

Alumina Ceramics

- # **Air slide: Pneumatic static bearing of large size**
- # **Vacuum chuck:**
Large size vacuum chuck plate to minimize exfoliation FPD glass
- # **Electrostatic chuck: FPD glass can be vacuum chucked firmly.**

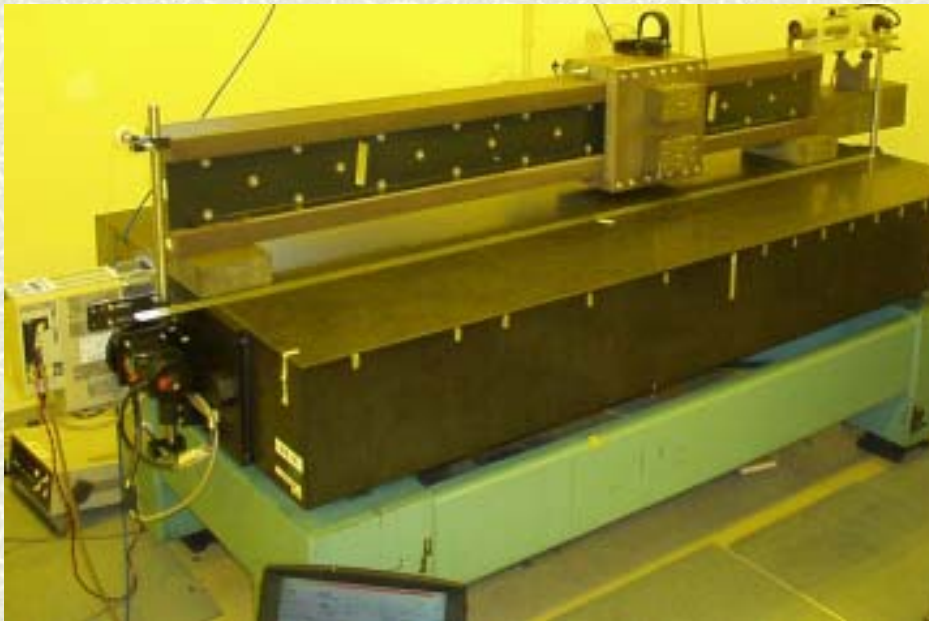
Features of Ceramic Air Slide

- # **Very hard, high rigidity aluminum ceramic is in use(SA610)**
2 – 3m long aluminum material(Young's modulus: 280GPa) can be manufactured.
Even when abnormal object scratches in, or crash by miss operation, it does not cause deep ditch like stone, or does not burn like metal.
Shallow scratch can be repaired by removing abnormal object or scratch.
No deterioration over the years, maintaining high accuracy.
- # **Table is maintained with flat bearing, 5 μ m compressed air layer**
High move accuracy and high accuracy repeatability are possible
With small friction(friction coefficient is less than 0.002), consistent speed, high speed move are possible.
No friction, care for maintenance is not required.

Air slide

I-type Beam Air Slide

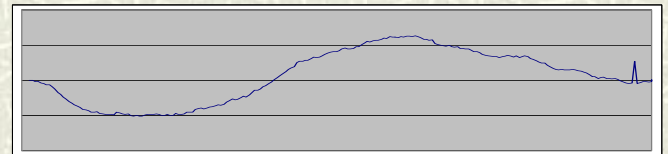
Table size : 300 × 290mm
Guide length : 1860mm
Travel : 1200mm



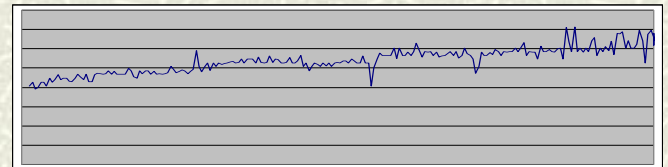
**For X-axis bearing on
double column**

Bearing rigidity : Horizontal 120N/μm
Vertical 200N/μm
Air consumption : 14 NI/min

