self-cleaning function; for "contaminated" vias, flatter tip angle
HAL (lead-free)	91	07, 97, 98, 38	14, 09*	Aggressive tip-styles with self-cleaning function; for "contaminated" vias, flatter tip angle
Chem. Ag	91	07, 97, 98, 38	14, 09*	Aggressive tip-styles with self-cleaning function; for "contaminated" vias, flatter tip angle
Chem. Sn	91, 97	07, 91, 97, 98	**	possibly higher spring-force combined with tip-style 97
Chem. NiAu	91, 97	07, 91, 97, 98	**	possibly higher spring-force combined with tip-style 97
OSP	91, E-Type, Rotating Probe	91, 97, 98 E-Type	**	Warning: Combination of aggressive tip-style and higher spring-force; too thin copper layer; Rotating Probe can lead to damage of the surface

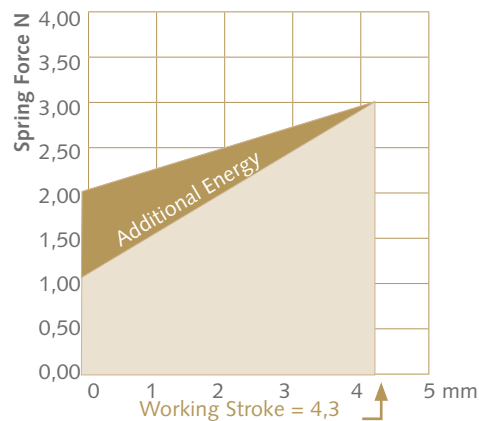
* 09 in the case of bent component pins
 ** Component Pins with this surface not known

With INGUN e_{type}[®] non-genuine defects have no chance:

Apart from those standard Test Probes from Ingun which have proven themselves for many years and have been further developed for lead-free solder materials and surfaces, Ingun offers especially in regard to the tip-style 91 a further feature: the e-type Probe. The increased pre-load of the spring-force by the e-type Probe ensures up to 25% greater penetration into the test pad and subsequently a greater contacting reliability. At the same time the usage of the e-type reduces the mechanical stress of the PC-Board during contacting. With the e-type Probe it is still possible to contact harder solder and flux-deposits (due to higher temperatures of the lead-free solder process) without additional stress to the PC-Board.

All advantage of the High-Energy Probe in summary:

- available in all standard grid/pitch sizes: 050, 075, 100 mil
- 100% compatible to the standard probe series GKS-050, 075, 100
- Equipped with the proven tip-style 91 (dagger)
- Production tests on customer sites have confirmed the effectiveness



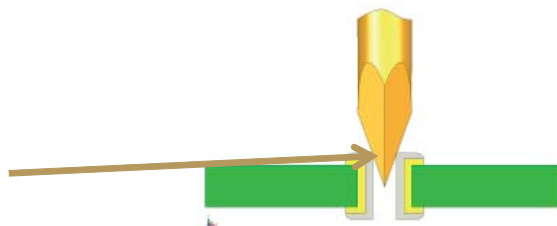
More Information can be found in our Test Probes catalog 2009 on Page 19 and 20 or on our Homepage www.ingun.com.

Tip Style 38: Contacting of Vias

Due to the changed wetting behavior of lead-free solder materials then flux-deposits can get into the holes of the vias. This problem can be counteracted with a new tip-style geometry - such as tip-style 38.

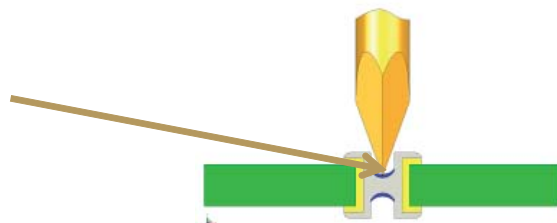
Sn/Pb with HAL:

Good contact with HAL on the inner-side of Vias.



