Fine Polish TDC

# Ultra Precise Mirror Polishing/Lapping service

## Contributing to MicroNanoTech

4th of April,2011

"Innovations for Industry" Forum

TDC Corporation

Natsuko Murakami

www.mirror-polish.com

# Agenda

Fine Polish TDC

- Representing JAPAN-TOHOKU region
- Introduction
  - Corporate Profile
  - What TDC offer.
- What can be achieved by our technique
  - Sub-nano order Surface Roughness
  - Sub-micron order Flatness, Size tolerance
  - Angle, weight, volume, reflection condition
  - Curved surface, precise ball, pipe
  - Thickness control, metal foil
  - Square bar
- How it's applied in MEMS
  - Nano inprinting table
  - LIGA Process Mold base
  - Nano inprinting roll
- Other
  - Quality assurance
  - Delivery
  - Our future

Fine Polish TDC

# Representing JAPAN-TOHOKU region

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# 11th, March, 2011
# Mega-Earthquake, Tsunami

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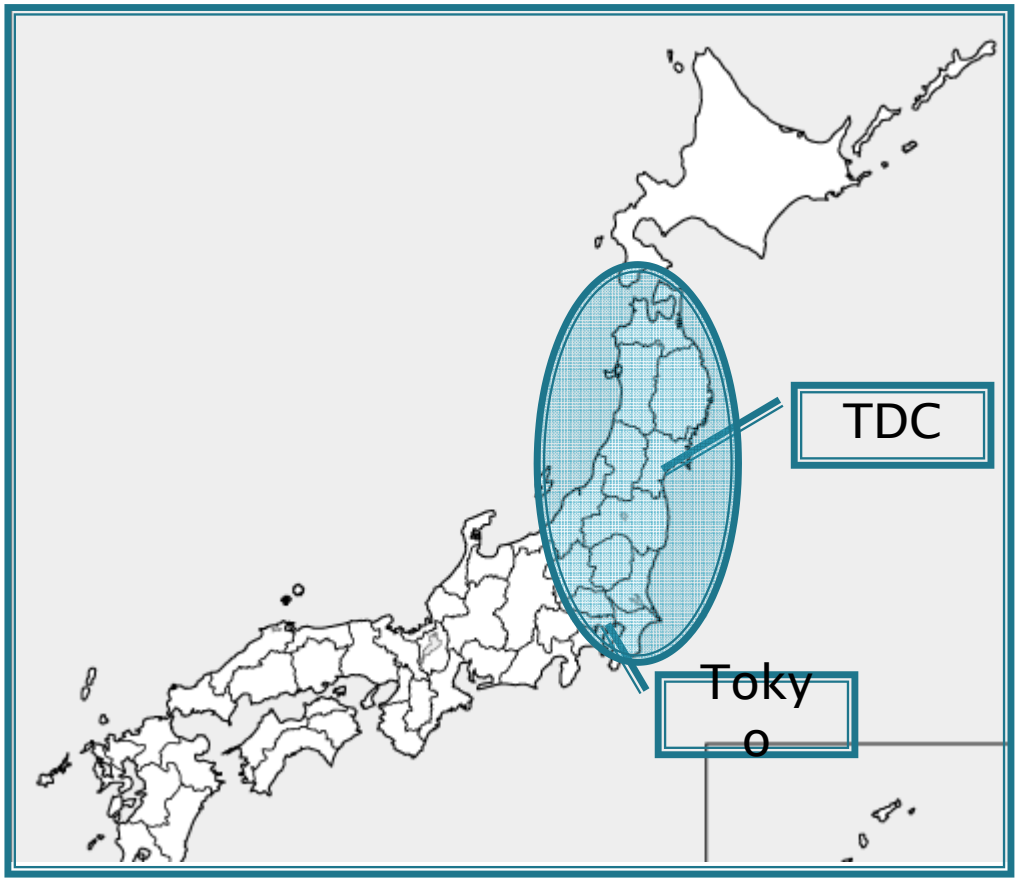


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# Impact on TDC

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- All staffs and their families are safe
- No serious damage on factory, machines
- Infrastructure damage
  - Electric power came back on 15th ,March
  - Water supply came back on 16th, March
- Factory operation started one week after the earthquake