Horizontal linearity: 1.1 μm/1200mm



Yawing: 1.3sec/1200mm



Air slide

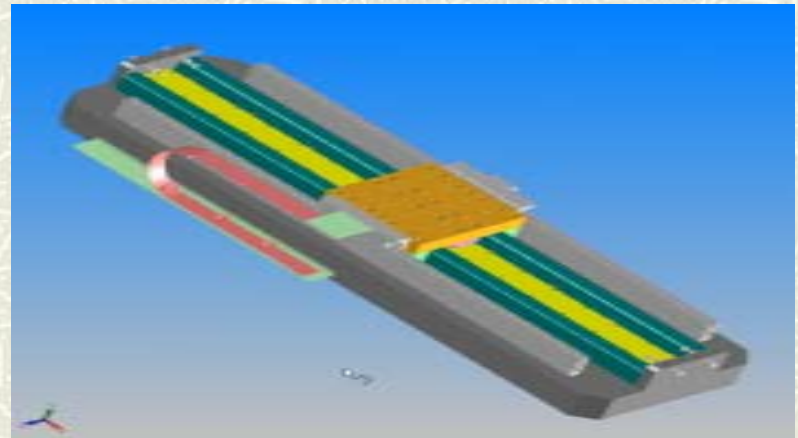
Magnet Plate Air Slider

Table size : 300 × 290mm
Guide length: 1650mm
Travel : 1320mm

Bearing rigidity Horizontal: 100N/μm
Vertical : 100N/μm
Air consumption 10 NI/min



For Y-axis of double column



Air Slide

Square Air Slide Guide

Table size : 180 × 120mm

Guide size: 80 × 80mm

Travel : 100mm



Z-axis short travel guide

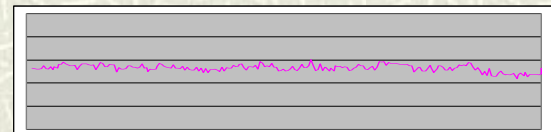
Bearing rigidity:

Horizontal: more than 200N/μm

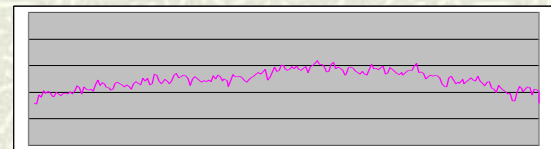
Vertical : more than 200N/μm

Air consumption: 7 NI/min

Straightness: 0.04 μm/100mm



Straightness: 0.10 μm/100mm



Measurement was done by
reversing, using glass mirror
and electric micrometer

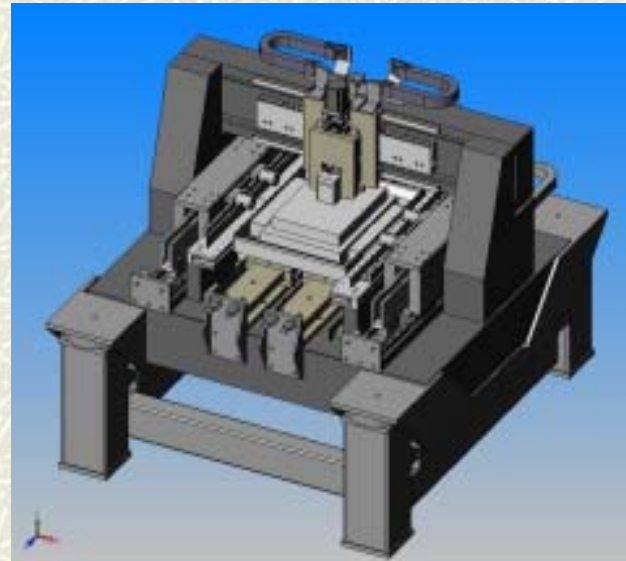
Air Slide

T-type Air Slide Guide

For heavy load guide

Table size : 200 × 200mm
Guide length: 400mm
Travel : 200mm

Bearing rigidity : Horizontal:250N/μm
Vertical:500N/μm
Air consumption:10 NI/min



Large Construction Micro hole vacuum chuck plate



Small conductive material : SA509

Volume resistivity : 1×10^8 \cdot cm

Surface resistivity: : 1×10^8 /cm²

**At FPD glass is leaving,
detachment charging with
electricity is small.**

**The total height difference
is within 10 μ m**

Size: 800 x 500 x 30mm x 8 pc.

