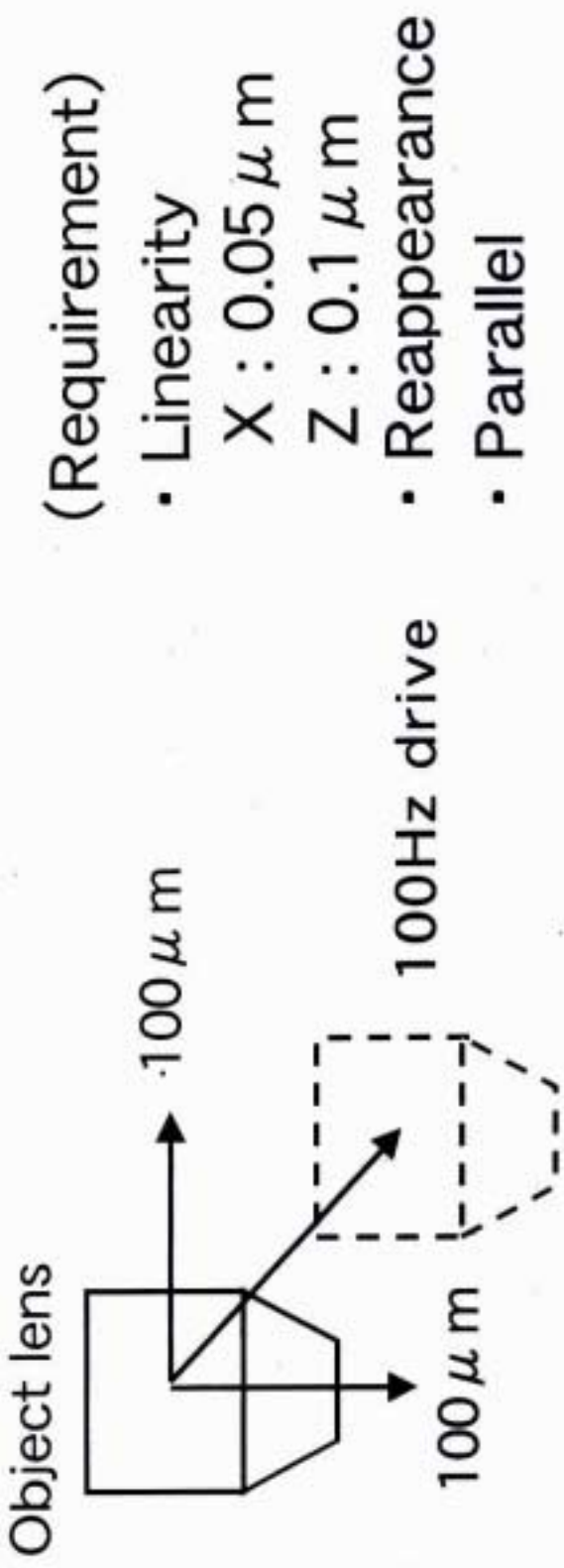


Development of the high-speed stage

by Piezo Actuator


S.Ishikawa(Nagoya Univ.)

# 2 Axes Driving



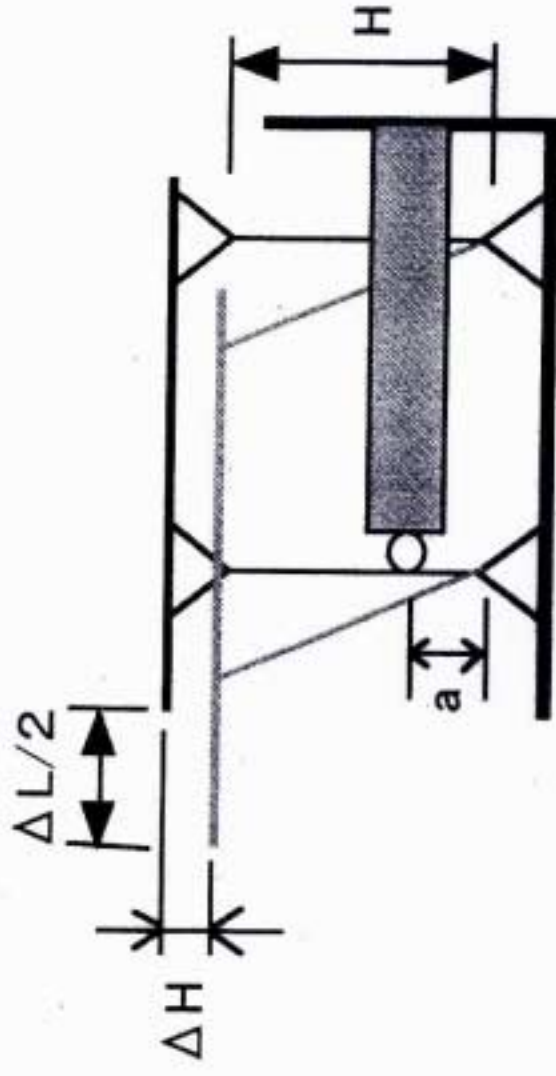
(Requirement)

