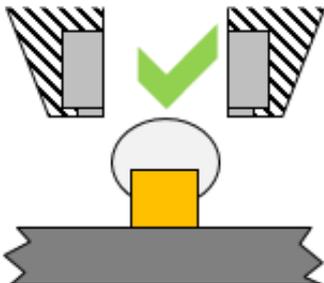


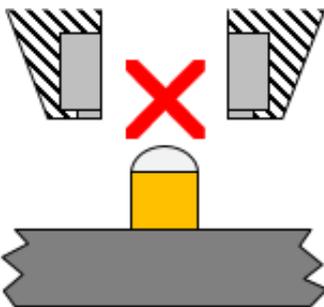


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This shape of solder is possible to test similar to regular Cold Bump Pull (CBP)



The solder interconnect is very difficult to test. Shear is the best test

8. Copper pillar

i. Solder to copper

Copper pillars can be tested in multiple ways. The best method depends on your failure mode of interest and the construction of your sample. If you are interested in the interconnect between the solder and the copper, it depends on the shape of the construction whether a **Cold Bump Pull (CBP)** type test is feasible. If not, a shear may be the only effective test to qualify your process.

The test sequence for the CBP-approach is as follows:

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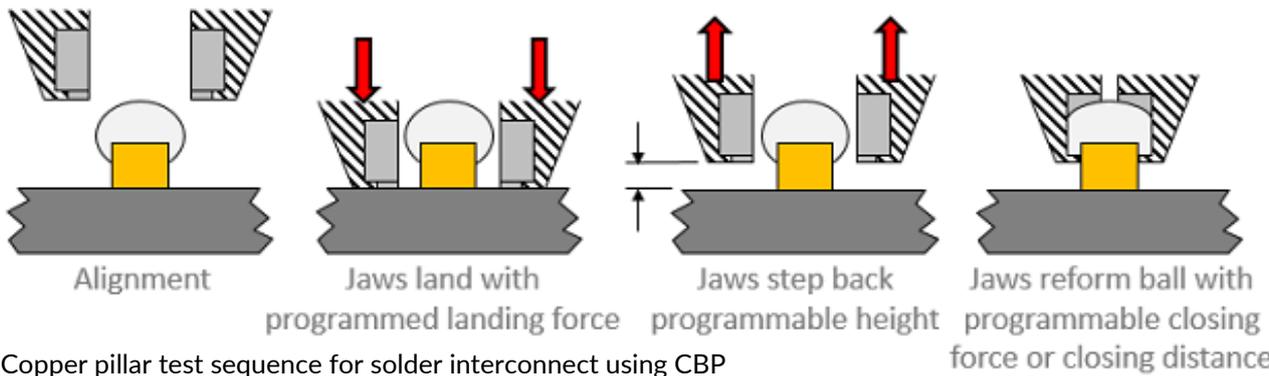
Other offices

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- Thailand
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Bond testers

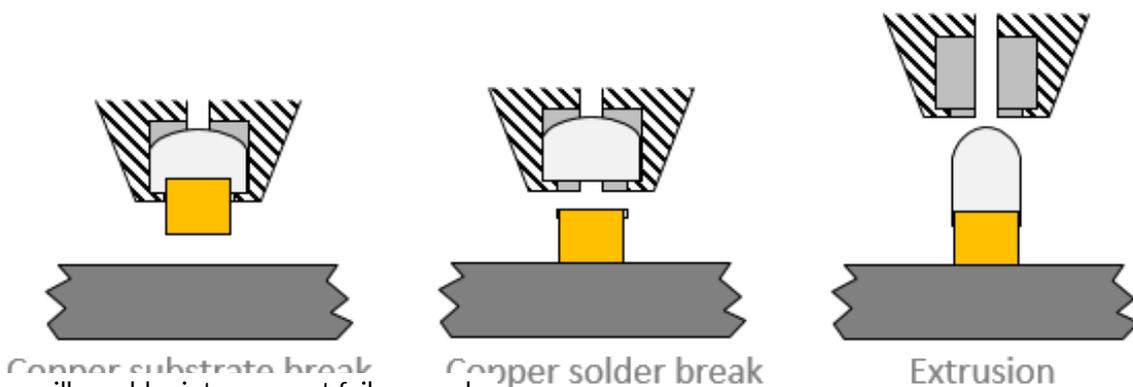
- Condor *Sigma*
- Condor *Sigma Lite*
- Condor *Sigma W12*
- Condor *150HF*

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Copper pillar test sequence for solder interconnect using CBP

Whether to use a closing distance or constant closing force on the tweezer jaws depends on which method produces the most failure modes of interest or highest force. The failure modes are;



Copper pillar solder interconnect failure modes

Copper to substrate breaks are a common failure mode. When this happens the bond strength and failure mode of the copper to the substrate pad is known. Copper solder break is not so common and probably indicates a non-wet. Copper extrusions indicate strong bonds.