Orifice vacuum chuck

Large Material Pin-type Vacuum Chuck Plate

Material : SA610

Flatness : less than 10 μ m

**Cutting 75 μ m deep,
1 mm pin pattern**

Contact area : less than 5 / 100

At FPD glass is leaving,
detachment charging wit
electricity is small.



**Reverse side can be rib shape by a
use of mold**

Size: 1300 × 1300 × 40mm
Pin type vacuum chuck

Large Material

Ceramic Tables bolted together



Size: 800 × 800 × 150mm
(2 pc are bolted)



Reverse side: M10SUS bolt
12 pc. (3 × 4)

Inner Electrode Static Chuck

FPD Glass Side Module

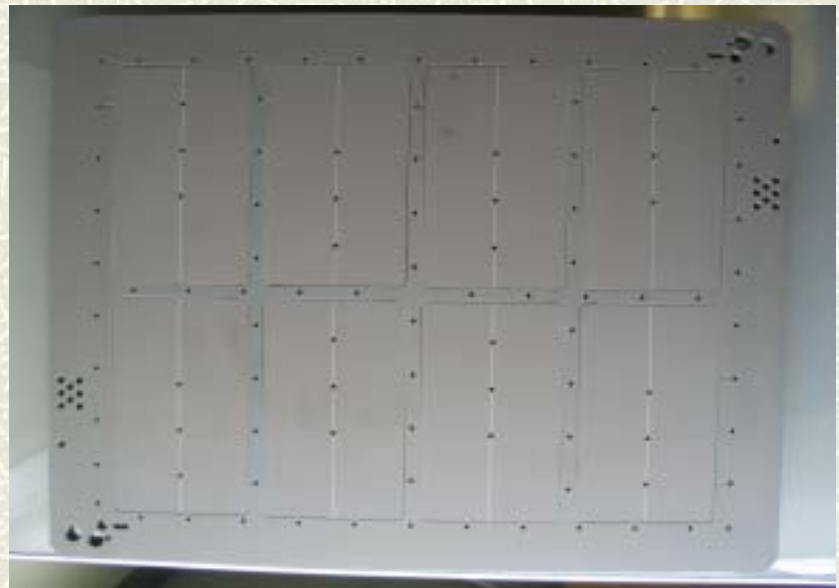
100 ~ 200 × 5 ~ 15mm

(single plate)



450 × 550 × 15mm Joint module

(100 × 160 × 5mm x 8 pc. Joint)