- We are still suffering from region wide gas shortage, transportation inconvenience

# Thread of radiation

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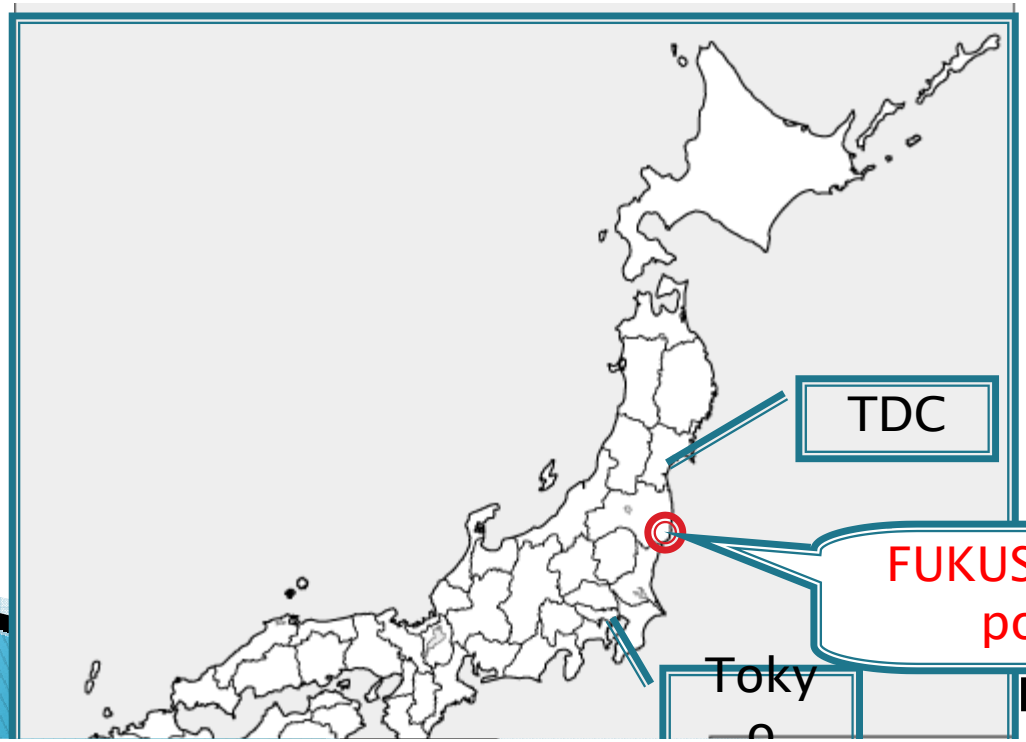
- 20km from Fukushima power plant is high risk area.(This criteria is set on the assumption of worst case sinareo)
- TDC is 100km away from Fukushima nuclear power plant. Radiation level is harmless.