- Linearity
  - X :  $0.05\ \mu\text{m}$
  - Z :  $0.1\ \mu\text{m}$
- Reappearance
- Parallel

How to Drive ?  Piezo Actuator

How to Guide ?  Parallelogram Flexure System

(Movement principle)



Parallelogram Flexure System

$\Delta H$  = Out of plane error

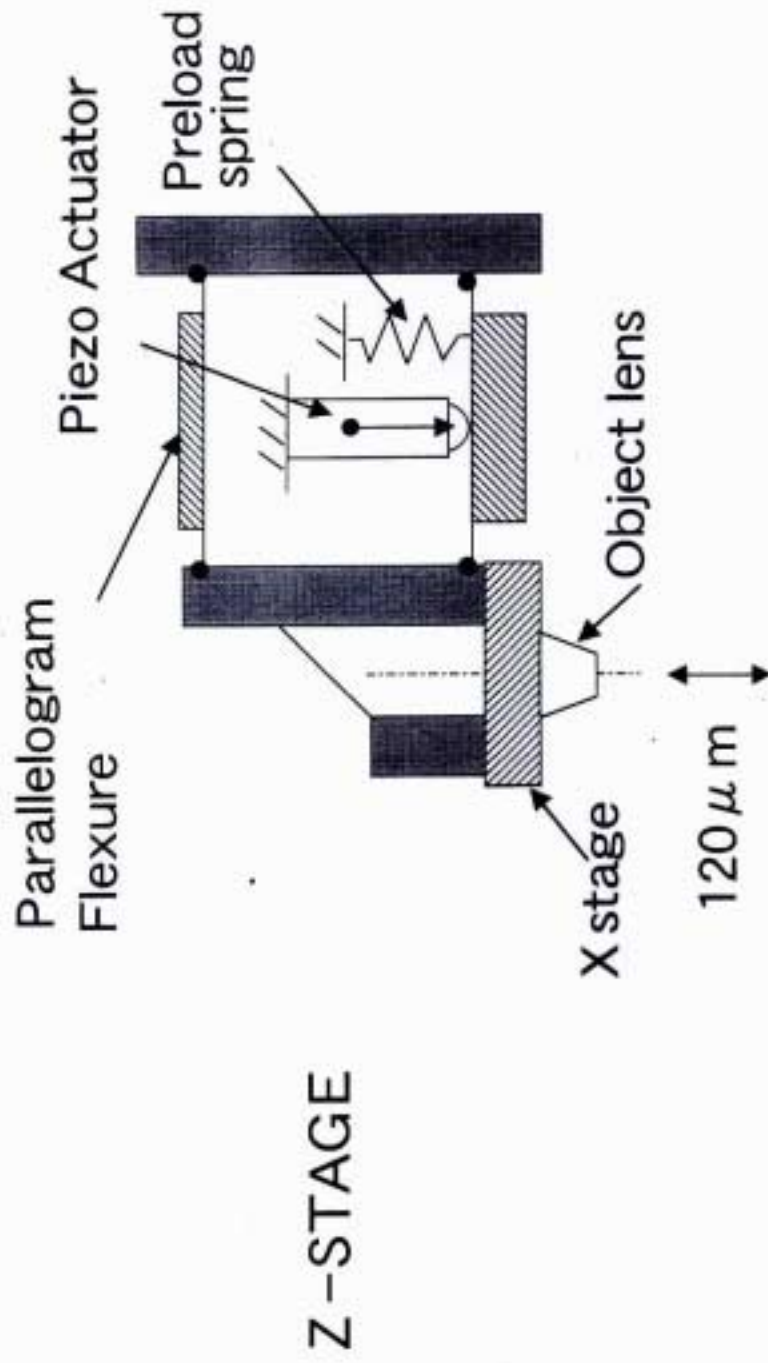
$$\hat{=} (\Delta L/2)^2/2H$$

Here,  $\Delta L = 120 \mu\text{m}$ ,  $H = 28\text{mm}$

$$\therefore \Delta H = 0.064 \mu\text{m}$$

Linearity & Parallel is OK

