



# **Piezo Nano Motion**

# - High Precision Micrometer/Strain Sensor -

Harbin Core Tomorrow Science & Technology Co.,Ltd.

# **High Precision Micrometer/Strain Sensor**

The micrometers are instruments with micrometer or millimeter measurement ranges with nano-level accuracy. They are grouped into inductive, capacitive and laser types and mainly used for high-precision measurement of length, thickness, depth, taper and other applications. Piezo strain sensor is used for force process monitoring. When subjected to deformation force, it outputs voltage signal.

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## Applications



### Product List

Туре	Appearance	Measure mode	Measuring range	Characteristics	Page
L.D1 LVDT		Inductive	0~1mm	7-digit display RS-232, RS-485 serial port Peak hold function VDC or 4~20mA output	2
E09.Cap		Capacitive	0~200µm	Modular design Optional multi-channel measure	3
LG-2MM		Laser	0~2mm	+/-0.01%F.S. accuracy Resolution to 7.6nm 40kHz sampling rate Up to 150 sensors integrated USB2.0 interface	4
NSE2001		Piezoelectric	100με	Sensitivity 40mV/µɛ Low frequency lower limit 0.01Hz Temperature -40~85° C	5

#### Application

• Length (depth, height, thickness, diameter, taper) measurement

Vibration measurement
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Precision positioning system

Optical fiber alignment position detection

Micro-displacement detection



# **Inductive LVDT Micrometer**



The LVDT micrometer is a contact micrometer that detects external displacement or deformation through an inductive probe. The measurement range is 0~1mm, and the accuracy is better than 100nm.

#### Control Panel

	1 96mm	2 3
48mm	L.D1	Mode Set Down
	4	56

No.	Function
1	Range lamps
2	Mode key
3	Up and hold key
4	7-digit red display
5	Down and zero key or preset
6	Set key

#### Contact Digital Probe



#### Technical Data

Туре	L.D1	Units		
Measuring range	0 ~ 1	mm		
Channels	Single Channel			
Resolution	<0.1	μm		
Display type	7-digit red LED			
Display update frequency	10	times/s		
Display range	-99.9999~+99.9999			
Indicator light	Low, OK, high warning lamps			
Probe type	Digital rebound			
Sensor reading rate	100 readings	/s		
	4~20mA, -5V~+5V, -10V~+10V, 0V~+5V,			
Analog output	0V~+10V(optional)			
Digital output	Alarm relay - open collector, low, OK, high,			
	relay response time: 0.1- 9.9 s(optional)			
Computer interface mode	RS-232, RS-485			
Operating voltage	+24	VDC		
Current	Max 850	mA		
Storage temperature	-10~+70	°C		
Operating temperature	+10~+40	°C		
Dimensions(H×W×D)	48×96×137	mm		
Size without panel(H×W)	44.5×93	mm		
Depth behind panel	425			
(including terminal)				
Changing the probes of different measuring ranges can achieve a larger range of				
detection, up to ±10mm.				

#### Characteristics

- 7-digit red digital display
- Peak value hold
- VDC or 4~20mA output
- RS-232, RS-485 serial port
- Contact measure
- Reading rate: 100pcs/s

#### Application

Length(depth, height, thickness, diameter, taper, etc.) measurement, vibration measurement, precision positioning system, micro-displacement detection, position detection, optical fiber alignment and etc that require micro-displacement detection.

#### Typical Application



Diameter and flatness measure



Coaxiality and dimensionality measure





Eccentricity measure

# **Capacitive CAP Micrometer**



E09.Cap capacitance non-contact micrometer can measure the small displacement in the range of 0~200µm through the capacitance probe, the measurement accuracy is nanometer level. The micrometer is composed of a chassis and a sensing module, which can form a multi-channel measurement.

#### Module Combination



Sensing module

Chassis and power supply module Single channel micrometer

#### Capacitance Probe



Appearance

6-channel micrometer

#### Technical Data

Туре	E09.Cap	Units
Measuring range	0~200	μm
Linearity	±0.1	μm
Static resolution	2.5	nm
Dynamic resolution(1kHz)	100	nm
Sensor diameter	10	mm
Minimum target diameter	10	mm
Static repeatability	5	nm
Signal temperature stability	<0.005	%FSO/°C
Long-term stability	<0.04	%FSO/month
Bandwidth	2	kHz(-3dB)
Operating temperature	+10~+50	°C
Humidity	<85	%
Voltage output	0~+10	V
Power supply	220VAC 50Hz±10%	
Sensor cable length	1.6	m
Board size: L×H×D	35×130×180	mm
Chassis size: L×H×D	280×170×360	mm

#### Characteristics

- · Modular design, free combine
- · Single board module available
- · High resolution
- Analog output
- Non-contact measurement

#### Principle

It is based on the principle of an ideal parallel plate capacitor. The sensor and the measured target on the opposite side form two electrodes. The principle of guard ring capacitor is used to ensure that the sensor is still linear when measuring any metal.