Inner Electrode Static Chuck Features

Dual Electrodes Fine Pattern

Dielectric (insulated) can be chucked

Electrode solid sintering & stable release

Inside vacuum and atmosphere, excellent anti-electric voltage and durability

Secured mass production system

To comply with large size FPD glass

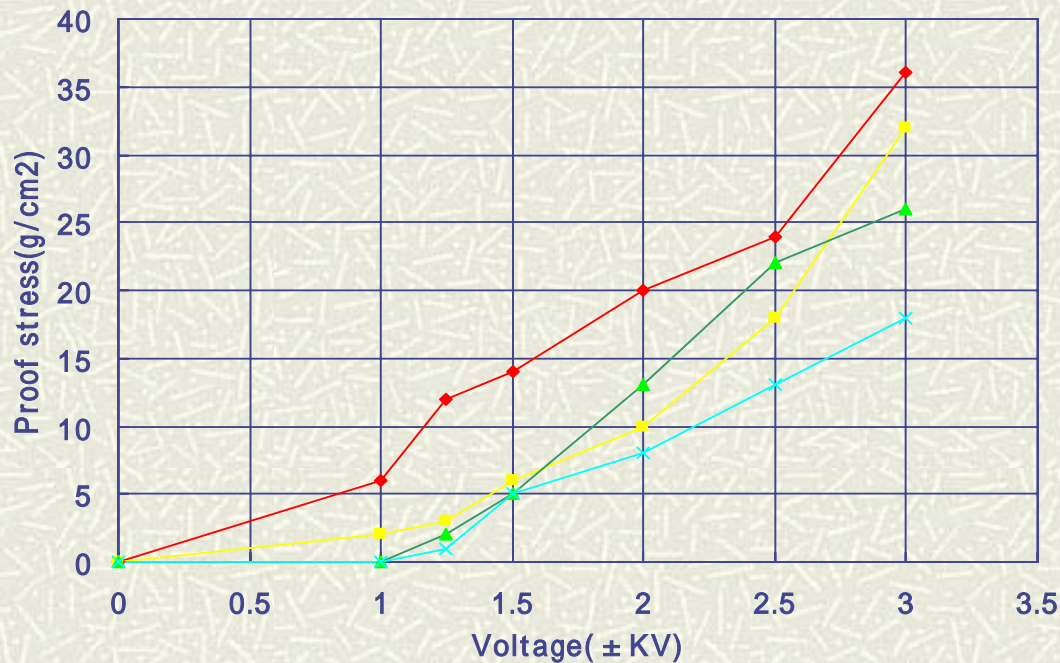
Material is Alumina Ceramic

High accurate flat is formed & high frictional resistance with high accuracy.

Inner Electrode Static Chuck

Quartz Glass for FPD can be chucked

Voltage & horizontal pressure



Static chuck size:

Valid size: 100*160mm

Glass:

Composite quartz glass:

Size: 6 inch X 0.7 mm thick

Measurement:

Horizontal push force
by a spring scale

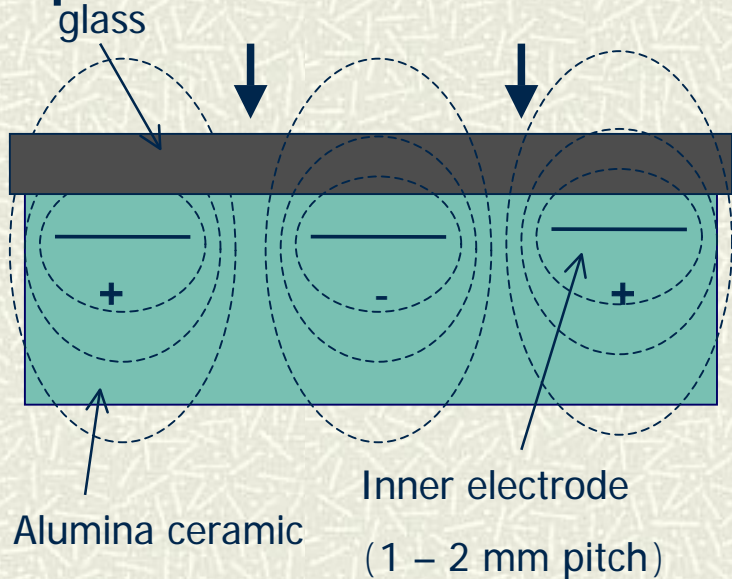
Circumstances:

Temperature: 23

Humidity: 50%

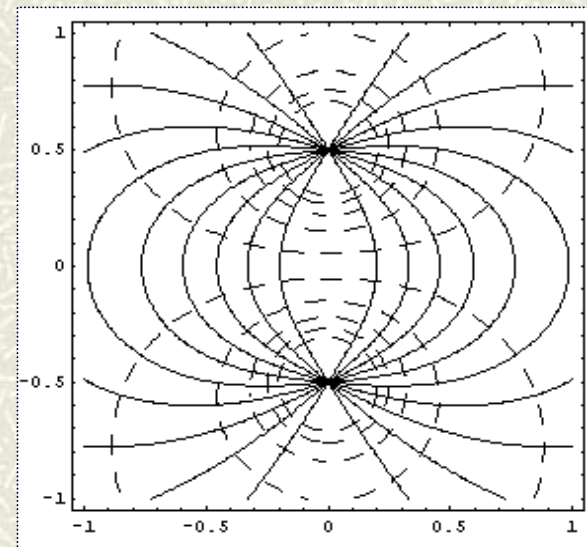
Why Glass can be Chucked?

- # Dielectric (insulated) can be chucked
- # Coulomb force by potential slope of Electric dual polarities



Equal potential line of electric dual polarity(dotted line) & electrical magnetic force(solid line)

Data :Electro magnet theory(by Mr. Takuichi Hirano)



Inner Electrode Static Chuck

Fine Electrode is Solid Sintered with Alumina

Thin curtain electrode is evenly covered by alumina ceramic.

Alumina ceramic inside the cylinder is totally filled and solidly sintered.

