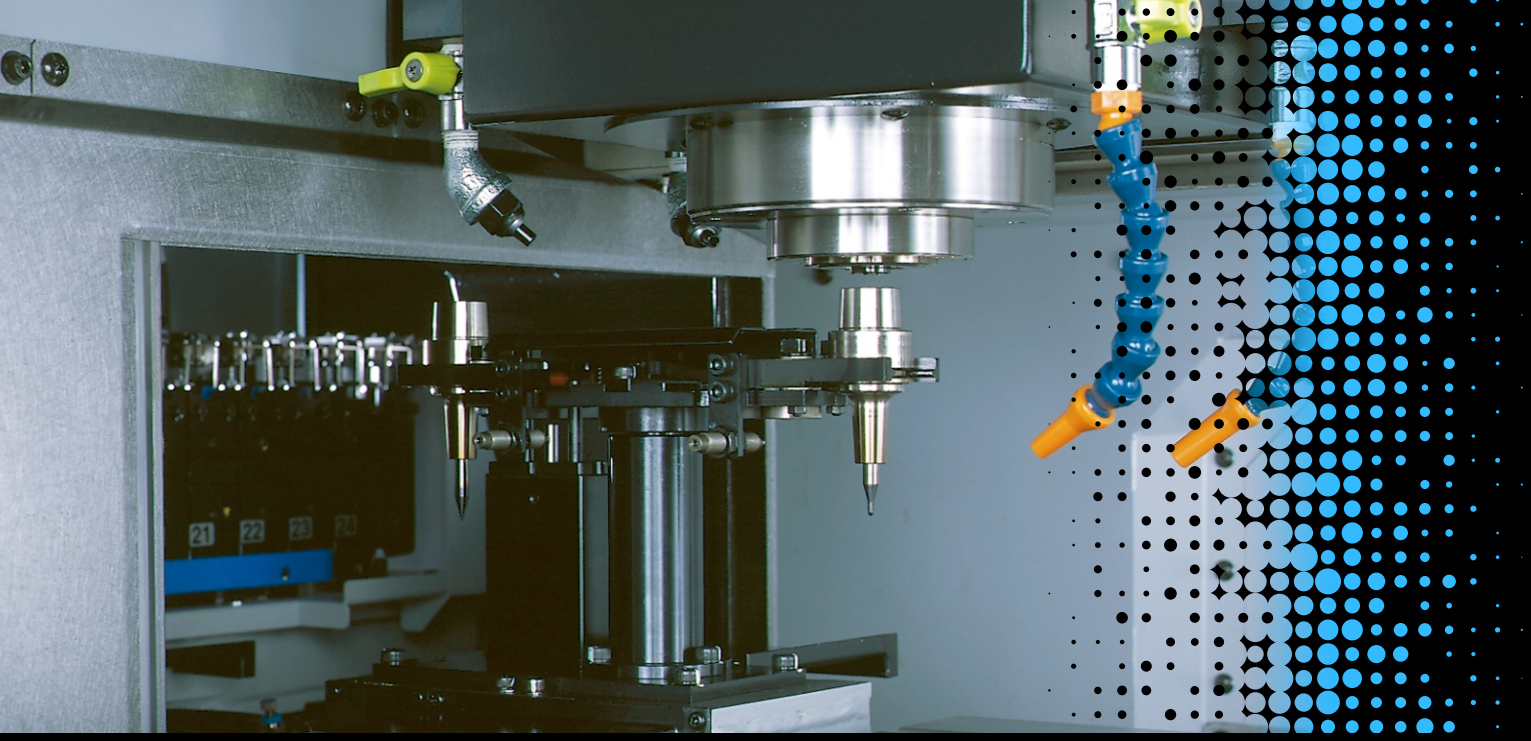
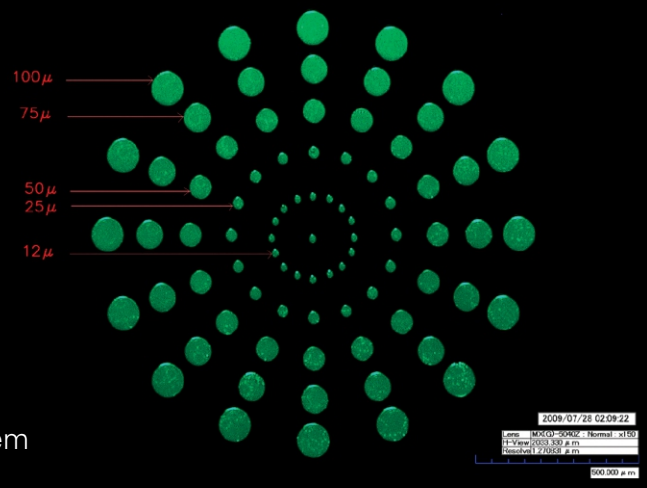