#### **Typical Application**



Displacement, distance, position, elongation



Online inspection, size inspection



Size, tolerance, identification	Insulator thickness measur ement
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## Laser Micrometer



LG-2MM laser micrometer is a non-contact measuring instrument, its measuring range is 2mm, the maximum measuring range can reach 10mm when changing different probes, and the static resolution can reach 7.6nm.

#### Characteristics

Laser measurement

· High precision

Non-contact measurement

#### Principle

The principle of laser triangulation displacement measurement is to use a laser beam to focus on the surface of the object to be measured at a certain angle, and then image the laser spot on the object surface from another angle. Since the position of the laser irradiation point on the object surface is different, the angle of the scattered or reflected light is also different. With CCD photodetector measuring the position of the spot image, the angle of the chief ray can be calculated, and the height of the laser irradiation point on the surface of the object can be calculated. When the object moves along the direction of the laser line, the measurement result will change, so that the displacement of the object can be measured with the laser.

Range 0~2mm

#### Using Method & Size



Thickness measure

#### Typical Application



Axis motion measure



Motor vibration measure



Diameter measure









Metal thickness measure



#### Distance measure



Advantages High precision, not limited by the material, texture, shape,

and reflectivity of the measured object. It can measure from white to black, from metal to ceramics, and plastics, and noncontact measurement has no abrasion on the surface of the measured object. The modular structure is composed of three parts: USB interface module, power supply module and probe module. The probe modules can be assembled and cascaded for multi-channel measurement.

Sampling frequency 40kHz



#### **Technical Data**

Туре	LG-2MM		Units
Measuring range	0~2		mm
Reference distance	25		mm
Spot size(diameter)	30		μm
Linear	Best 0.01	Typical 0.02	±%F.S.
Repeatability(static)	20	40	nm
Repeatability(dynamic)	100	200	nm
Resolution(static)	7.6		nm
Resolution(dynamic)	20		nm
Max sampling frequency	40		kHz
Output frequency	Max 4	4	kHz
Sampling period	256/512 μs 1/2/4/8/16/32/64 ms		
Bandwidth	1300, 650, 325, 163, 81, 40, 20, 10, 5		Hz
Laser power	<5		mW
Laser class	3R		
Laser wavelength	670		nm
Available modes	Diffuse or mirror		
Operating temperature	perating temperature 0~40		°C
Storage temperature	-20~70		°C
Humidity	10~95% No		
Turniaity	condensation		
Temperature Coefficient	±0.05		% F.S./°C
Size of laser probe	76.2×76.2×26.6		mm
Size of laser probe	(Not include connector)		
Mass	203		g
PC communication	USB2.0		
Power supply	24VDC/0.13A		

Thickness measure

Amplitude measure Runout measure

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# **Piezo Strain Sensor**



Strain sensors are mainly used to measure the deformation of a structural surface. Generally, during the entire process of applying force, the mechanical load-bearing structure will be strained by a tensile or compressive force greater or lesser than the required force. The strain sensor can perform indirect dynamic and quasi-static force measurement on it, and the relationship between the force and strain is linear enough to effectively meet the requirements of accurate measurement and monitoring. When using strain for indirect measurement, the force split can be close to 99%, much higher than direct measurement.

Strain sensors can be used for process monitoring of force, such as welding force monitoring. The sensor is equipped with electronics and IEPE interface. The converter type is 10-32UNF.

#### Characteristics

• Sensitivity: 40mV/με • Lower limit of low frequency: 0.01Hz • Acceleration compensation • Application: process monitor of force

#### Mounting & Force Monitor



#### Drawing



#### Technical Data

Typical value	Units
Deformation in the	
direction of the longer axis	
40	mV/με at room temperature +20%/-10%
Positive voltage when	
tension is applied	
0.01	Hz
14.7	kHz
100	με
Coaxial 10-32 UNF	
4(min 2, max 20)	mA
12(min 8, max 14)	V
60	S
M6×20, tapered head	
5(min 3, max 10)	Nm
-40~+85	°C
50	g±5%
	Typical valueDeformation in thedirection of the longer axis40Positive voltage whentension is applied0.0114.7100Coaxial 10-32 UNF4(min 2, max 20)12(min 8, max 14)60M6×20, tapered head5(min 3, max 10)-40~+8550

#### Structure



A. The measured mechanical structure is used to be stretched or compressed cyclically.

B. The two contact feet (yellow area) of the strain sensor transmit the structural strain to the sensor and the piezo element through friction to measure the shear force.

C . Piezo measuring element generates an electric charge proportional to the applied shear force.

D. The sensor housing or body, similar to a spring, converts strain into a corresponding proportional force.

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