

# Compact Type Tilt Sensor

This product is a non-contact angle measurement sensor equipped with a semiconductor laser and adopting an optical autocollimator method.

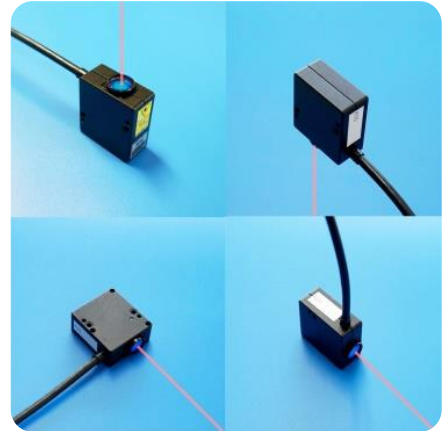
## 1, Features

Newly developed world's smallest\*1 optical sensor head.  
Best suited for embedded equipment.

### Amazing Downsizing



It can be installed in any direction, even in narrow spaces.



\*1 According to our research in October 2020

## 2, Configuration Example



PC

• Windows 10 (Japanese version, English version, 32-bit version, 64-bit version)

Smartphone, Tablet

• For Android OS over 4.3 \*Not compatible with iOS.



GP-2000  
MONITOR

PLC etc...

## - Example

It can be used to solve various themes.

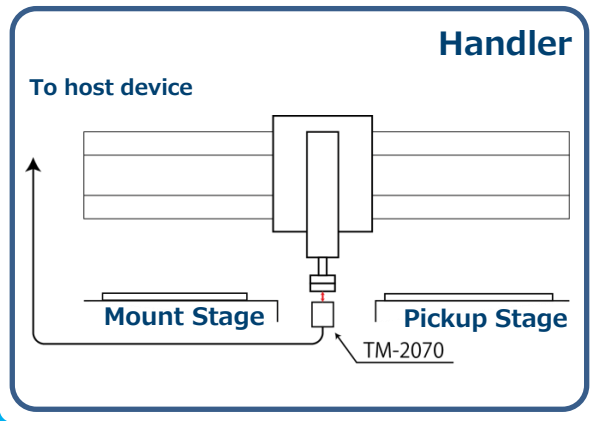
## - Semiconductor

### - Theme

How to mount a semiconductor chip in parallel on a package

### - Solution

Install TM-2070 in the mounter and measure tilt of the chip picked up by the handler. If it is within the specified value, it can be mounted. If not, status change to error. A reduction in defects can be expected.



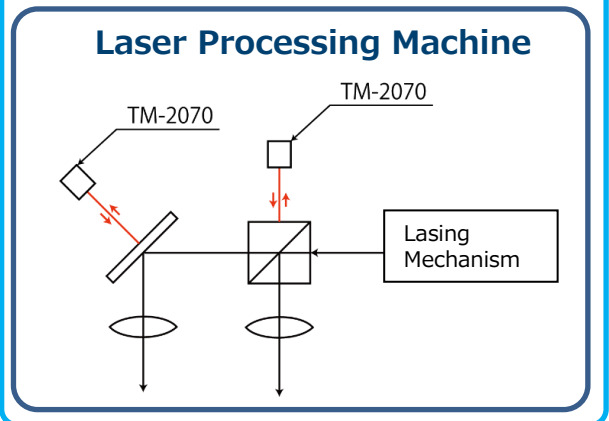
## - Processing Machine

### - Theme

How to monitor and accurately adjust the orientation of optical components that make up a laser processing machine

### - Solution

By installing TM-2070 into the equipment, the component angle can be monitored. Since the status of the equipment can be grasped from the value, stable processing can be performed at all times.