## (Structure of the device)

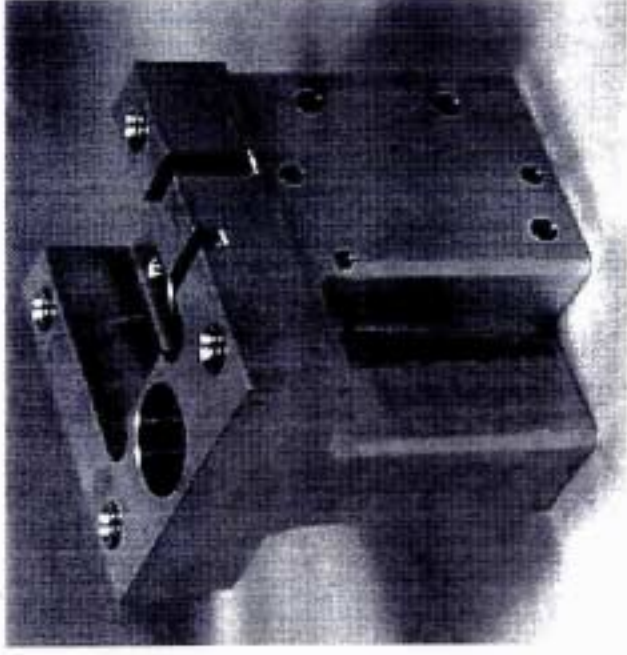
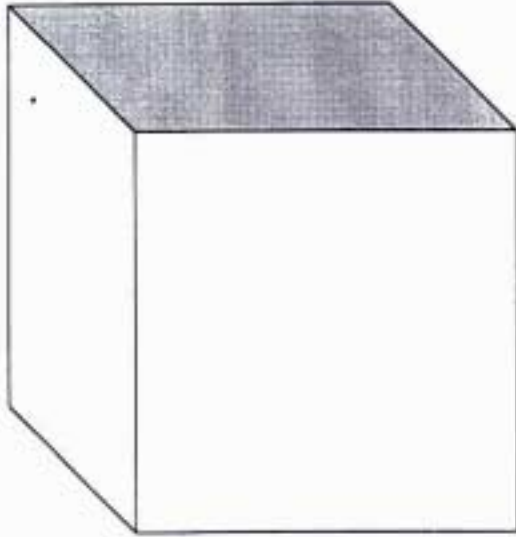


### Specifications of stage

| Stage | Travel range ( $\mu\text{m}$ ) | All weight (g) | Movement part weight (g) |
|-------|--------------------------------|----------------|--------------------------|
| X     | 120                            | 120            | 25 (With the lens)       |
| Z     | 120                            | 800            | 130                      |