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# Quick recovery

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11th,March,2011

17th,March,2011

# High tech industry cluster

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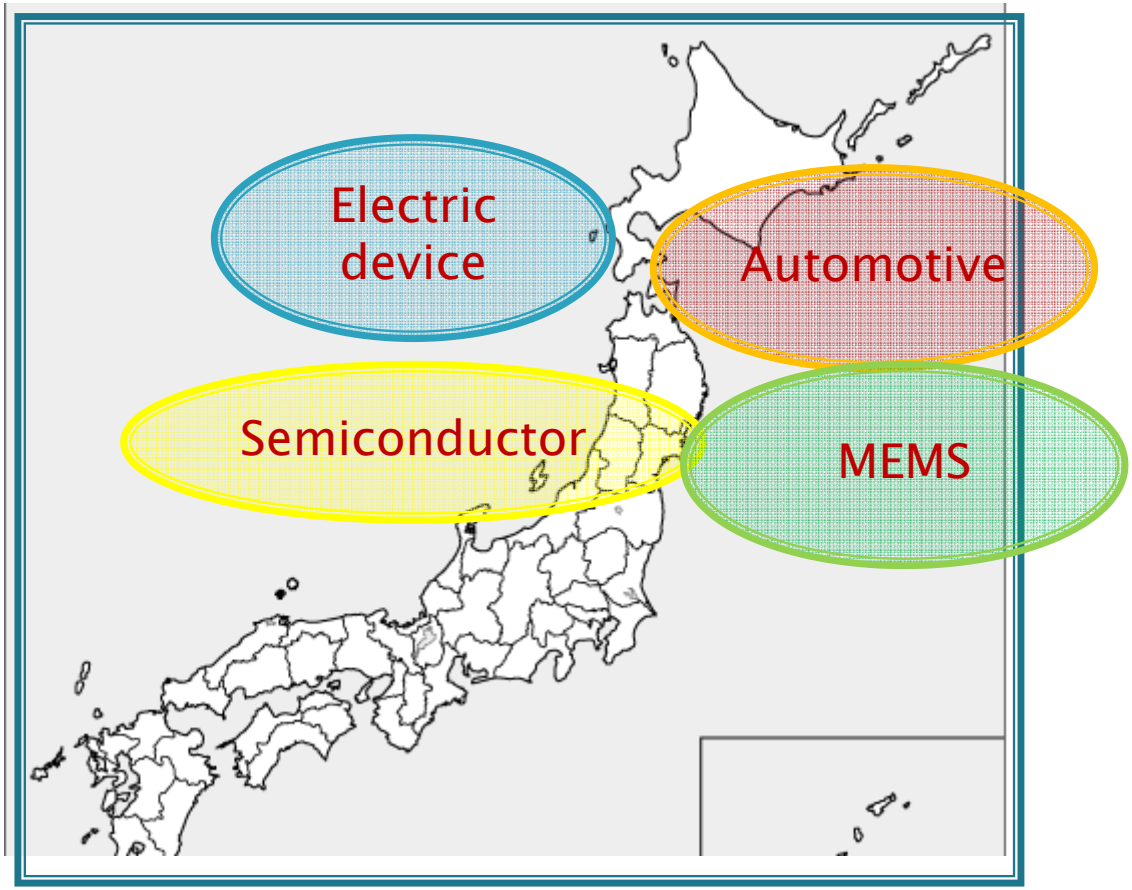
- Tohoku region is global supplier



Fine Polish TDC

# Introduction

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# Corporate Profile

Fine Polish TDC

- TDC Corporation
- Established 1989
  Former company, Die casting was established in 1953.
- Capital 30 million yen
- President Ryoya Akabane
- Employee 50

# Location

TDC HQ is located in Miyagi, Northern area of JAPAN
Sales offices in Tokyo, Osaka.

# What TDC offer

Fine Polish TDC

- TDC is a manufacture which mainly provide

**Super Precise**
**Mirror Polishing/Lapping**
**Service**

- We don't sell any
  - lapping machines,
  - lapping process,
  - abrasive tool, etc….

# Production Equipments

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We possess various equipments
centered around the lapping machine.

- From material procurement to finishing surface.
- From one to mass production
  - Lapping machine (one side) 80
  - Lapping machine (both side) 15
  - Grinding machine 10
  - Slicing machine 9
  - Others （NC Lathe, Milling, EDM, etc.)

# Lapping machines

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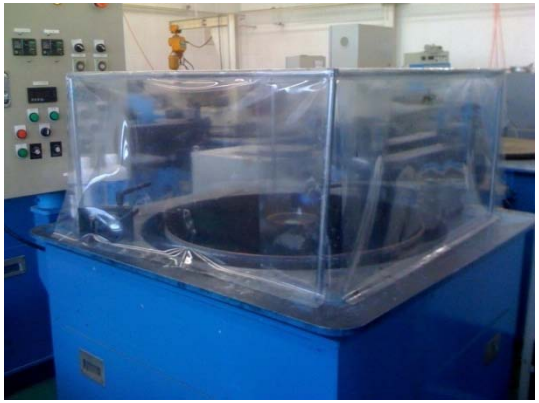
The half of TDC'S lapping machines are made by ourselves.

In-house machines make it easy to control quality and to shorten production lead time.