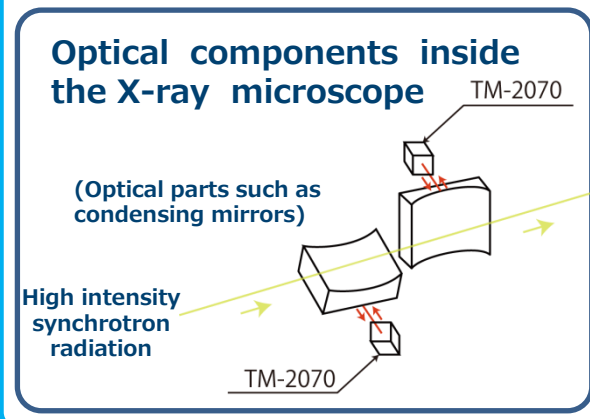
## - Measuring Equipment

### - Theme

How to accurately adjust an optical components such as microscopes using X-rays

### - Solution

By installing TM-2070 into the equipment, monitoring and adjusting the component angles, stable measurement values can be expected.



## - Analytical Equipment

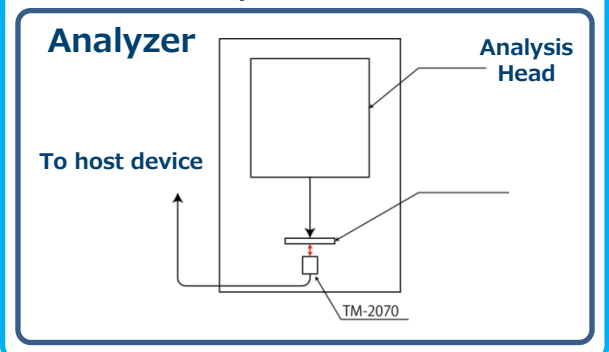
### - Theme

How to measure by aligning the axis of the device and the object to be measured in an optical analysis instrument

### - Solution

By installing TM-2070 into the analyzer, and adjusting the angle of the jig for mounting the measurement object, it is possible to align the measurement axis with the analyzer.

Measurement is always possible at a constant angle, and stable measurement values can be expected.



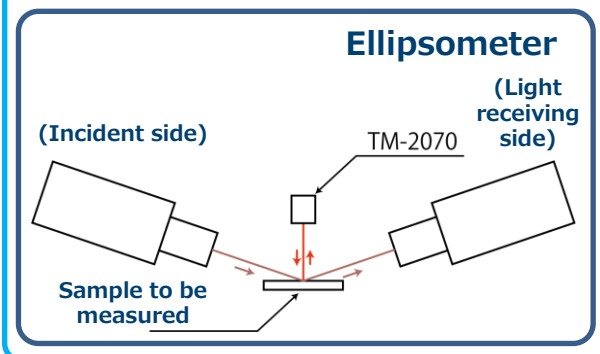
## - Measuring Machine

### - Theme

How to maintain the installation state (angle) of the sample to be measured under same conditions in a device that uses light to measure the thickness and refractive index of a film such as an ellipsometer.

### - Solution

By installing TM-2070 into the ellipsometer and adjusting the angle of the sample to be measured, it is possible to perform measurements under the same conditions, and stable measurement values can be expected.



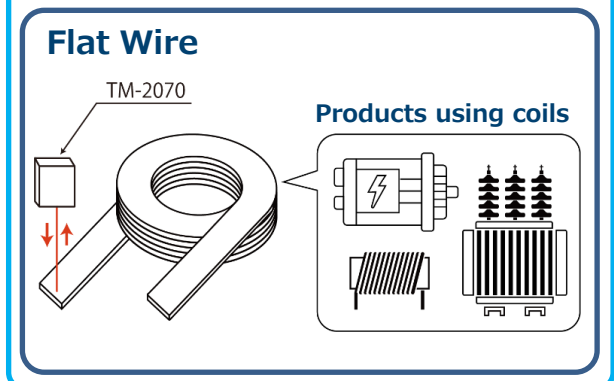
## - Production Equipment

### - Theme

How to monitor the orientation of the rectangular wire during the winding process in production

### - Solution

The TM-2070 is installed into a production line that uses highly efficient motors, transformers, coils, etc., and the angles of rectangular wires are monitored. By doing so, you can expect to prevent twisting and tilting abnormalities.