# (Working process)

Example : Z-stage

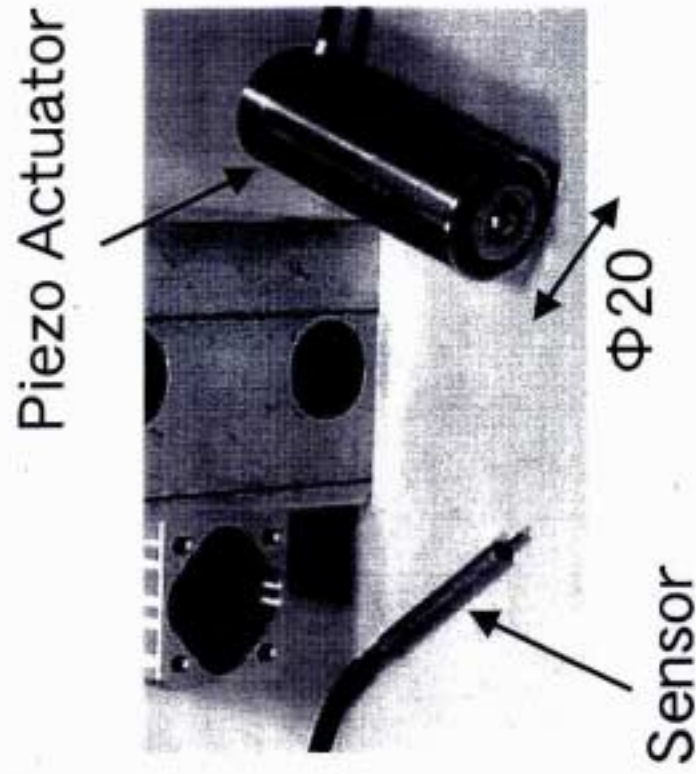
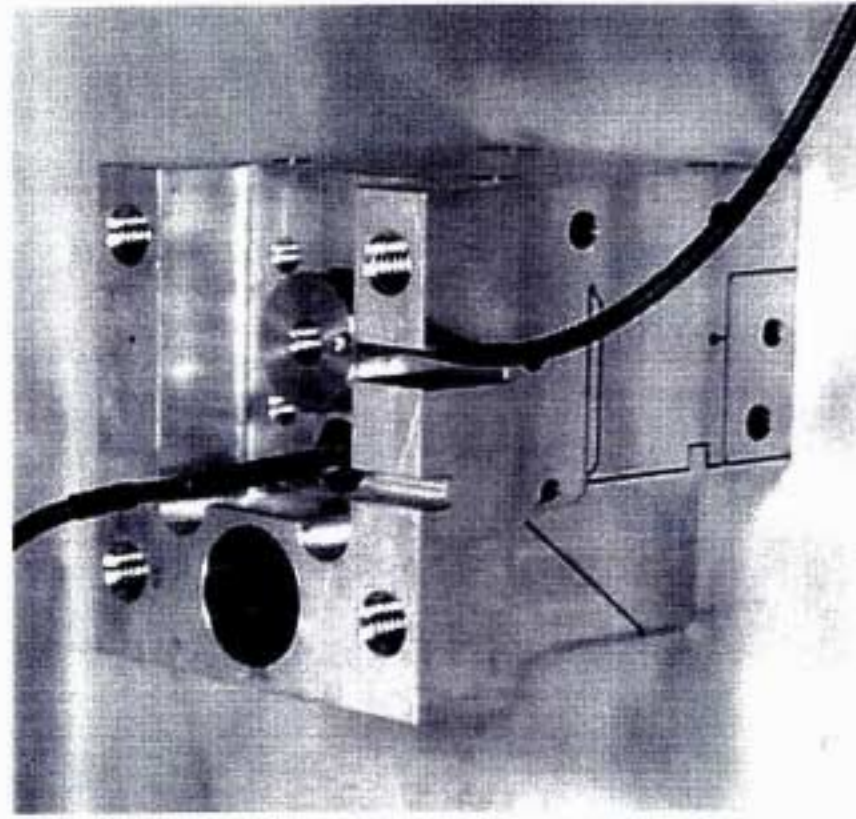


Material

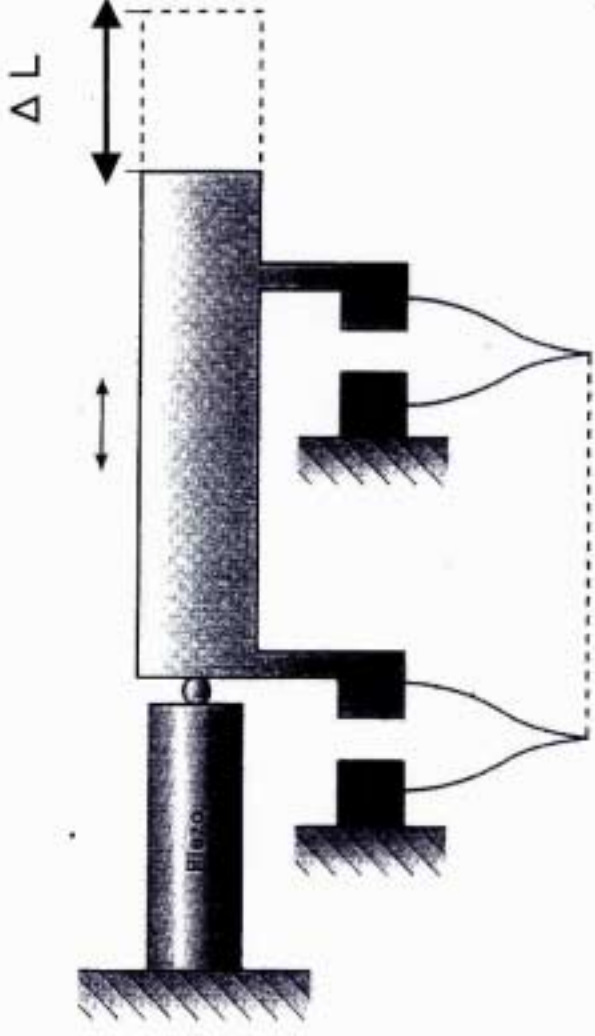
Cutting Work

- Milling
- Drilling

W-EDM → (Assembling of Z-stage)