High electric resistivity
High reliance



Section photo of electrode

External Electrode Static Chuck

Static Chuck for Conductive Plate

- # **Semi conductive alumina**
Resistivity: $10^9 \sim 10^{10} \text{ } \cdot \text{cm}$
Small current and
- # **strong adhesion power**
- # **Dual polarity system**
on sintered reverse side,
silver electrode is printed
sand burned
Joint free large flat face



450 × 550mm

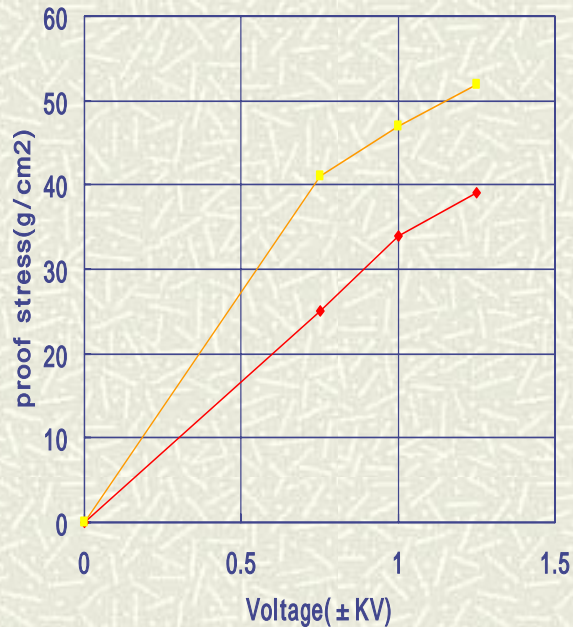
(Print area: 420 × 420)

(Data: Nueron Precision Co., Ltd).

Exterior Electrode Static Chuck

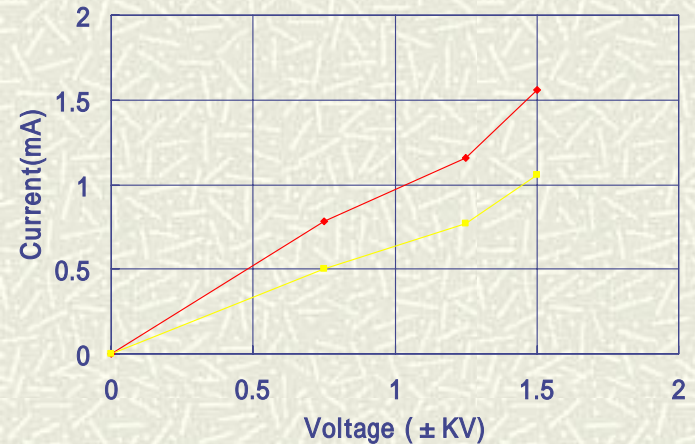
Glass Adhesive Force with ITO Film

Voltage & horizontal pressure



Electrostatic chuck
size: 450 × 550
Glass size with ITO film:
80 × 80 × 0.5
Measurement:
Horizontal tension
strength
(6 points × average
of 2 times)
Circumstances:
Temperature: 23 ~
26
Humidity: 55 ~ 62%

Voltage & horizontal pressure



Alumina Ceramic Features

		Alumina Cermic		Cast iron	Stainless steel	Aluminum	Stone
		SA610	SA509	FC25	SUS304		Granite
Density		3.5	3.4	7.8	8	2.7	2.8 - 3.0
Water absorption	%	0	0	0	0	0	0.03 ~ 0.3
Hardness	Gpal(HV10)	13	12	6.2	3.8		6
Bending strength	Mpa	300	250	400			30 ~ 50
Young's modulus	Gpal	280	230	110	200	70	30 ~ 90
Thermal conductivity	W/m·K	13.8	—	46	16.7	237	1.3
Coefficient of thermal expansion	10-6/	5.7 (-8~100)	—	8.4 (20 ~ 100)	17 (20 ~ 100)	24 (20 ~ 100)	8 (- 80 ~ 100)
Electrical resistivity	·cm	$> 10^{12}$	10^8	—	—	—	—
Alumina constant	%	about 90%	about 83%	—	—	—	—
Dielectric constant		9	9	—	—	—	—