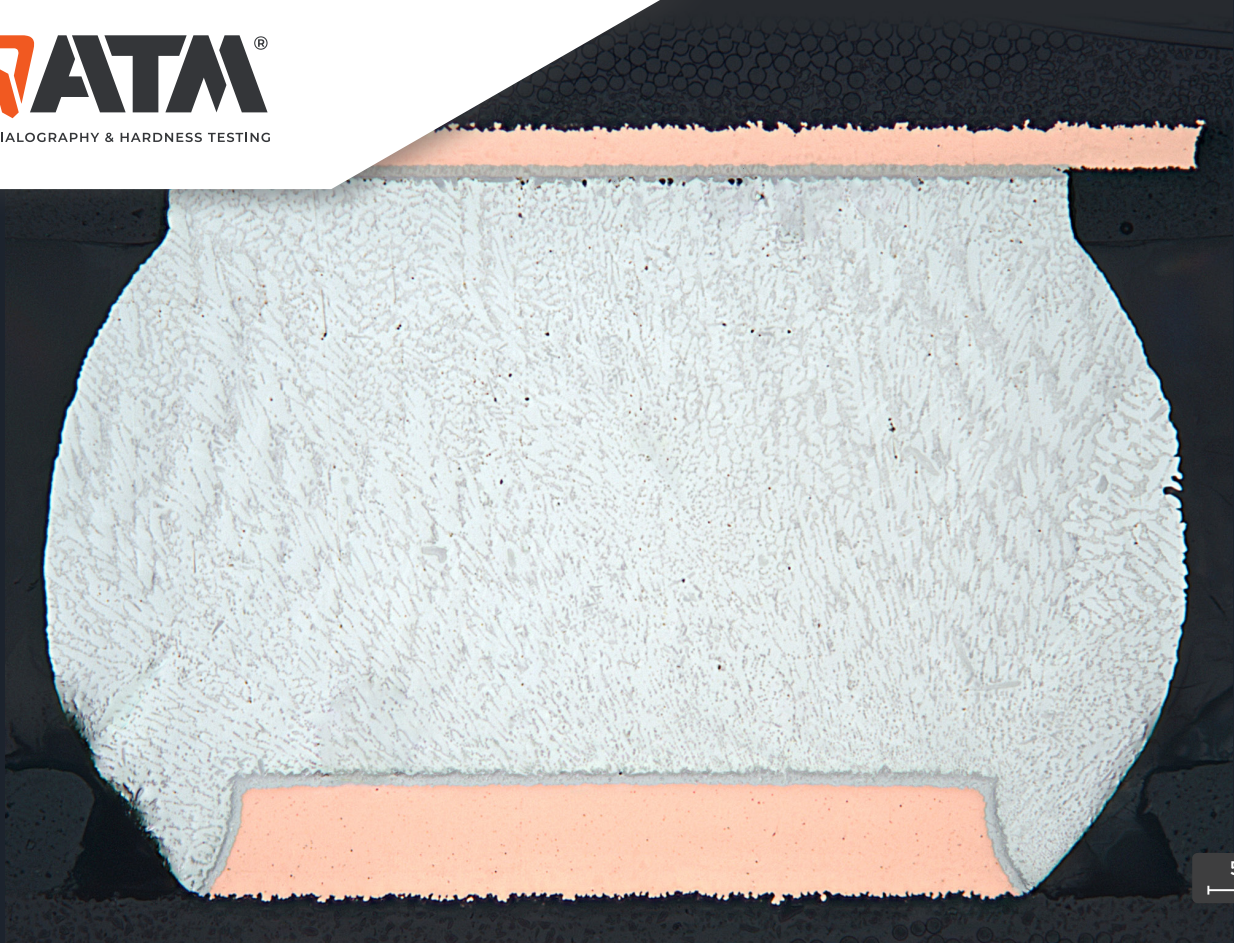




ATM Qness GmbH
Emil-Reinert-Str. 2
57636 Mammelzen
Germany

Phone +49 2681 9539-0
E-Mail info@qatm.com

ATM Qness GmbH
Reitbauernweg 26
5440 Golling
Austria

Phone +43 6244 34393
E-Mail info.at@qatm.com

www.qatm.com

EXAMINATION OF THE SOLDER BALLS IN THE BALL GRID ARRAY (BGA)

Objective:

The aim of the investigation is to analyze the solder ball row, ordered as ball grid array (BGA). The investigation characteristics are cracks, pores, shape and adhesion. For this purpose, a printed circuit board was processed with the Qcut 200 A cutting machine, mounted with epoxy resin Qpox 92 and prepared with Qpol 250 Al ECO. The preparation process is as follows: a small piece from the PCB must be cut with the Qcut 200 A. This piece need to be mounted with Qpox 92. The mounted sample should be ground with Qcut 200 A till to the target area (investigation area). After that the preparation must be continued with the Qpol 250 Al ECO.