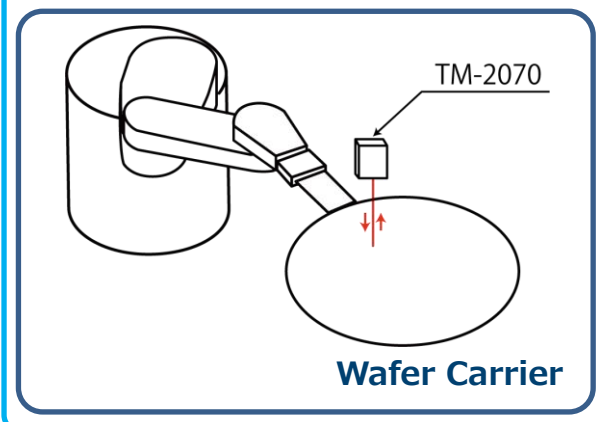
## - Semiconductor Equipment - Inspection Equipment

### - Theme

How to monitor the orientation of a wafer during chucking on a semiconductor carrier

### - Solution

By installing TM-2070 into the equipment and monitoring the wafer angle, it is expected to prevent abnormalities and troubles such as wafer dropouts and chuck misalignment.

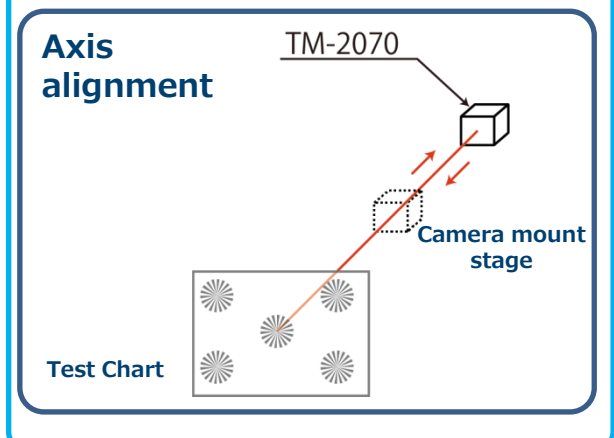


### - Theme

To set the axis of the test chart

### - Solution

By checking and adjusting the angle between the test chart and the camera mounting surface with TM-2070, it is possible to align the chart axis. Stable inspection results can be expected by controlling the angle.

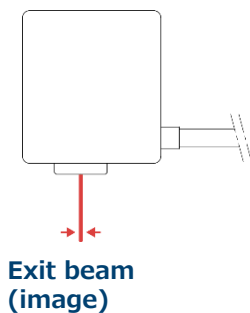


## <Introduction of examples of specification optimization>

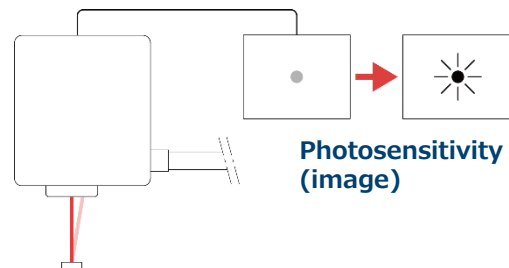
- To irradiate the beam only on the measurement surface of the extremely small part
- To measure objects with extremely low reflectance

1) Make the exit beam diameter thinner.

- TM-2070



2) Improve light sensitivity.



## - Example

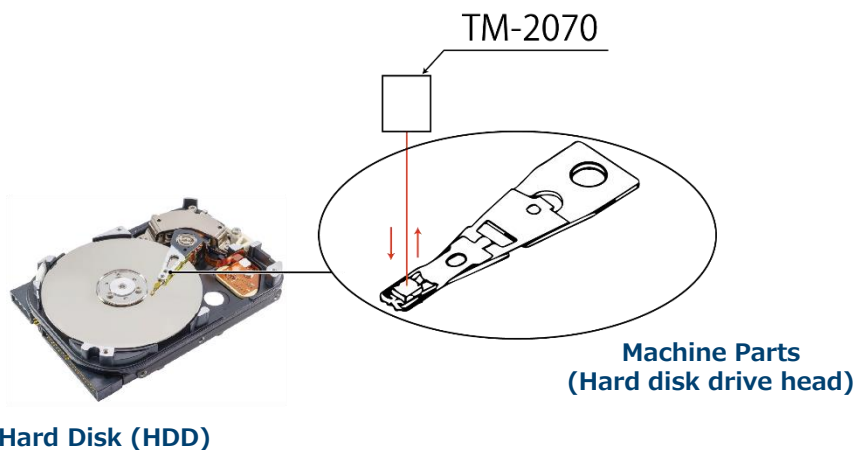
### - Microminiature Parts

- Theme  
Hard disk drive (HDD) head tilt measurement

### Mechanical Parts

By making the measurement beam diameter as thin as possible, it is possible to measure the angle of the target object only.

