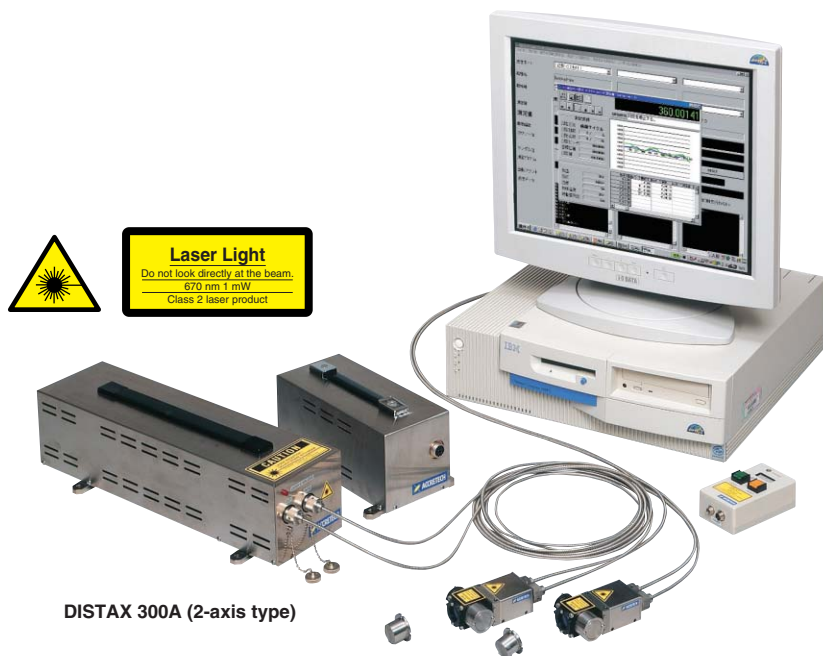


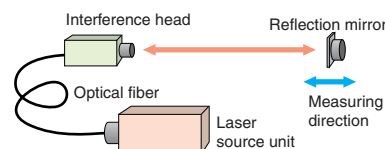
DISTAX >>>

Built-In Laser Interferometer with Optical Fiber Coupling

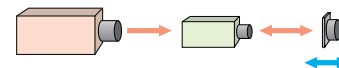
DISTAX 300A



DISTAX 300A (2-axis type)



Traditional approach: Three points must be arranged in a straight line. This requires considerable skill and experience.



DISTAX connects the laser source and the interference head using an optical fiber cable. Setup can be performed by simply aligning the interference head and the reflection mirror in a straight line.

Features

- High speed and high function system for measuring a maximum of three axes.
 - Various interference optical heads are available for a wide range of measuring items.
 - Host of programs for a variety of machine tool inspection standards can be executed on an external personal computer.
- Complete CNC automation of following processes: Measurement → Compensation → Inspection → Report.

- Utilizes stable-frequency high-precision He-Ne laser as the light source.
- Optical axis alignment can be performed by simply arranging the interference head and reflector in a straight line. This efficient process dramatically reduces man-hours.
- Board type counter can be incorporated into a PCI bus.

Specifications

System

Model	300A
Max. measuring length	Corner cube type: 10m, Plane mirror type: 5m
Optical fiber length	Select 3m, 5m or 10m
Resolution	Corner cube type: 5nm, Plane mirror type: 2.5nm
Max. response speed	Corner cube type: 630mm/s, Plane mirror type: 315mm/s
Accuracy	$\pm (L \times 10^{-7} + 0.01 \times 10^{-6})$ m L = Measuring length (m)
No. of axes	Max. 3

Counter Board

Max. response frequency	2.0 MHz
Reflection mirror movement speed	Single path interference head: Approx. 630 mm/sec. (interference signal wavelength input/2 o'clock) Double path interference head: Approx. 315 mm/sec. (interference signal wavelength input/4 o'clock) Refer to measurement specifications for the reflection mirror movement speed.
Max. count	$\pm 2^{33}-1$
Data output delay time	Max. 1μs
No. of axes	1 axes/1 board

Laser Head Specifications

Light source	Stabilized wavelength single mode He-Ne laser
Light output	Approx. 0.3 mw (for 1 axis)
Wavelength stability	$\pm 1 \times 10^{-7}$
Number of optical axes	3
Warm-up time	Approx. 10 minutes
Input voltage (Unit PS-300A power source for laser head used)	Single phase AC 100 V \pm 10% Frequency 50/60 Hz 3-pin AC plug
Power consumption	90 VA
Main dimensions	160(W) \times 455(D) \times 116(H) mm 7.5kg
Usage environment	Temperature: 10°C – 40°C (Temperature change during usage \pm 10°C) Humidity: 10 – 90% (no condensation)

