HIGH SPEED MICROMACHINING CENTER

MicroMach Innovations Pvt. Ltd.

- **DYNAMIC STABILITY**
  High damping granite structure
- **STIFFNESS**
  Low chip load due to high spindle speeds
- **HIGH ACCURACY AND PRECISION**
  Stable optimized structure and nano-precision Z-stage
- **VERSATILITY: MILLING AND DRILLING**
  High torque spindle
- **LOW COST**
  Economical precision ballscrew x-y stages
  and AC synchronous electric spindle
  with high-stiffness ceramic bearing

ADVANCED FEATURES

Excellent surface quality (Ra~100nm)

High spindle speeds upto 140,000RPM

High feed rates

Vibration free rigid structure

Micromachining of difficult-to-cut materials

(Tool steels, Ti alloys and Ni superalloys)

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Design Approach

- Static Structure
- Modal and Dynamic Analysis
- Error Budgeting

Initial Design Consideration

Design of Machine Tools

Machine Tool Model

SELECTION OF OPTIMUM DESIGN

- Static Analysis
- Modal Analysis
- Frequency Response
- Analysis Dynamic Analysis
- Impact Analysis

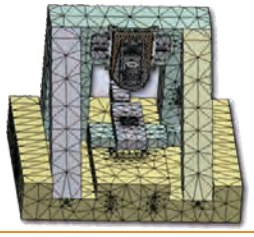
Error Budgeting

Geometry Optimization

Optimal Design

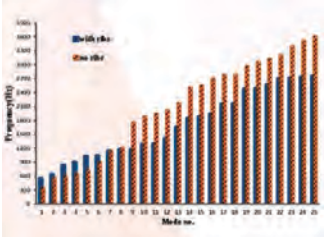
FINITE ELEMENT ANALYSIS

In order to design stiff structure to withstand heavy loads & impacts



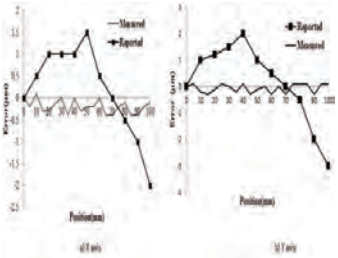
RIB STRUCTURE

Our studies showed that Vibrational frequencies are curbed by the Ribs hence better stability



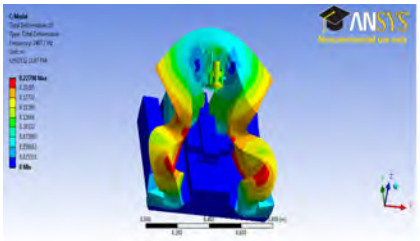
ERROR BUDGETING

Precise positioning of slides with nenometric resolution. Calibrated by Zeiss CMM



MODAL ANALYSIS

For selection of optimum structural configuration with reduced deflection at tool tip and other machine components

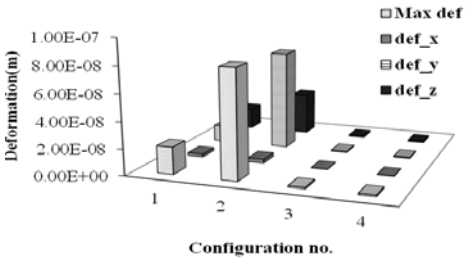


18th mode (2408 Hz)

VIBRATION DAMPING

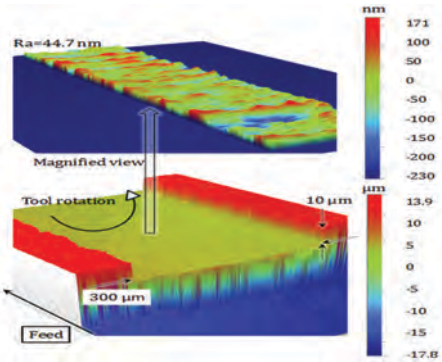
Frequency response analysis shows excellent damping ability with ribs

components	Ribs	No ribs
No slot	Configuration-1	Configuration-2
Slot	Configuration-3	Configuration-4



