



Probe Card Ceramics - Material & Specification Sheet

Si₃N₄ guide rings, guide plates and ejector inserts - capability, tolerances and process

Silicon nitride guide rings, guide plates and ejector inserts for cantilever and vertical / MEMS probe cards. NitriCeram currently supplies Si₃N₄ probe card ceramics to probe card manufacturers in Taiwan, Japan, Korea and mainland China. All figures below are our standard commercial capability.

Why the guide decides the life of the card

A guide ring or plate positions the needle array over each die and absorbs the Z-axis load of every touchdown - hundreds of thousands per week in a single wafer-sort step. It wears through needle chatter, planarity loss, particle generation and repeated autoclave / plasma cleaning. When the guide fails, needles, PCB and the remaining ceramics are scrapped with it. Alumina is hard but brittle and fails by edge chipping; Si₃N₄ pairs comparable hardness with 6.5-8 MPa·m^{0.5} toughness, holds a fine ground finish and needs no conductive coating.

Standard capability

Item	Specification
Material	GPS-sintered Si ₃ N ₄ ; density ≥ 3.20 g/cm ³ , hardness ≥ 1500 HV, flexural strength ≥ 750 MPa. RoHS-compliant, no free silica.
Dimensional control	OD / ID tolerances to ± 0.005 mm; flatness ≤ 0.003 mm on sealing faces; thickness-matched sets available.
Surface finish	Ra ≤ 0.1 μ m standard on contact faces; ≤ 0.025 μ m lapped on request. Edges micro-chamfered to protect needle tips.
Cleanliness	Ultrasonically cleaned and double-bagged - ready for cleanroom introduction without re-cleaning.
Inspection	Full CMM report with first articles; per-lot inspection records for production.

Wear performance as a guide

Property	Si ₃ N ₄ value
Wear life as a guide	3-5x longer than 99% alumina (customer field data, cantilever cards)
Hardness (HV10)	≥ 1500 - resists sliding wear without chipping
Fracture toughness K1C	6.5 - 8 MPa·m ^{0.5} - edge chipping is what kills alumina guides
Particle shedding	Very low; no conductive particles, no free silica
Water absorption / swelling	0% - dimensional stability is independent of humidity
Electrical behaviour	Insulating and non-magnetic, no coating needed



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Material comparison

Property	Si ₃ N ₄ (GPS)	Al ₂ O ₃ 99%	ZrO ₂	Tool steel / POM
Hardness (HV)	~1500-1600	~1400-1600	~1200-1300	<= 700 / negligible
Fracture toughness (MPa*m ^{0.5})	6.5-8	3-4	8-10	-
Wear life as a guide	Baseline (longest)	~ 1/3-1/5 of Si ₃ N ₄	Good, but heavy	Short; swells with humidity
Chipping / particle risk	Very low	Higher (brittle)	Low	High (metal debris)
Electrical insulation	Insulating	Insulating	Insulating	Steel: conductive
Water absorption	0%	0%	0%	POM: yes
Density (g/cm ³)	3.20-3.26	3.85-3.95	~ 6.0	~ 7.8 / 1.4
Plasma / chemical cleaning	Stable	Stable	Stable	Degrades

Zirconia is tough but heavy, and its low thermal conductivity disturbs thermal test heads - which is why the wear data, not the datasheet, should pick the material.

From drawing to blanket order

Step	What happens	Lead time
1. Drawing or sample	DXF / DWG / PDF, or a worn part itself. If the original drawing is lost we reverse-engineer from the sample.	-
2. DFM review	Tolerance stack, edge treatment and grind-access check, returned before you commit to anything.	24-48 h
3. First articles	Supplied with a full CMM dimensional report.	2-3 weeks
4. Production	Per-lot inspection records; blanket orders scheduled out.	8-12 weeks

Prototype quantities start at 1-10 pcs, so a qualification trial does not require a production commitment.

Why NitriCeram

Probe card guides are not bought in and resold. NitriCeram is a brand of Shandong Dolphin Technology Co., Ltd., operating an integrated line from powder synthesis through forming, gas-pressure sintering, HIP, precision grinding and in-house testing - 15 gas-pressure sintering furnaces, 9 HIP and 3 hot press units. ISO 9001 quality system with in-house density, phase (XRD), microstructure (SEM) and strength testing. Every shipment carries a material certificate naming grade, route and measured density (> 99% of theoretical).

Send a guide drawing - or the worn part - to dolphintec@aliyun.com. We reply within 24-48 hours with a DFM review, recommended grade and price. NDA signed on request before drawings change hands.