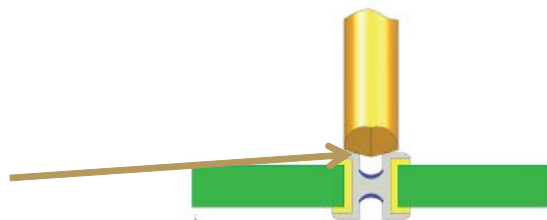
Lead-free with solder paste Via:

In the case of small point-angles the tip-style strikes flux-deposits before the edges can contact the inner-side of the vias. The tip-style cannot penetrate flux-deposits (blue).

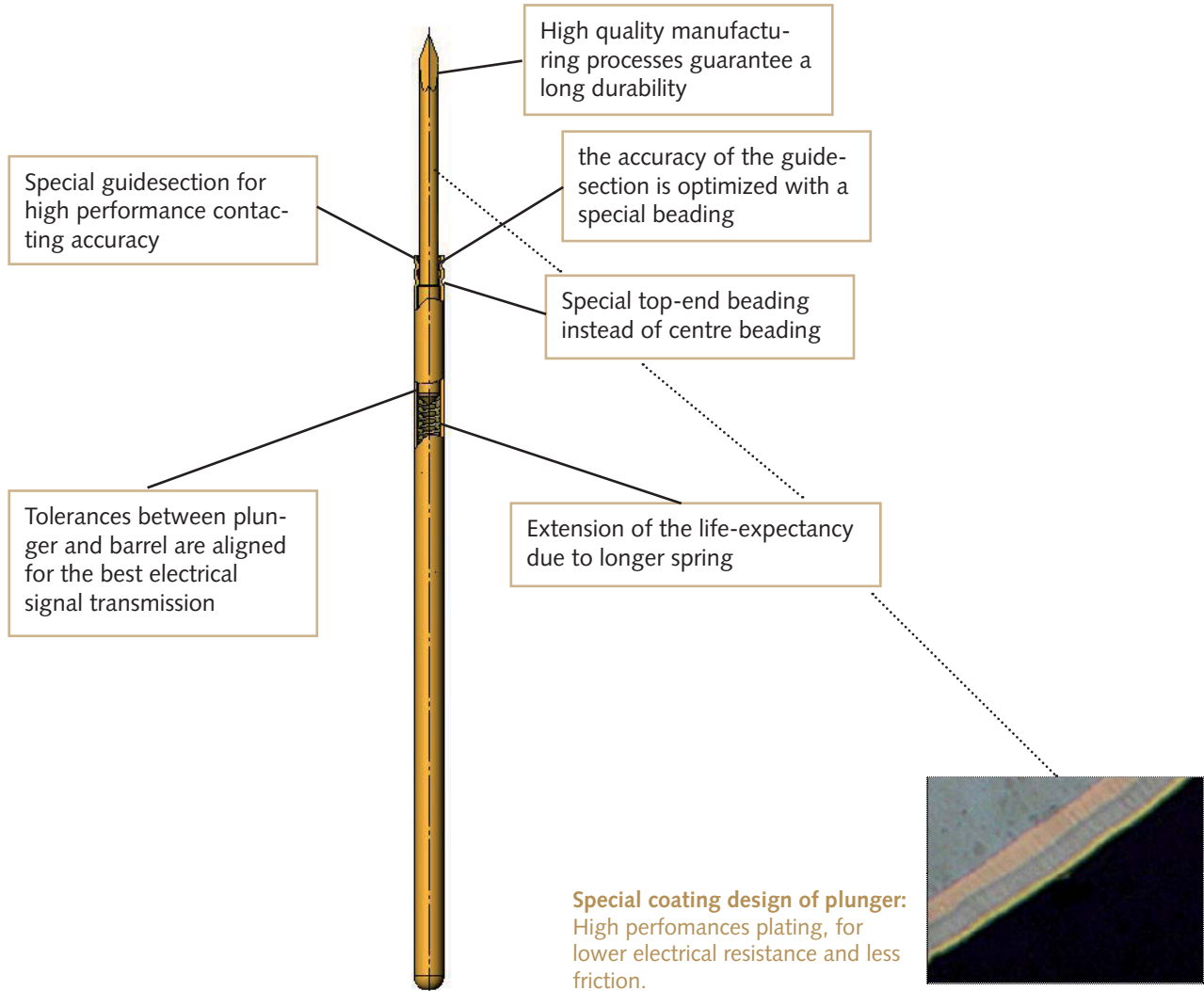


Lead-free with solder paste Via:

With a larger tip-angle (e.g. tip-style 38 with 150°) a reliable contact of the edges of the inner-side of the vias is achieved before the point strikes flux-deposits.