CUTTING



Precision cut-off machine
Qcut 200 A

Device	Qcut 200 A	
Cut-off disc	Diamond cut-off disc	Item no.: 95007077
Coolant and anti-corrosion agent	Coolant Standard	Item no.: 95014281
Clamping tool	- 2 x Easy clamping plate S - 2 x Piccolo 54	Item no.: Z2236030 Item no.: Z1350008
Cutting method	Automatic longitudinal cutting method (with X-Axis)	
Parameter	- Feed speed - Pulse parameter - Cut-off disc rotational speed	0.1 mm/s Without pulse 2500 rpm
Note	- In this cutting process, the PCB must be cut to approx. 1 mm before the target area (investigation area) - after this step, the sample must be mount with the epoxy resin "Qpox 92"	



Cold mounting material Qpox 92

COLD MOUNTING

Mounting Material	Qpox 92
Mixing ratio	20 g : 4,6 g (Resin : Hardener)
Curing time	approx. 12 h
Mounting mould	PP mould, Ø 40 mm
Accessories	- Mixing cups - Mixing stick - Plastic clips - Infiltration unit - Scale
Notes	

CUTTING



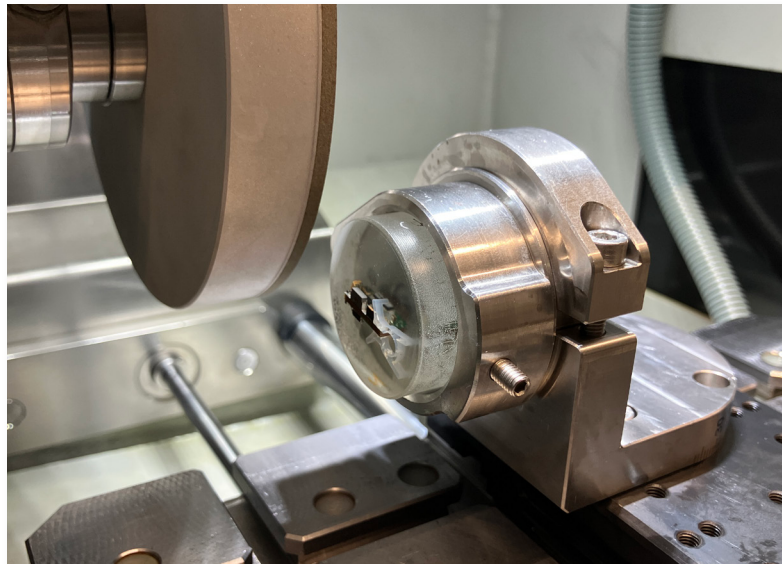
Precision cut-off machine
Qcut 200 A

Device	Qcut 200 A	
Grinding cup wheel	Grinding cup wheel	Item no.: 95015123
Coolant and anti-corrosion agent	Coolant Standard	Item no.: 95014281
Clamping tool	- Easy clamping plate S - Easy adaption vertical - Drop shape sample holder	Item no.: Z2236030 Item no.: Z2236033 Item no.: Z1870045
Cutting method	Automatic longitudinal cutting method (with X-Axis)	
Parameter	- Feed speed - Grinding parameter - Grinding cup wheel rotational speed	10 mm/s Removal = 0.8 mm Step depth = 0.050 mm Cycles = 5 2500 U/min

Note

- This grinding process with the Qcut 200 A is to do after cold mounting with epoxy resin Qpox 92. Grinding with the diamond cup wheel enables plane-parallel grinding and is therefore a good way to precisely reach the target area (investigation area)

Mounted sample prepared for the grinding process with the diamond cup wheel





Automatic grinding and polishing machine Qpol 250 A1 ECO

GRINDING/POLISHING

Device	Qpol 250 A1 ECO	
Sample holder	6 x Ø 40 mm	Item no.: Z5446025
Pressure	Single pressure	