CNC Fully Automatic Measuring Systems

DISTAX Manager

- Inspection system used in combination with the DISTAX 300A system to significantly reduce the number of inspection man-hours on NC machine tools.
- Continuous automatic measurement of X, Y and Z axes can be performed after one setup operation (maximum of three machine tools for total of 9 axes). In addition, transmission of correction data (pitch error, backlash, etc) and output of inspection results are fully automated.
- ISO standard measurement programs fully comply with ISO 230-2. These programs handle average deviation of stop positions in one



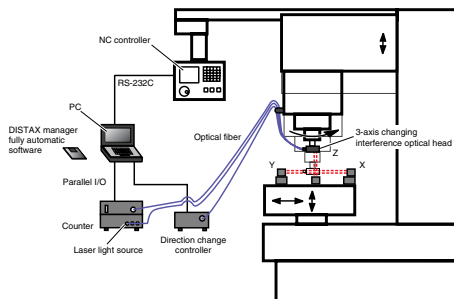
X axis



Y axis



Z axis



The adoption of optical fiber eliminates cosine error due to inclination of the head. This enables consistently high precision measurements. Setup is extremely easy and can be completed in a short amount of time since alignment of the optical axis can be performed by simply arranging the interference head and reflector in a straight line. In addition to 3-axis automatic measurement, the unit can be used to simultaneously or sequentially control three NC units. This high processing capability dramatically boosts the efficiency of adjustment and inspection processes.

High Efficiency

Alignment of the DISTAX is extremely easy, and the interference head can be built into the machine, eliminating the necessity of troublesome setup with a tripod. The DISTAX Manager is a fully automatic system capable of continuous automatic calibration and inspection of the X, Y and Z axes with one setup operation. Fully automatic operation of the system can be performed at night. Backlash compensation and NC pitch error compensation are performed when measurement is completed. This data can be used for immediate automatic output of an inspection report that complies with ISO standards.

DISTAX Manager Software	
Specifications	
Number of measuring points	Max. 3 axes; 3 NC units simultaneously or sequentially
Connection to NC unit	RS-232C
Types of NC units	Compliant with FANUC 16, 18 or 21
Measurement/output data	Fully compliant with ISO 230-2 standard 14 positioning accuracy inspection items, including average reversing error Various graph outputs Output of formatted inspection reports
Correction	Measurement of NC pitch error and correction of NC backlash

Distance (JIS, ISO) / Speed / Dynamic Measurements

Resolution: 0.005 μm (0.0025 μm)
 Measuring accuracy: $\pm 0.1\text{ppm}$
 Measuring range: 10m/axis (5m/axis)
 Values in parentheses for plain mirror.



Corner cube



Plain mirror
(produced after receipt of order)

Pitching/Yawing/Two-Point Links Straightness/Flatness Measurement

Resolution: 0.05 sec. (0.015 sec.)
 Measuring distance: 5m
 Measuring accuracy: $\pm 0.2\%$ ($\pm 0.6\%$)
 Measuring range: $\pm 10^\circ$ (0.5mm)
 Values in parentheses for flatness measurement.



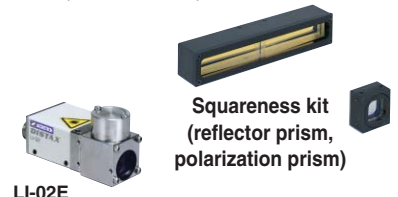
LI-02D



Corner cube dual type

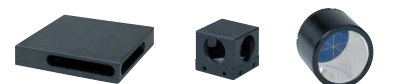
Straightness / Squareness Measurements

Resolution: 0.05 μm
 Measuring distance: 3m (1m)
 Measuring accuracy: 0.4 $\mu\text{m}/\text{m}$ (± 0.5 sec.)
 Measuring range: $\pm 1.5\text{mm}$ ($\pm 0.08^\circ$)
 Values in parentheses for squareness measurement.



LI-02E

Squareness kit
(reflector prism, polarization prism)



Square kit
(Penta-prism, bender, large corner cube)

Measuring item Interference heads Reflectors

Laser Interference Measuring Sensor

LAZAX



Features

High Resolution

LAZAX achieves a high resolution of $0.01 \mu\text{m}$ for long displacement measurements (30 mm) not possible with conventional non-contact displacement sensors.