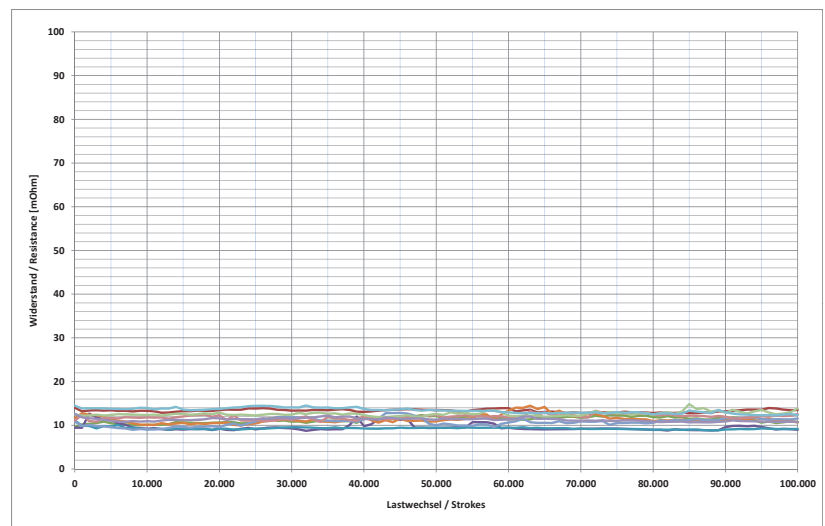


Advantages of INGUN Test Probes when contacting lead-free solder materials:



Contact resistance in relation to the number of cycles:

The lab tests prove that the total of all above stated advantages of the INGUN Test Probes keep the negative influence of contact resistance almost constant and therefore guarantees a reliable measurement.



Lead-free Technology

General information in relation to lead-free technology

Presently preferred lead-free solder materials:

- ↗ US: NEMI & SMTA
 - o Sn3.9Ag0.6Cu*
- ↗ Europe:
 - o Sn(3.4-3.9)Ag(0.5-0.9)Cu*
- ↗ JEIDA:
 - o Sn3.0Ag0.5Cu*

Sn = Tin
 Ag = Silver
 Cu = Copper

Range of alloy compositions:

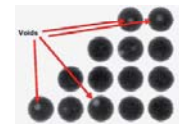
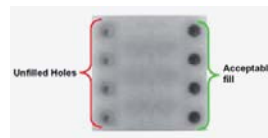
- ↗ SN-(3.0-4.0)Ag-(0.5-1.0)Cu*
- ↗ Melting Point ~ 217 °C (SnPb: ~ 183 °C)

(*) Values in weight per cent

Comparison lead-free and leaded solder processes:

The wettability characteristic of melted solder on the surface influences how good the solder distributes itself on the pads and bonds with them. The wettability force of Sn/Ag/Cu lead-free solder materials is clearly weaker than that of Sn/Pb solder material. This influences the solder process as follows:

Defects	Comparison
Open Solder Connections	Lead-free > SnPb
Short-circuits (Bridging)	Lead-free > SnPb
Void connections	Lead-free > SnPb
Wrong positioning	Lead-free > SnPb
Non-accessible solder connections	about the same
Superfluous solder	about the same

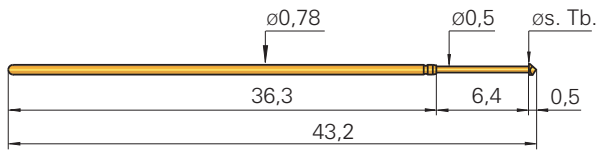


Characteristics of lead-free surfaces:

