

# Ultra-compact Tilt Sensor

TM-2070

**This product is a non-contact angle measurement system consisting of an optical autocollimator that utilizes a semiconductor laser.**

- Equipped with the world's top class miniaturized optical sensor head
- Can be installed in narrow spaces that were not possible with conventional autocollimators.



## Guide

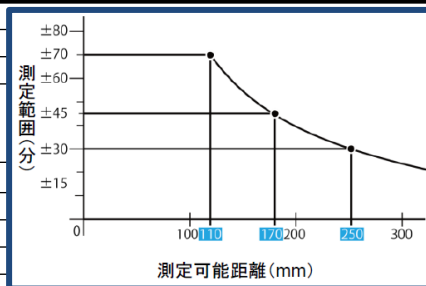
- ▶ Supports various system configurations  
Compatible with various hardware such as Windows PC, PLC, Smartphones and Tablets.  
The DIO function enables LD control, Relative origin control, and Status monitoring during measurement.
- ▶ Accessories  
GP-2000 (image processing unit) / Sensor cable (1m) / Power cables / Rubber pads / Software (Windows 10 Japanese/ English version, 32/64-bit version)
- ▶ The image processing unit can be mounted on a DIN rail.

## Attention

- ▶ The appearance and specifications of the product are subject to change without notice for improvement.  
Be sure to use the attached sensor cable. A 2m sensor cable is also available as an option. Please use the rubber pads when installing GP-2000.

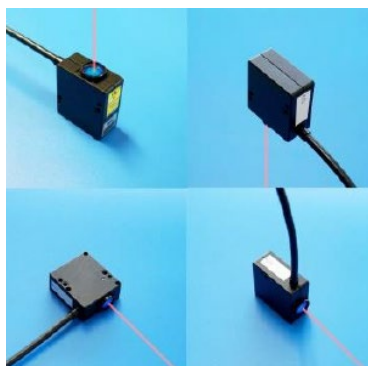
## Specifications

|                                    |  |  |
|------------------------------------|--|--|
| Part Number                        | <b>TM-2070</b>   |  |
| Object to be measured              | Optical surface (R>0.5%)                                       |  |
| Measurement item                   | Tilt (θX,θY)   |  |
| Measurable distance and range      | 0~110mm ±70arcmin.<br>0~170mm ±45arcmin.<br>0~250mm ±30arcmin. |  |
| Measuring method                   | Optical autocollimator   |  |
| Range                              | Tilt (θX,θY)   | ±70arcmin. (Circular area)   |
| Repeatability※1                    | 1arcsec.   |  |
| Linearity※2                        | ±0.25% of F.S. (±0.35arcmin.)                                  |  |
| Light source                       | Wavelength   | 650±10nm   |
|                                    | Output   | 1mW max. (JIS C6802 2014 Class 2)  |
|                                    | Beam diameter  | Φ1mm※3   |
| Digital Input / Output             | D-Sub 9pin male  | Measurement data output (60data/sec.), Control command input                         |
|                                    | mini USB Mini-B  | Image data output※4  |
|                                    | XG4A-2034 (Omron)  | IN : TARGET,LD ON/OFF,APC,SOFT RESET<br>OUT : READY, REL,OK, NG, ND, ER, LD ON, GOOD |
| Power consumption                  | Max. 15W   |  |
| Dimensions (excluding protrusions) | TM-2070 : W38×D42×H18mm / GP-2000 : W50×D55×H100mm             |  |
| Weight                             | TM-2070 : 0.1kg / GP-2000 0.3kg                                |  |

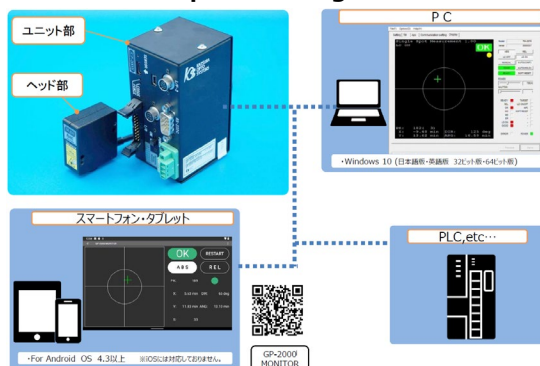


- ※1 6σ when measuring in a stationary state with a standard sample installed at W.D.50 mm. When the camera brightness (PK) is 180
- ※2 Indicates the error with respect to the ideal straight line when measuring with the standard sample installed at W.D.50 mm. It may change depending on the object to be measured.
- ※3 Diameter immediately after sensor injection. (1 / e<sup>2</sup> width)
- ※4 It is possible to check the camera image by using the dedicated software "GP-2000 Paramset".