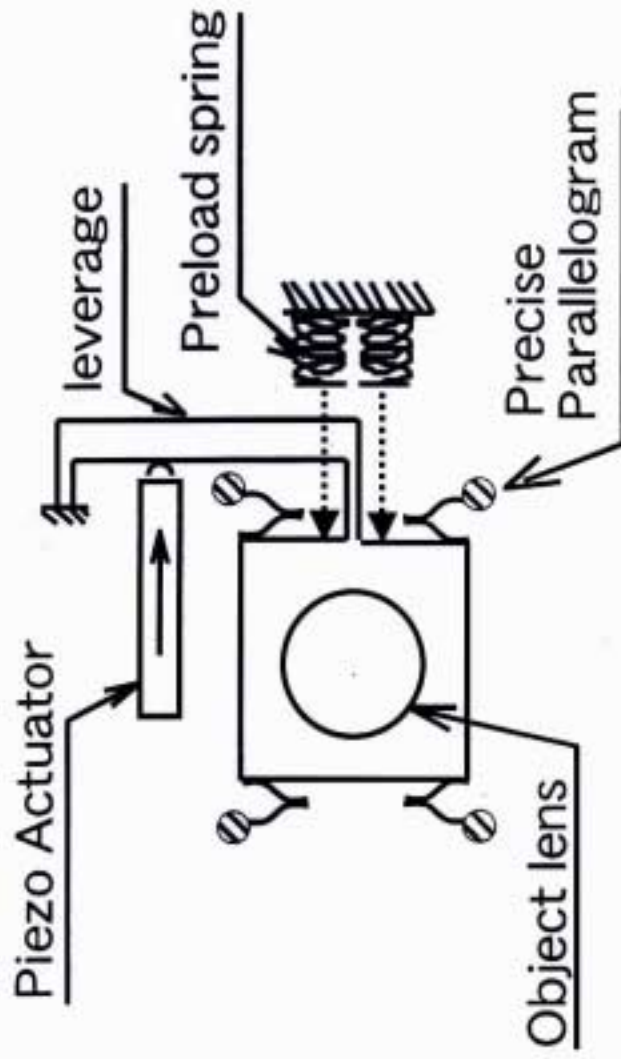


Precise Parallelogram Flexure System



Circular arc motion is denied  
Out of plane error  $\hat{=}$  Nanometer  
⇒ Adapted to the X-stage

# (Structure of the X-stage)

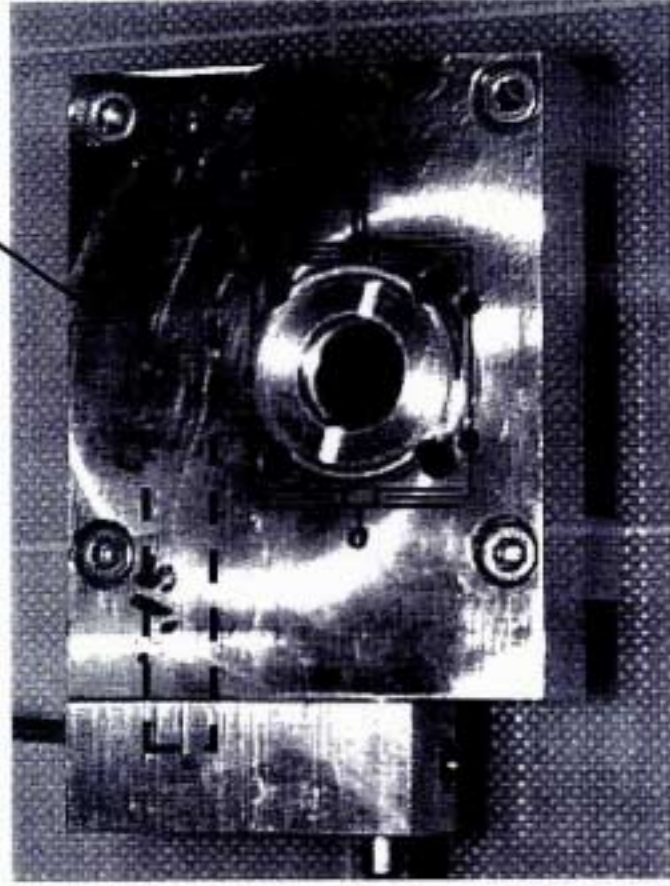




(Assembling of X-stage)