Sensitivity Calibration Unnecessary

Precise control of the semiconductor laser temperature enables high-precision measurements that are not influenced by temperature changes.

High Stability and Precision

The adoption of a Fizeau type interference optical system and heterodyne interference provide high stability and precision.

Super Compact Probe

The tip of the detection probe has a very small diameter of 3.8 mm, making it ideal for incorporation in compact high-precision XY table positioning detectors and other such units.

Host of Functions

The unit comes with a host of functions, including smoothing (6 types), display resolution changeover, mm/inch changeover, object light intensity level display, error display and external output.

Specifications

● Main Specifications

Model	L-DD-01
Accuracy	$\pm 0.1 \mu\text{m}$
Max. response speed	15 mm/s
Laser wavelength used	Approx. 670 nm
Resolution	$0.01 \mu\text{m}$
Max. measuring length	30 mm

● Detection Probe

Laser light output from probe tip	1 mW or less
External dimensions	$\phi 3.8 \times 30 \text{ mm}$ (tip)
Min. distance from probe tip to measured surface	20 mm
Max. distance from probe tip to measured surface	50 mm
Beam spot diameter of measured surface	Approx. 0.4 mm
Optical fiber cable length	3 m
Weight	30 g

● Display Unit

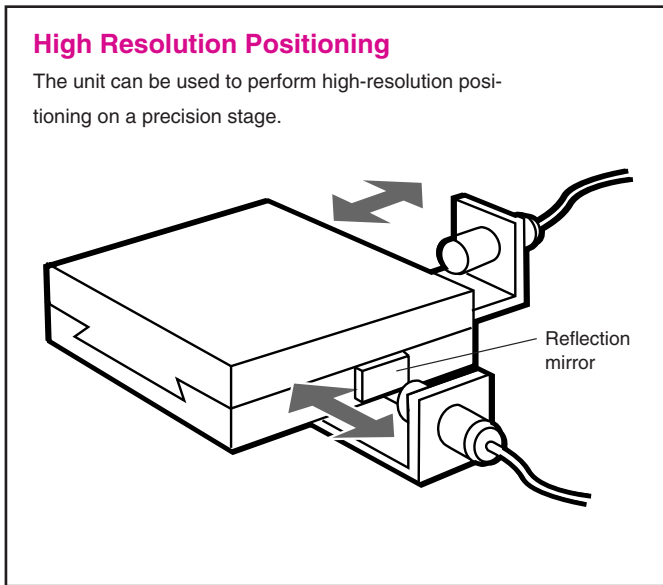
Display	8 digit blue fluorescent display tube
Min. display value	0.00001 mm (0.000001 inch)
Output (measured data)	24-bit straight binary
External operation	Zero set, output latch
Functions	Detection signal level display, error pattern display, smoothing, mm/inch changeover, min. display changeover (0.01, 0.1, 1, 10 μm)
Dimensions	278(W) \times 300(D) \times 71(H) mm
Weight	3 kg

Power source	AC 85 – 250 V, 50/60 Hz, 30 VA
Usage temperature	23°C \pm 5°C (Storage temperature: 0 – 50°C)
Options	Analog output, probe fixture with gate mechanism

Applications

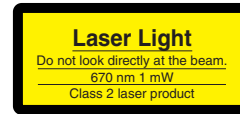
High Resolution Positioning

The unit can be used to perform high-resolution positioning on a precision stage.