MACHINING RESPONSE

Nanometric surface finish achieved with Ultra high speed Micromachining centre



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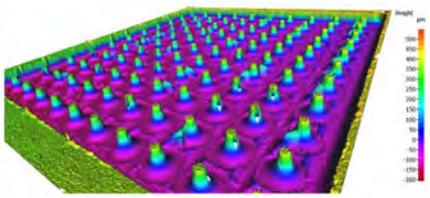
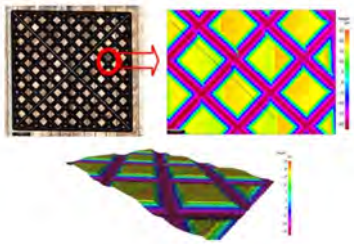
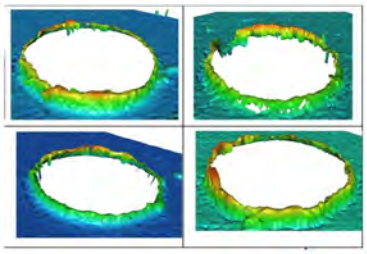
APPLICATIONS



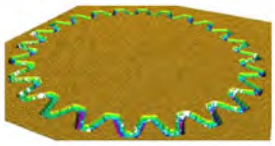
Micro Needles Mold
Bio-medical Applications



Textured Surface
Bio-medical Applications

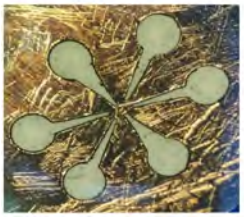


Micro Holes (Nozzles)
Automobile Industries

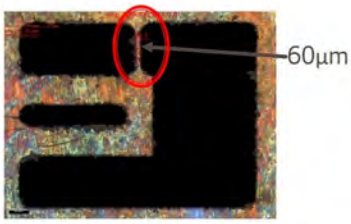


Micro Gear
Material BMG
Watch Industries

Spiral Channel
(100 micron)
Microfluidic Application

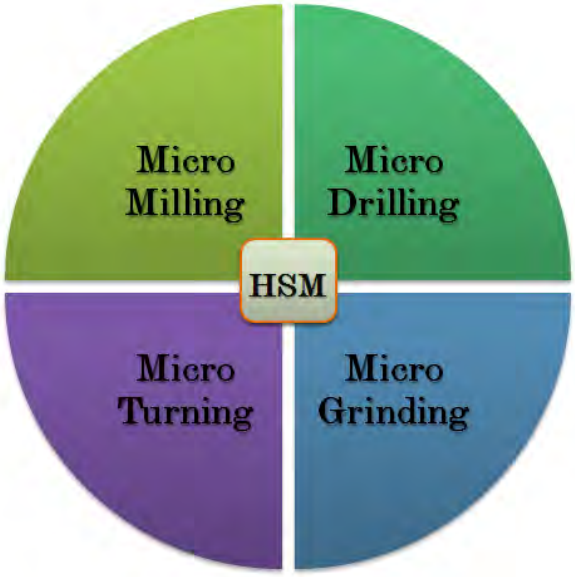


Thin Flim Mask
Thickness 50 micron
MEMS Devices



Thin Flim Mask
Bridge width 60 micron
MEMS Devices

PROCESS VERSATILITY



ACCESSORIES (Optional)

- Minimum Quantity Lubrication (MQL) Setup
- Microscope for tool registration and measurement
- Nano-Second Pulsed Fiber Lasor
  -Surface Texturing, Microdrilling, Colored Marking

TECHNICAL DATA

AXES X, Y

Travel distance	100 mm
Drives	Precision Ground Ball Screw/Brushless DC Servomotor
Max. Feed Rate	0.06-6000 mm/min
Maximum Load	Horizontal 25 kg Vertical 10 kg Side 10 kg
Resolution (Machine/Prog.)	0.2 µm / 0.5 µm
Avg. Accuracy	±0.5 µm

AXIS Z

Frictionless pneumatic dual counterbalanced mechanism for high precision

Travel distance	60 mm
Drives	Non contact Direct Drive/Brushless Linear Servomotor
Max. Feed Rate	0.06-6000mm/min
Maximum Load	Vertical 10 kg
Resolution (Machine/Prog.)	1 nm/ 10 nm
Avg. Accuracy	±0.3 µm

SPINDLE

Spindle Speed	Customized (5000 -140000 rpm) with variable frequency drive
Tool Holder	According to spindle (Mega 4S, ER-11, ER-8)
Spindle Torque	According to spindle (4.3 N-cm (140000 rpm); 11.9 N-cm (80000 rpm)

CONTROL SYSTEM

PC based high precison motion control
CNC operator interface
Standard NC code compatibility

STATIC AND DYNAMIC RIGIDITY

- High thermal stability machine structure due to low thermal expansion and thermal conductivity of granite
- Enhanced vibration isolation due to optimized granite machine structure

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