Top View

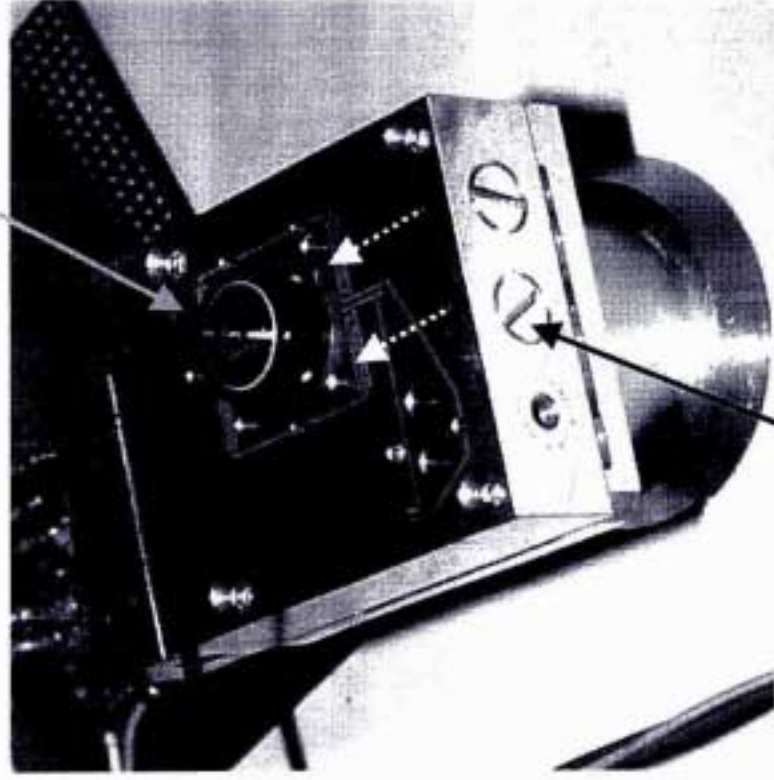
Piezo Actuator



57mm

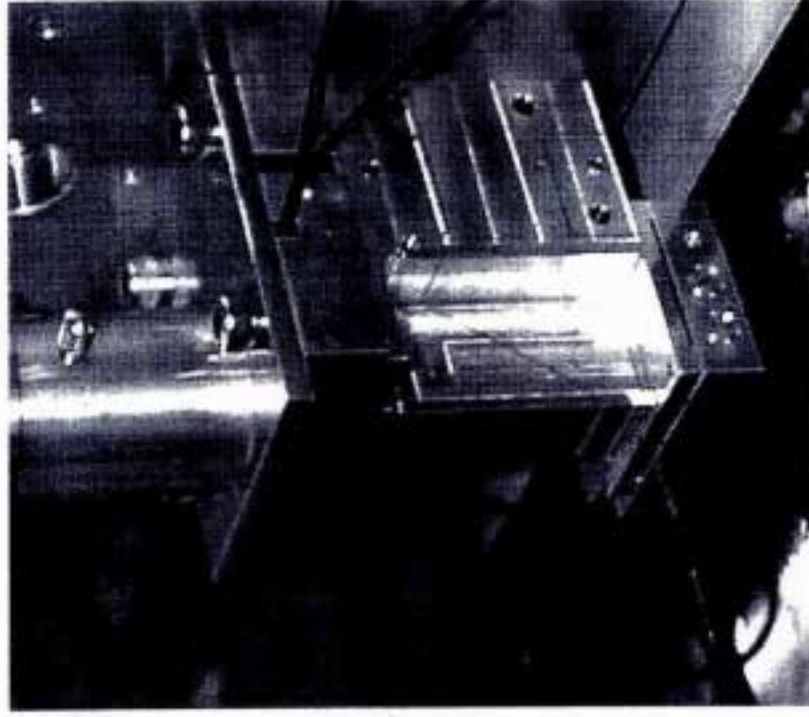
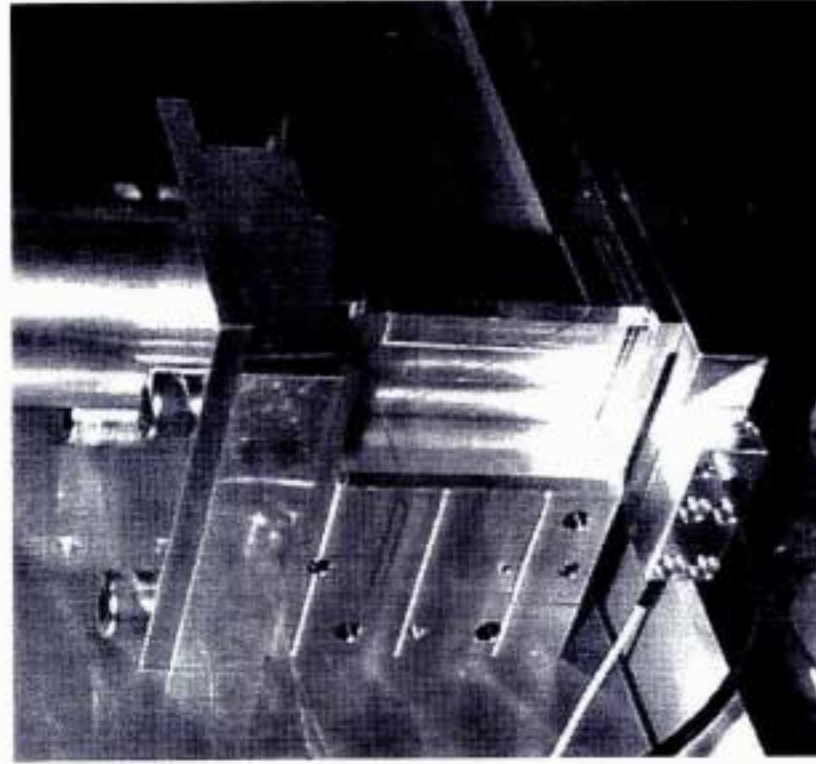
Bottom View