The test sequence for the shear-approach is as follows:

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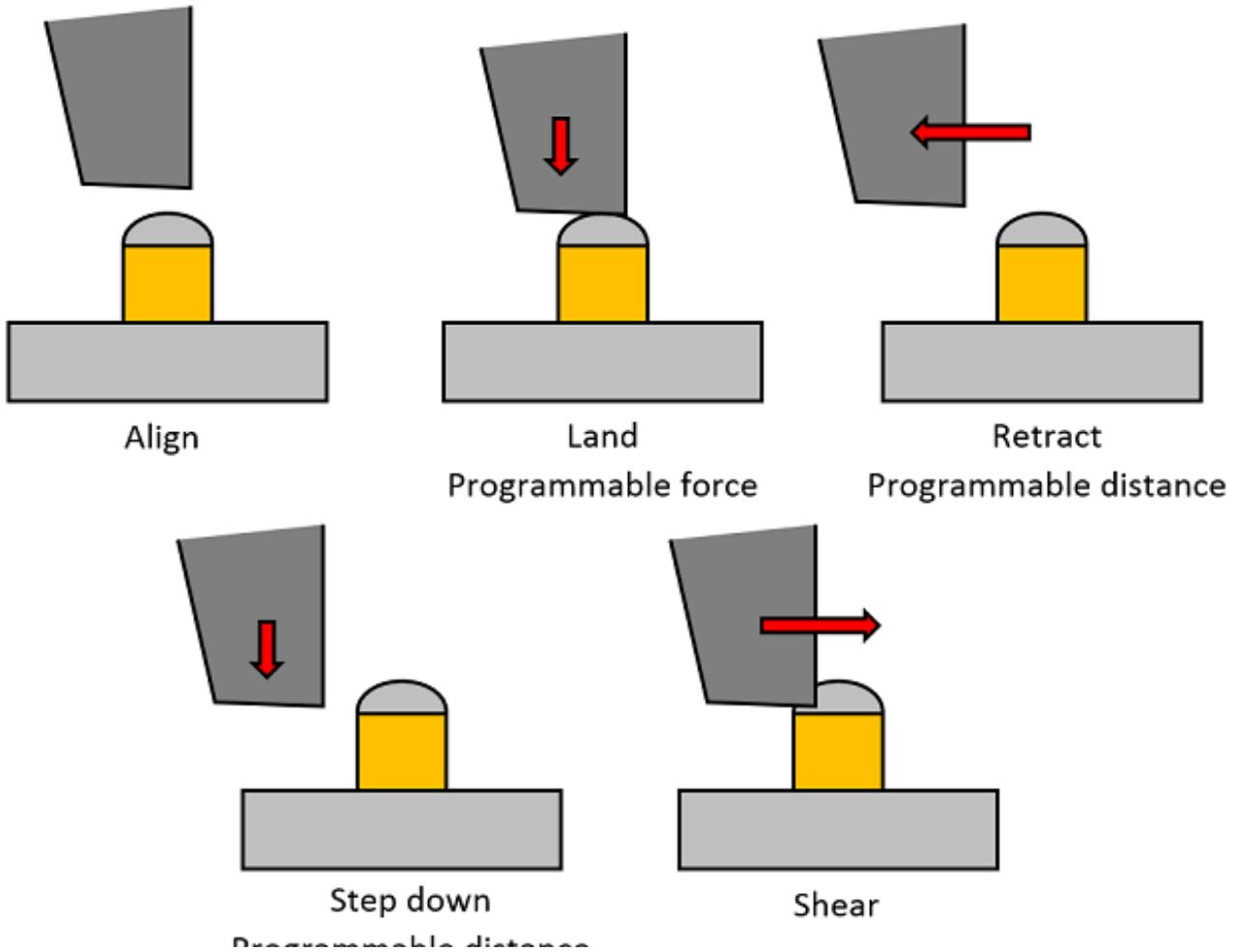
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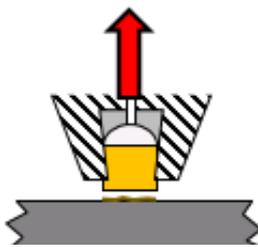
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The test sequence using XYZTEC's unique top landing shear method

The rationale behind the top landing and the rest of this test sequence is further explained on our [copper pillar test type page](#). In this how-to we focus on tweezer pull tests only.



Pull test copper pillar gripped with two tapered cavities

ii. Copper to pad

The failure mode of interest between the copper and the pad can be produced by either a pull or a shear test and the measured bond strength used for your process control. In many other applications pull testing is typically preferred because the bond is subjected to a simple tensile

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load, distributed over the bond area. The bond separation is clean making failure mode analysis of the surfaces relatively easy. Unlike solder bumps, copper is relatively hard and gripping it therefore easier.

Constant Closing Force 220g Step back 25µm		
Sequence	Result (g)	Failure mode
1	30.8950	P1
2	28.7756	P1
3	38.5604	P1
4	39.8527	P1
5	28.8891	P1
6	34.6535	P1
7	38.7797	P1
8	42.4205	P1
9	33.4713	P1
10	39.9420	P1
Average	35.6240	
StdDev	4.9610	

Example of typical pull test results for Copper pillar

Solder balls require precise reforming in order to be able to apply a meaningful test load on to the bond. Copper also has to be reformed in order to be able to grip it but this takes the form of well know gripping methods such as plain surfaces and friction, a few serrations that slightly reform the copper in order to get a mechanical grip or a slight taper.

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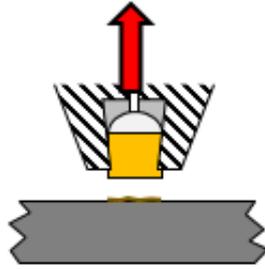
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Failure mode P1



Failure mode P1

An alternative to pull testing is shear testing. We tend to prefer shear testing to pull testing for copper pillar.

Read more on the [copper pillar test type page](#).

Continue to read:

Previous page: [Ribbon Pull and Peel](#)

Next page: [Stud Pull / Pick and Place](#)

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