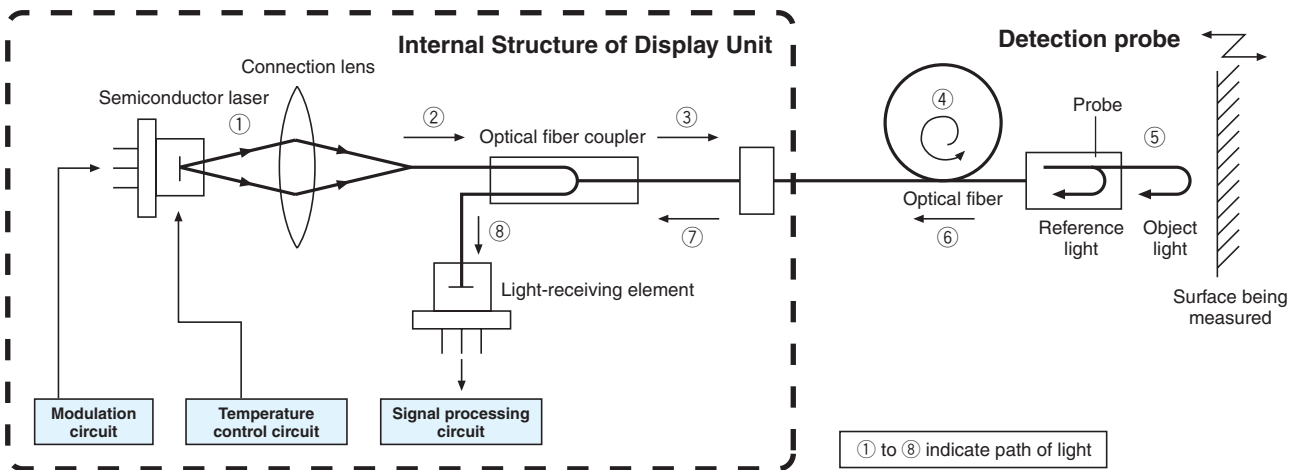
Laser Light

Safety precautions have been implemented on this unit in accordance with JIS standards. The amount of output is low, but make sure to follow the instructions on the label to prevent injury.

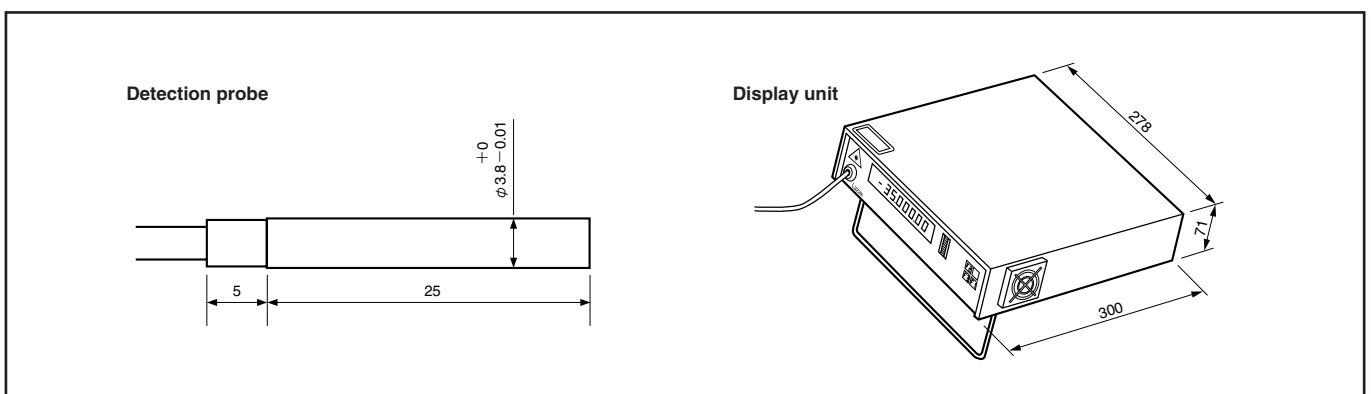


Explanation of Principle

Frequency modulated semiconductor laser light is transmitted to the optical fiber cable through the optical fiber coupler, and converted into parallel light by the lens at the tip of the detector probe. The reflection light from the probe performs heterodyne interference with the object light from the measuring surface as reference light, and goes through the detection probe and optical fiber coupler and is detected by the light-receiving element.



Outer Appearance/Dimension Diagram



Non-Contact Detection of Conductor/Semiconductor Displacement

CADICOM

Capacitance Type Displacement Sensor



Non-Contact Type

The object being measured is not subjected any load since no contact is made, and is free from influence of the vibration mode or rotation.

Extensive Range of Materials

The unit can be used to detect displacement in a wide range of conductors and semiconductors, regardless of the type of material.

■ Detection Principle

When a potential is applied with two electrodes facing one another as shown in Fig. 1, an electric charge builds up between the electrodes. This is defined as $C = q/V$ where the electric charge is q , the voltage is V and the capacitance is C .

The capacitance (C) is a function of the surface of the opposing electrodes (S) and distance between the electrodes (D).

This is expressed by $C = \epsilon \times S/D$ where ϵ is the dielectric constant of the air.