Object lens



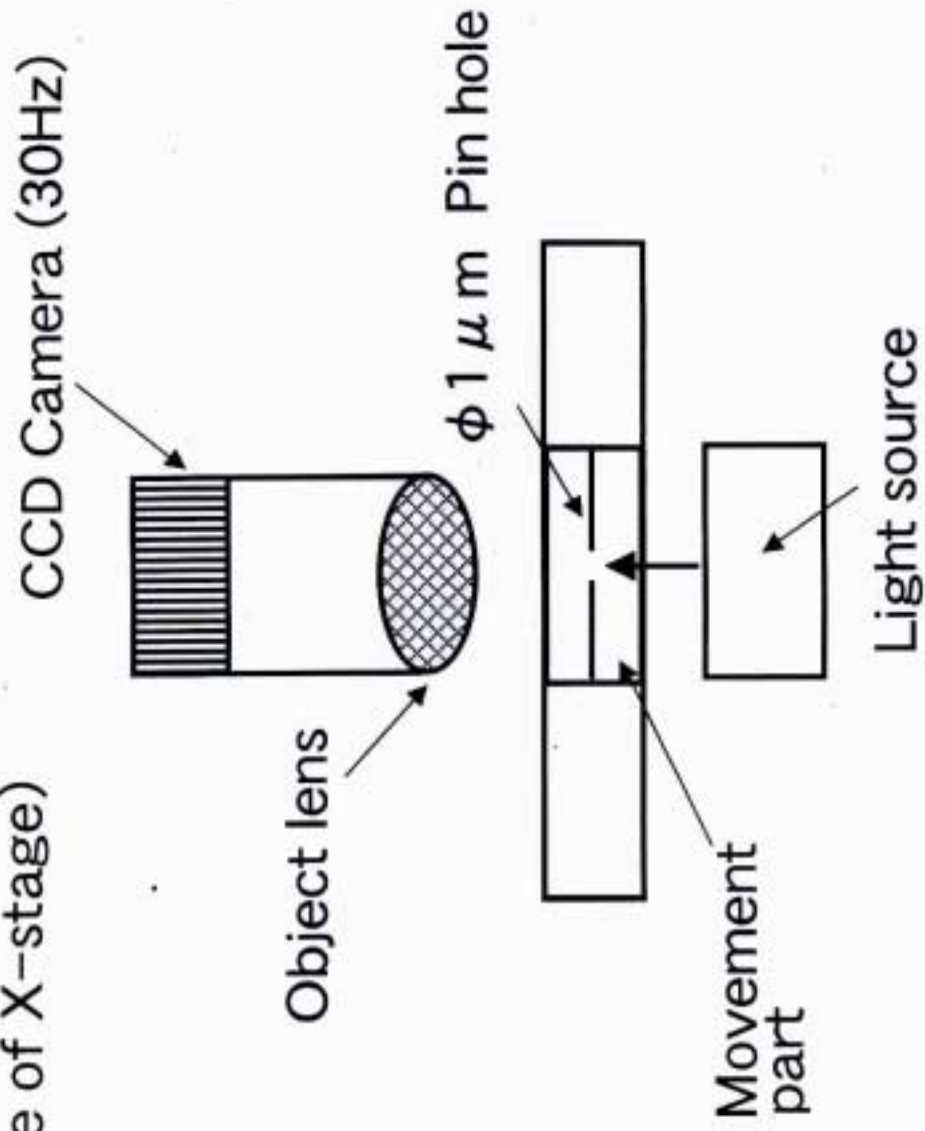
Preload spring

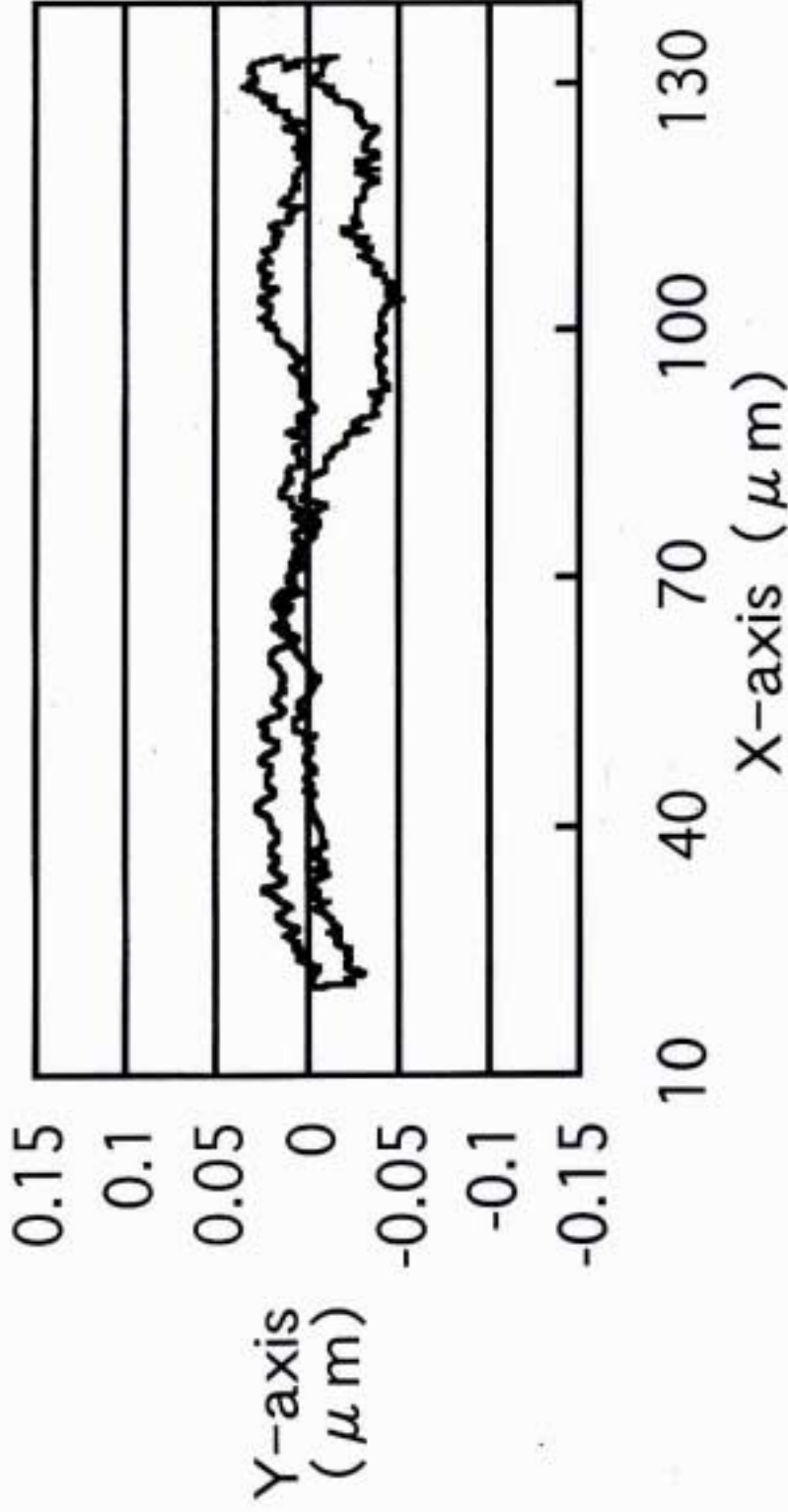
## Combination of Xstage and Zstage



# Performance examination

(Test device of X-stage)





Linearity Within  $\pm 0.05 \mu\text{m}$

Performance is enough for S-UTS