In-house 32ｉｎ-10、24in-3、 15ｉｎ-18

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# About our technology
# Super Precise Mirror Polish

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# What we can process.
## wide variety of material

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- Metal
  (SUS,Nickel,Copper,Aluminum,Titanum,Molybdenum,Tungsten,Tantalum……..
  STAVAX)
- Ceramics
  (Alumina、PZT、PMN-PT…)
- Resins （Engineering plastics, Acryl, Teflon ….)
- Glass(Quartz、BK7、PYREX)
- Semiconductor material（Si、SiC…)
- Others (newly developed materials)


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# What can be achieved?

## Sub-nano order surface roughness

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- Sample data

| Material | Roughness |
|---|---|
| Nickel | Ra0.8nm |
| SUS304 | Ra0.7nm |
| SUJ2 | Ra0.9nm |
| Titanium | Ra0.7nm |
| A1050 | Ra1.7nm |
| Cemented Carbide | Ra1.6nm |

[Measurement tool]
Non contact optical 3D Profiler
Talysurf CCI3000(Taylor Hobson)

# What can be achieved?

## Sub-micron order flatness

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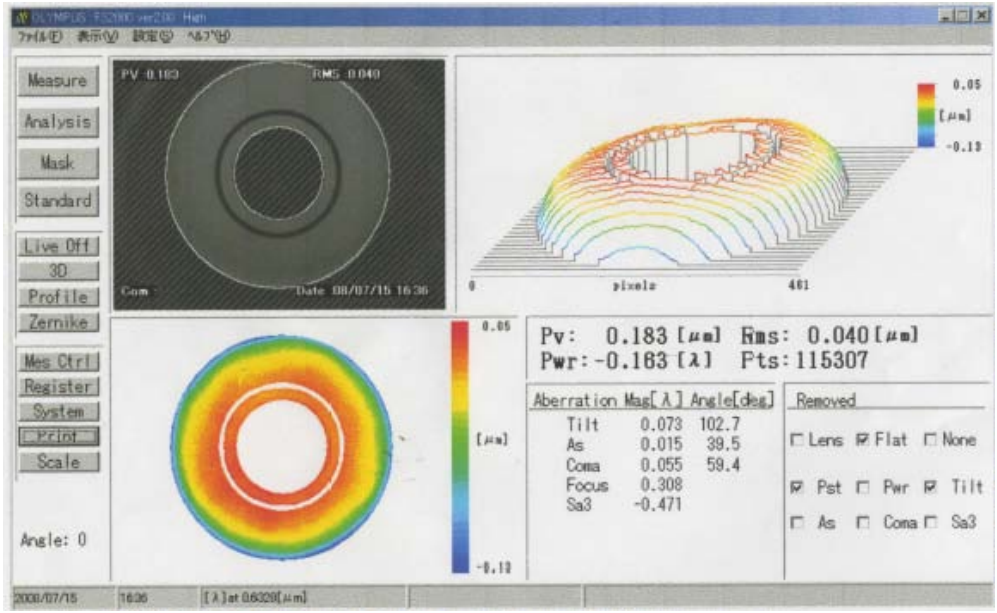
- Sample data

| Area | Flatness ( $\mu$ m) |
|---|---|
| 4” square | 0.05 |
| $\phi$ 500 | 1.0 |

**Data sheet**




【Capacity】
$\phi$ 0.1～$\phi$ 1,500mm

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# What can be achieved?

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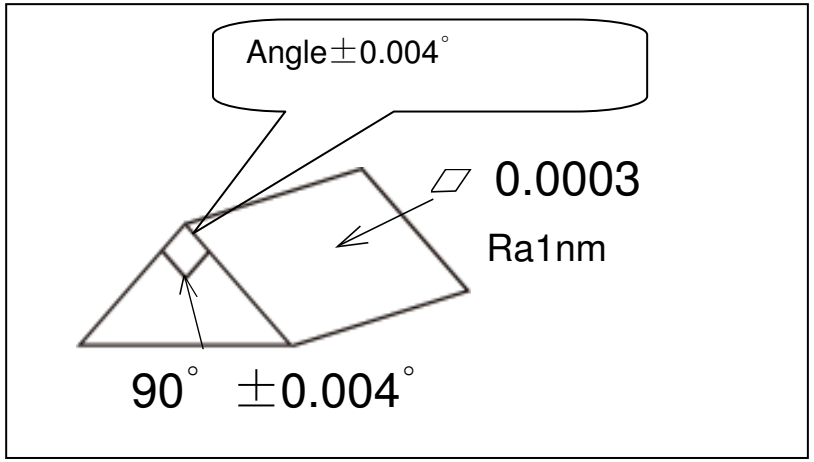
- Control Angle(+/-0.004 degree)