The light-receiving sensitivity has been improved, making it possible to measure objects with a reflectance close to 0%.

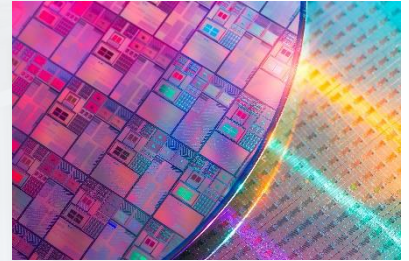
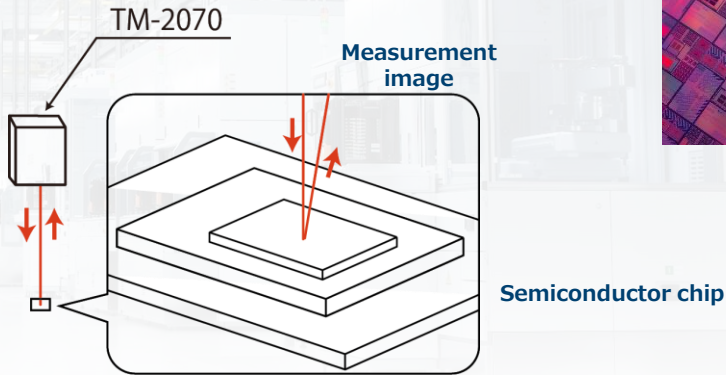


## - Microminiature Parts

- Theme  
Inclination measurement of laminated semiconductors, etc.

Measurement of the amount of tilt when mounting tiny semiconductors, etc.

### Electronic Components

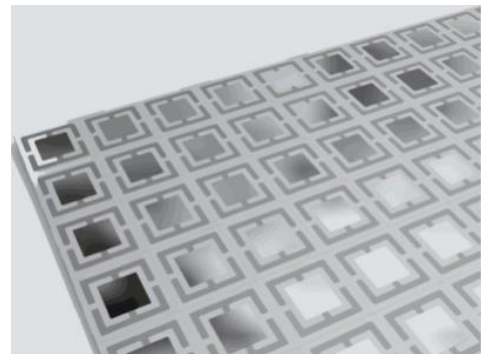
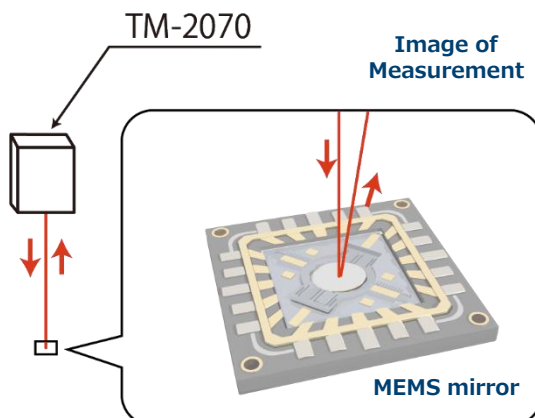


## - Microminiature Parts

- Theme  
Tilt measurement of MEMS mirror

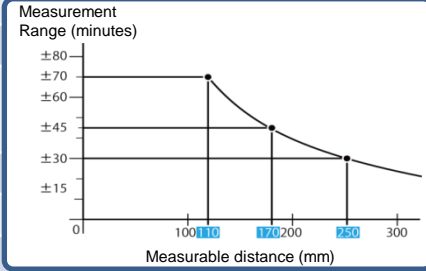
Measurement of the tilt amount of tiny optical parts, etc.