12µm to 100µm Aperture Sample

Micro-drilled on a VMC



Material:	Brass foil
Thickness:	.025mm
Work Holding:	Erowa ITS pallet system
Tool Holders:	Big Kaiser micro collet chuck system
Machine:	V22
Drills:	100µm – Titex (twist drill - 8:1 flute length) 75µm – Union Tools (twist drill - 16:1 flute length) 50µm – Union Tools (twist drill - 18:1 flute length) 25µm – National Jet (spade drill - 7:1 flute length) 12µm – National Jet (spade drill - 3:1 flute length)

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Process Notes

100µm Holes

Coolant:	Makino spindle lubricant
Number of Drills	(1) Drill used for 16 hole pattern
Spot Drilling Used:	-0.006mm
Drilling:	S40000/G83 Z-.1 R.05 Q.008 F7.0 (mm)
Feed Amount per Peck:	0.008mm
Chip Load per Flute/Revolution:	0.00035mm

75µm Holes

Coolant:	Makino spindle lubricant
Number of Drills	(1) Drill used for 16 hole pattern
Spot Drilling Used:	-0.005mm
Drilling:	S40000/G83 Z-.1 R.05 Q.006 F6.0 (mm)
Feed Amount per Peck:	0.006mm
Chip Load per Flute/Revolution:	0.0003mm

50µm Holes

Coolant:	Makino spindle lubricant
Number of Drills	(1) Drill used for 16 hole pattern
Spot Drilling Used:	-0.002mm
Drilling:	S40000/G83 Z-.1 R.05 Q.005 F6.0 (mm)
Feed Amount per Peck:	0.005mm
Chip Load per Flute/Revolution:	0.0003mm

25µm Holes

Coolant:	Makino spindle lubricant
Number of Drills	(1) Drill used for 16 hole pattern
Spot Drilling Used:	-0.0008mm
Drilling:	S40000/G83 Z-.050 R.05 Q.004 F2.75 (mm)
Feed Amount per Peck:	0.004mm
Chip Load per Flute/Revolution:	0.0001375mm

12µm Holes

Coolant:	Makino spindle lubricant
Number of Drills	(1) Drill used for 17 hole pattern
Spot Drilling Used:	-0.0008mm
Drilling:	S40000/G83 Z-.036 R.05 Q.00075 F1.5 (mm)
Feed Amount per Peck:	0.00075mm
Chip Load per Flute/Revolution:	0.000075mm

Key Technologies

- **Premium tool holders** - Minimize drill tip run out
- **SGI.4** - Precise control of drill tip during peck cycle, optimize feed rate for retract/return
- **Hybrid ATLM** - Permits error free, and damage free tool tip measuring to sub micron accuracy for drills as small as 12µmØ
- **Makino spindle lubricant used as cutting fluid** - At this time, total benefit of tool life extension has not been accurately quantified
- **40k spindle** - Provides stable, high rpm operation with no tool vibration or run out, thus permitting effective drilling operations for tools as small as 12µmØ