- Control Size, Weight, Volume

# What can be achieved?

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- Control reflection condition
  - Made used in thesis in Osaka University
    - Broadband group delay desperation compensation for a microscope objective lens with a specially-designed mechanical deformable mirror

- Curved surface, precise ball,
- Pipe (inside/outside)

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# What can be achieved?

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- Thickness control
  Shim & Spacers (Thickness tolerance ±0.5μm)

- Metal Foil（SUS304、Cupper）
  - Thickness10μm～
  - Size 350*350mm

# What can be achieved?

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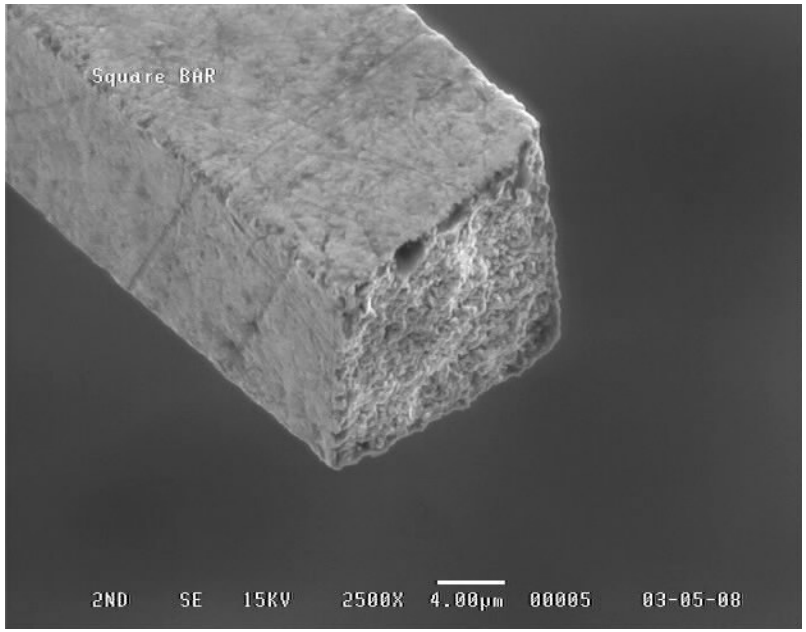
- 50 micrometer square bar（Cemented Carbide)



# Where our technology applied

## anywhere preciseness is required

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- Nano technology
- Micromachining(MEMS) Technology
- Semiconductor industry
- Automotive industry
- Medical industry
- Optical industry
- Aerospace industry
- Chemical/Pharmaceutical industry
- Printing industry
- Electronics industry

Over 2000 company/institute all over the world

Fine Polish TDC

# How TDC is applied in MicroNanoTech

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# TDC in MicroNanoTech
## Precise stage/table

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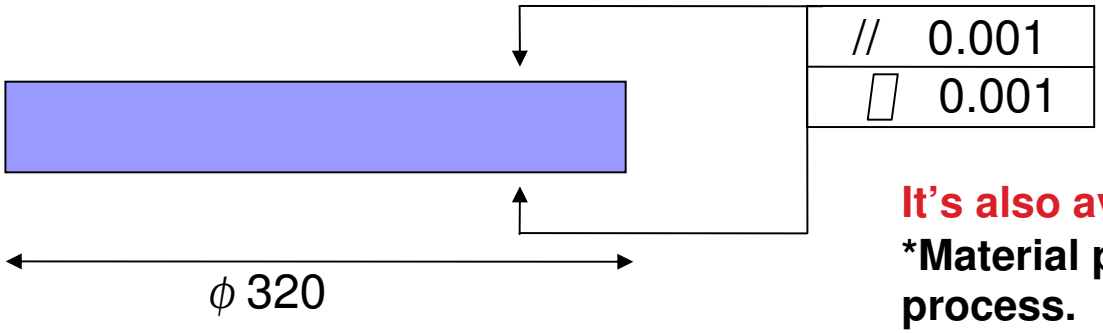
- Heat stage, pressure stage, etc.
  - Size: up to 12in wafer size
  - Flatness 0.001mm
  - Parallelism 0.001mm以下
  - Material: Glass, Metal, Ceramics