## Can be installed in narrow spaces in all directions



## Example of configuration



## ■ Example of use

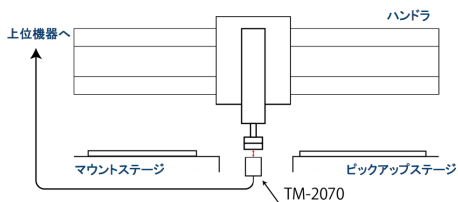
### ◆ Semiconductor

Requirements

When mounting the semiconductor chip on the package, mount it in parallel is desired.

Solution

Install TM-2070 in the mounter and measure the tilt of the chip picked up by the handler. Mount only when it is within the specified value, and discard the error product outside the specified value, which leads to the reduction of defects.



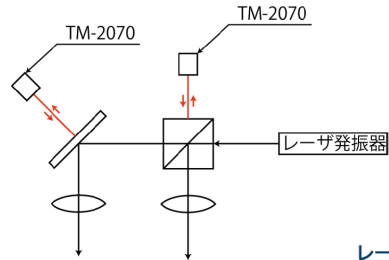
### ◆ Processing machine

Requirements

Monitor the orientation of the optics that make up the laser processing device and make accurate adjustments is desired.

Solution

By incorporating TM-2070 into the device, it is possible to monitor the angle of optics. The state of the equipment can be monitored based on the value, and stable machining can always be performed.



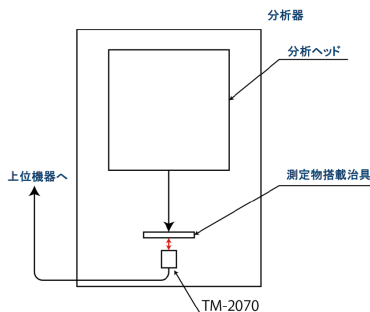
### ◆ Analytical equipment

Requirements

In optical analytical equipment, measurement in which the axis of the device and the object are well aligned is desired.

Solution

By incorporating the TM-2070 into the analyzer and adjusting the angle of the object mounting jig, the analyzer and the measurement axis were aligned. Stable measurement become possible at a constant angle, all times.



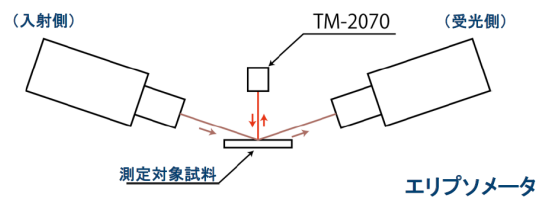
### ◆ Measuring equipment

Requirements

In an ellipsometer that measures film thickness and refractive index, the mounting angle of the target sample is adjusted to the same conditions for measurement is desired.

Solution

By incorporating TM-2070 into the ellipsometer and keeping the angle of the target sample constant, measurement under the same conditions becomes possible, and stable measured values can be expected.



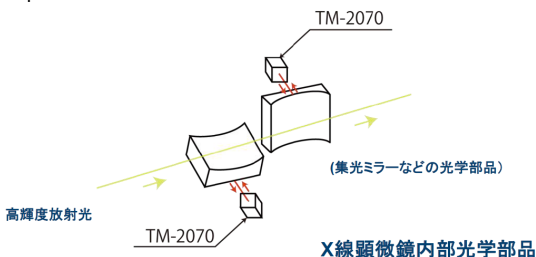
### ◆ Measuring equipment

Requirements

Accurate adjustment of optical components inside the X-ray microscope is desired.

Solution

By incorporating the TM-2070 into the device and monitoring and adjusting the angles of the optical components, stable measurements can be obtained.



### ◆ Semiconductor

Requirements

Monitor the orientation of the wafer during chucking with a semiconductor wafer transfer system is desired.

Solution

By incorporating TM-2070 into the equipment and monitoring the angle of the wafer, it is possible to prevent errors and troubles such as wafer dropout and chuck misalignment.