	HAL / HASL Hot tinning	Chem. Sn	Chem. NiAu	OSP	Chem. Ag.
Suitability for ICT	++	+	o	-	+
Layer thickness	0.5 - 25 µm	0.6 - 1.0 µm	3 - 8 µm Ni 0.04 - 0.1 µm Au	0.2 - 0.5 µm	0.1 - 0.3 µm
Solder ability	++	++	+	+ (one off)	o
Storability	+	-	++	-	-
	(6 - 12 months)	(<= 6 months)	(12 months)	(<= 6 months)	(<= 6 months)
Costs	+	o	-	++	o
Quality of surface	-	+	+	+	+
SMD Pitch	>= 0.5 mm	< 0.5 mm	< 0.5 mm	< 0.5 mm	
Other	Very suitable for ICT; poor in Fine-Pitch range – due to poor planarity and homogeneity	Relatively thin layer thickness in connection with high hardness	Very hard surface; Surface chips and is sensitive to mechanical stress	Limited suitability for ICT; reduced conductance of the surface, contamination of probe tips; very thin layer thickness in connection with high hardness after oxidation	Usage still limited, because still relatively new. Good for ICT and HF-Applications (Skin Effect)





**INGUN recommends the following
Standard Probe Series for ICT:**

Mounting and Functional Dimensions GKS 050



Grid:
 ≥ 1,27 mm
 ≥ 50 Mil

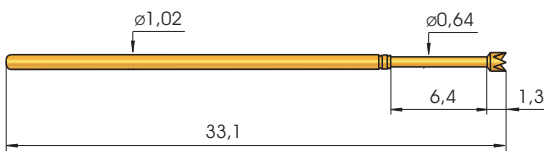
GKS 050
 ICT-/FCT Test Probe

Tip Styles lead-free			
Material	Tip Style	Versions	Standard Plating
3	07	 Ø 0,50 Ø 0,90	A
2	14	 Ø 0,50	A
2	38	 Ø 0,50	A
2	91	 Ø 0,50	A

Tip Styles lead-free			
Material	Tip Style	Versions	Standard Plating
2	97	 Ø 0,50	A





Further Tip Styles see in our catalog.





Mounting and Functional Dimensions GKS 075



Grid:
 ≥ 1,91 mm
 ≥ 75 Mil

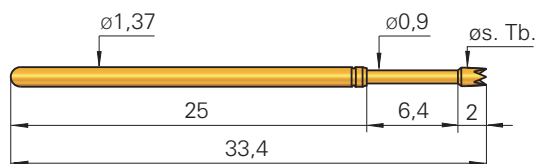
GKS 075
 ICT-/FCT Test Probe

Tip Styles lead-free			
Material	Tip Style	Versions	Standard Plating
2	04	 Ø 1,15	A
2	07	 Ø 0,64 Ø 1,00 Ø 1,20	A
2	09	 Ø 0,64	A
2	14	 Ø 0,50 Ø 0,64 Ø 0,80 Ø 1,20	A

Tip Styles lead-free			
Material	Tip Style	Versions	Standard Plating
2	38	 Ø 0,64	A
2	91	 Ø 0,64	A
2	97	 Ø 0,64 Ø 0,80	A
2	98	 Ø 0,64	A






Further Tip Styles see in our catalog.





Mounting and Functional Dimensions GKS 100



Grid:
 ≥ 2,54 mm
 ≥ 100 Mil

GKS 100
 ICT-/FCT Test Probe

Tip Styles lead-free			
Material	Tip Style	Versions	Standard Plating
2	04	 Ø 1,06 Ø 1,30 Ø 1,50	A
3	07	 Ø 0,90 Ø 1,50 Ø 1,70 Ø 2,50	A
2	09	 Ø 0,60	A
2	14	 Ø 0,50 Ø 0,80 Ø 1,06	A
2/3	14	 Ø 1,30 Ø 1,50	A

Tip Styles lead-free			
Material	Tip Style	Versions	Standard Plating
2	38	 Ø 0,90	A
2	91	 Ø 0,90 Ø 1,30	A
2	97	 Ø 0,90	A
2	98	 Ø 0,90	A

Further Tip Styles see in our catalog.

Further Tip Styles and details regarding the Test Probes can be found in our Test Probes catalog 2009 on page 23 to 27 or on our Homepage www.ingun.com

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