**It's also available!**

***Material procurement, and machining process.**

***Surface condition could be mirror, or frosted surface on your request**

***Retouch for used stage**

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# TDC in MicroNanoTech
## Precise mold base for MEMS

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- Various material
  - Metal- Nickel, Stainless steel, Copper, Tantalum, Molybdenum
  - Ceramics- Alumina, SiC, etc.
  - Quartz glass, Crystal, etc.

SUS304 $\phi$ 100*5mm
Flatness <0.5um
Parallelism <1um
Roughness <Ra0.0001nm

→ Corner slope is not allowed in order to guarantee high throughput and uniformity for manufacturing micro components.

# TDC in MicroNanoTech

## Severe size control for small blocks

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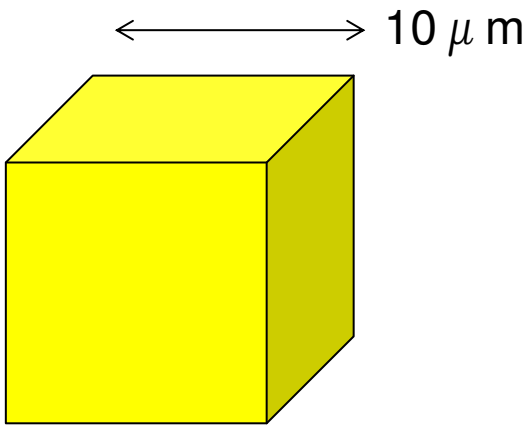
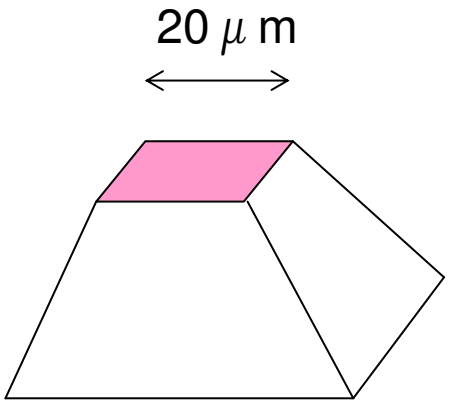



Cube: 10*10*10 μ m




Pyramid
Top face: □20 μ m
Bottom face:□80 μ m

# TDC in MicroNanoTech

## Nano imprinting Roll

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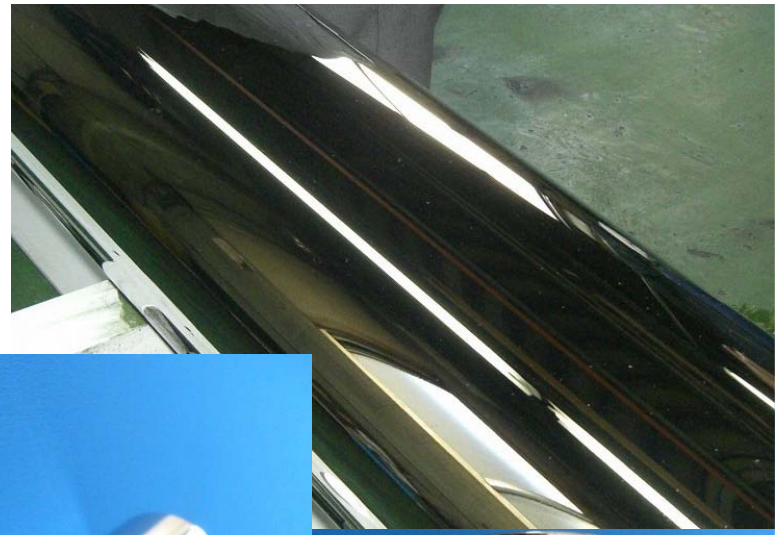
- Size: up to 2,000 mm long
- Material: Stainless steel, Aluminum, Glass
- Surface Roughness:
  - Ra1.5nm, Rz10nm