### Optical Components



### 3, Specifications

Item		Compact Type Tilt Sensor
Model		TM-2070 (Sensor Head) / GP-2000 (Image Processing Unit)
Measurement Object		Optical flat mirror (Reflectivity over 0.5%)
Measurement Item		Tilt ( $\theta X$ , $\theta Y$ )
Measurable Distance		0~110mm $\pm 70$ minutes 0~170mm $\pm 45$ minutes 0~250mm $\pm 30$ minutes (Refer to right)
Measurement Method		Optical Autocollimator
Measurement Range	Tilt ( $\theta X$ , $\theta Y$ )	$\pm 70$ minutes (Circular range)
Repeatability *1		1 arcsecond
Linearity *2		$\pm 0.25\%$ of F.S. (Equivalent to $\pm 0.35$ minutes)
Light Source	Wave length / Output / Beam Diameter	650 $\pm$ 10nm / Max 1mW (JIS C6802 2014 class2) / $\phi 1\text{mm}$ *3, $\phi 0.5\text{mm}$ *4
Digital Input / Output	D-Sub 9pin Male	Output Update Rate (60 times / second), Use Communication Command
	USB Mini-B	Image Output *5
	XG4A-2304 (Made by OMRION)	IN: TARGET, LD ON/OFF, APC, SOFT RESET OUT: READY, REL, OK, NG, ND, ER, LD ON, GOOD
Consumer Electricity		Max 15W
Overall Dimension (excluding protrusion)		TM-2070: W38xD42xH18mm / GP-2000: W50xD55xH100mm
Weight		TM-2070: 0.1kg / GP-2000: 0.3kg

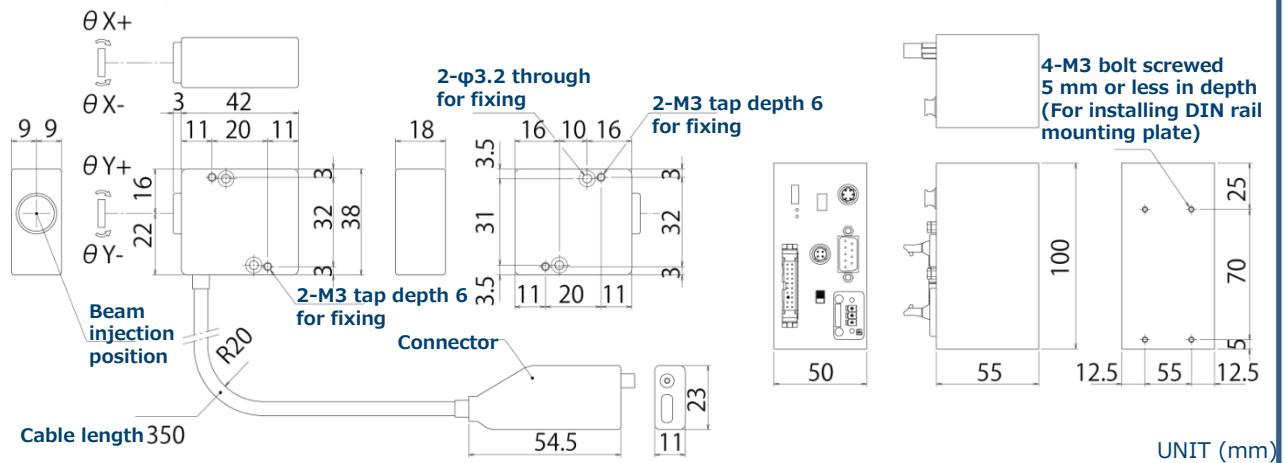


\*1 6 $\sigma$  when measuring in a stationary state with our standard sample installed at W.D. 50mm. When the camera brightness (PK) is 180.  
 \*2 Represents the error against the ideal straight line when measuring with our standard sample installed at W.D. 50mm. It may change depending on the object to be measured.  
 \*3 The diameter immediately after ejection from the sensor (1/e<sup>2</sup> width).  
 \*4 Special orders are accepted. Diameter at a working distance of 50mm (1/e<sup>2</sup> width). The model number for the head is TM-2070-C001. (Appearance is the same as TM-2070.)  
 \*5 The camera image can be checked using the attached dedicated software "GP-2000 Paramset".

### 4, External Diagram

- TM-2070 (Sensor Head)

- GP-2000 (Image Processing Unit)



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