STEP	MEDIUM		 rpm	 rpm	 Single pressure N	 min
 Grinding	SiC-Paper P1200	H ₂ O	200	120 ◄► Counter Rotation	15	0:45
 Pre-Polishing	GAMMA	Dia-Complete Poly, 3 µm	150	120 ►► Synchronous Rotation	25	4:00
 Polishing	ZETA	Dia-Complete Poly, 1 µm	150	120 ►► Synchronous Rotation	20	1:00
 Fine polishing	OMEGA	EPOSIL F 0.1 µm	100	80 ◄► Counter Rotation	20	1:45 (Rinsing time: 15 s)
 Etching (chem.)	-	-	-	-	-	-
Notes	- Pre-dosing for 3 µm und 1 µm: 3 s Dosing interval and dosing duration for Dia. Suspension 3 µm, 1 µm: every 30 s for 1,5 s - Dosing interval and dosing duration for fine polishing suspension: every 20 s for 1,0 s					

VIBRATORY POLISHING

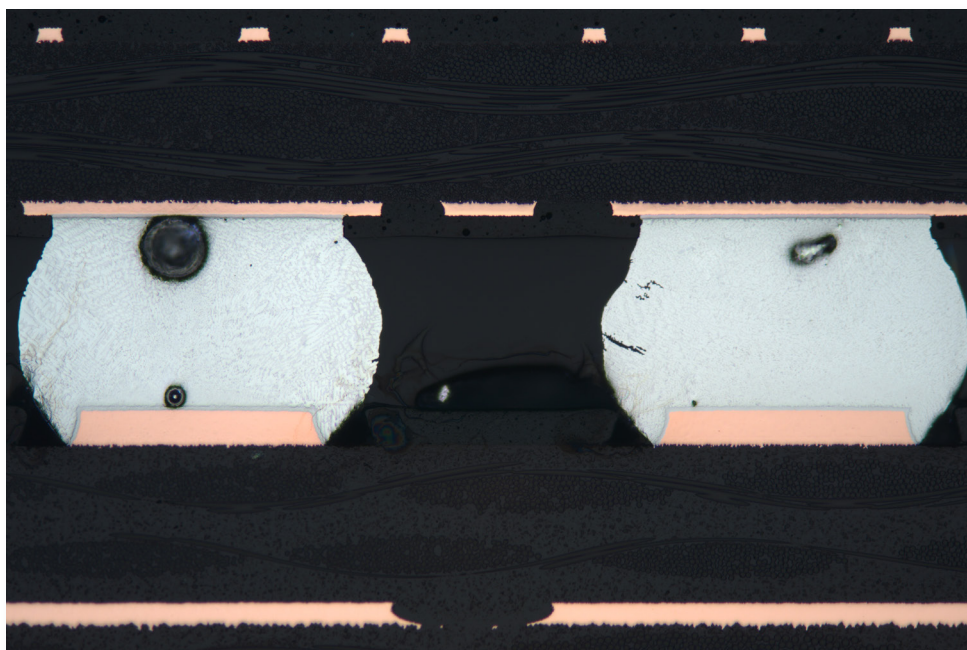


Vibratory polishing device Qpol VIBRO

Device	Qpol VIBRO	
Sample holder	Item no.: Z5651011	
Weight	2 × 190 g	

STEP	MEDIUM		Frequency (Hz)	 min
 Vibratory Polishing	IOTA	EPOSIL F 0.1 µm	80	30 - 60
Notes	- In addition to the frequency of 80 Hz, an intensity of 80% should be set			

Solder balls with pores and cracks - 100:1



Solder ball without errors - 200:1



CONCLUSION

As already mentioned in the individual preparation steps, a small segment must first be cut very close to the target area. The distance to the target area should be chosen so that the BGA row is not damaged but also so that not much has to be removed in the subsequent steps.

We recommend to grind the sample after cold mounting with a diamond cup wheel until it is very close to the target area.

To achieve the best mounting result, we recommend to use the cold mounting method with epoxy resin "Qpox 92". The investment should be carried out using the infiltration device. During mounting, attention must be paid to the alignment of the PCB segment. It must be aligned in such a way that the entire BGA row (solder ball row) is reached.

Due to grinding with the diamond cup wheel on the Qcut 200 A, only 1 grinding step is necessary on the Qpol 250 A1 Eco.

An optimum polishing result is achieved by using the Qpol Vibro. The finest scratches are removed. A very good edge sharpness is achieved.

The sample did not have to be etched for the test.