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# TDC in MicroNanoTech

## Super precise ball

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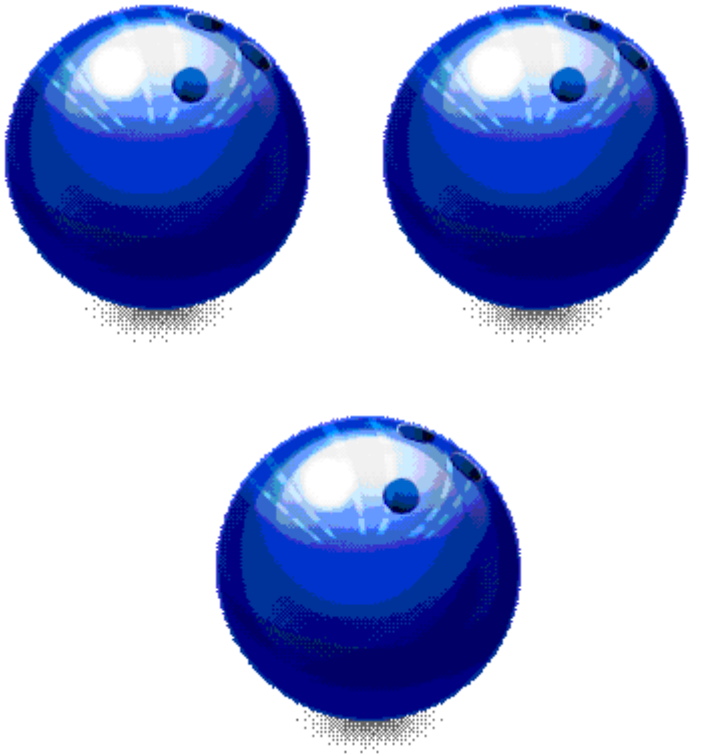
- Size: 0.5mm – 25mm
  Size tolerance: +/- 0.0005mm
  Sphericity: 50 nanometer
  Material: any kinds. (e.g. metals, ceramics...)

  No scratch on surface ( mirror finished )

- Super precision ball is used for
  - Probe
  - Stylus
  - Bearing
  - Master ball



Fine Polish TDC

# Policy and Message

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# Quality Assurance

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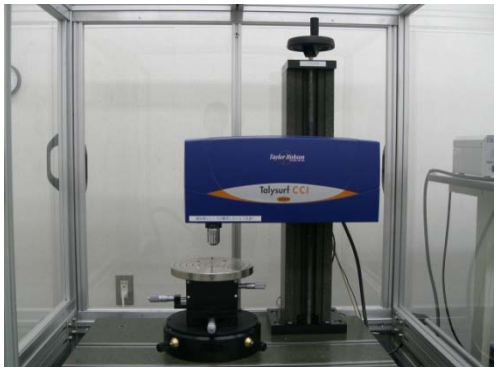
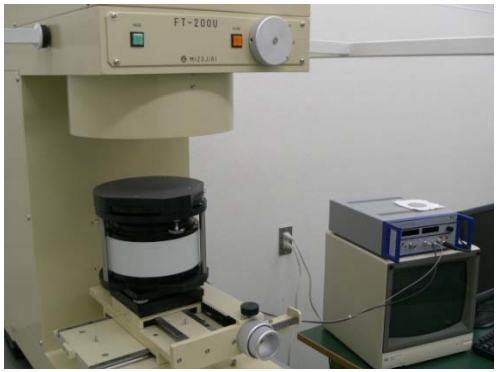
- TDC inspect our product one by one with reliable tools




Talysurf CCI3000




FT-200U


Ultra High Accuracy CMM
LEGEX9106

Talyrond 395

# Delivery

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- Quick Service / Quality Excellence.

# Secrecy policy

Fine Polish TDC

- TDC strictly control customer's information.
- Contract "non disclosure agreement" with customers who requires it.
- To keep customer's secret, no one can enter our factory.

# Our future

Fine Polish TDC

- As a global niche top, seeking more preciseness responding to customer's requirement.
- Always be in the forefront of Precise manufacturing.
- International collaboration

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We are looking forward to
collaborating with you
in near future.

Thank you very much
Hall6 /E18

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