The capacitance (C) is in inverse proportion to the distance between the electrodes as long as the dielectric constant ϵ and electrode surface (S) remain constant. Therefore, the distance (D) can be measured if the voltage which is proportionate to the capacitance (C) can be detected. On a practical level, an electrode called a guard ring is provided around the measuring electrodes to stabilize measurements with the sensor as shown in Fig. 2. Since output from the sensor is not linear, a linearizing circuit is provided to enhance linearity.

Wide Response Frequency

The unit has a wide response frequency, enabling measurement of various types of displacement, from static displacement to high-speed moving bodies.

Compact Probe

The probe is compact and the electrode is completely sealed.

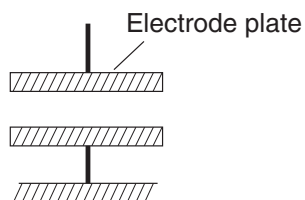


Fig. 1

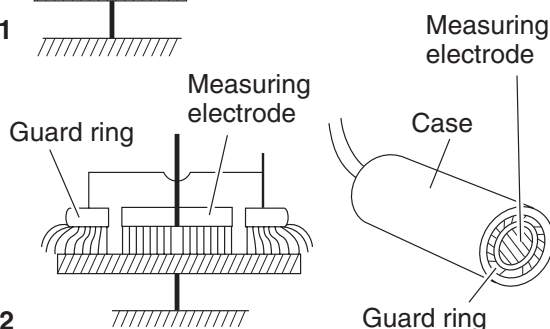
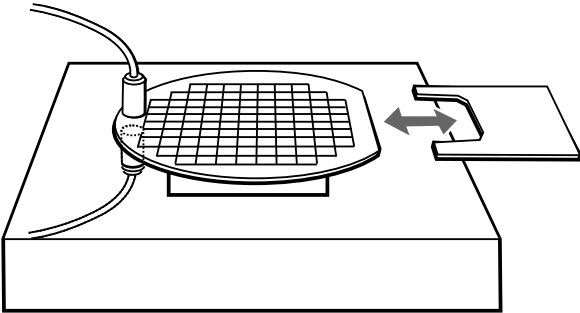


Fig. 2

Applications

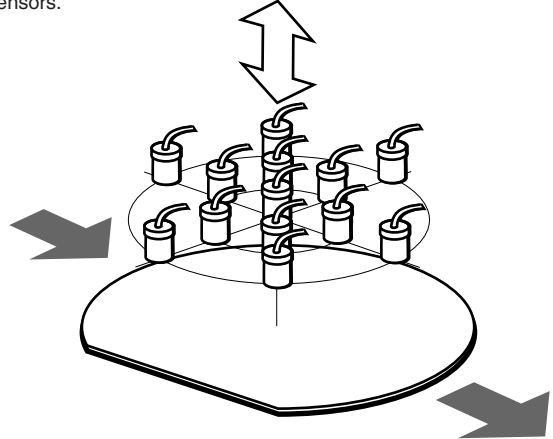
Non-Contact Wafer Thickness Measurement

Non-contact wafer thickness measurement is performed after the mask process.



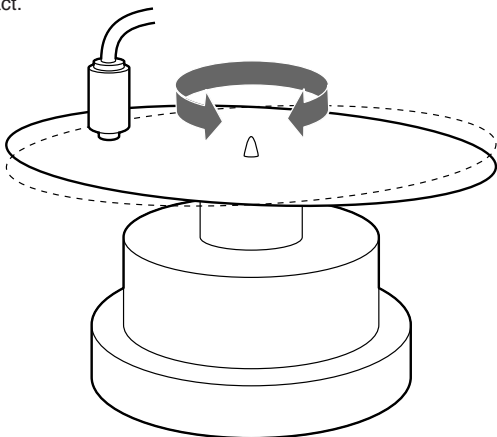
Wafer Flatness Measurement

Automatic processing of wafer flatness is performed by using 13 sensors.



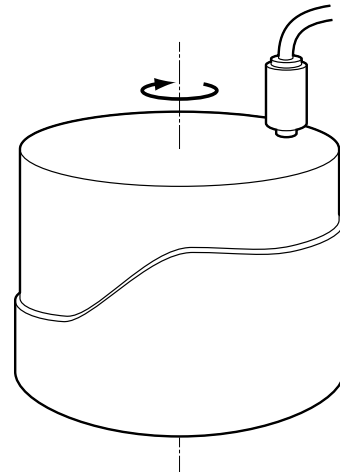
Hard Disk Surface Run-Out Measurement

Run-out and eccentricity can be measured without making any contact.



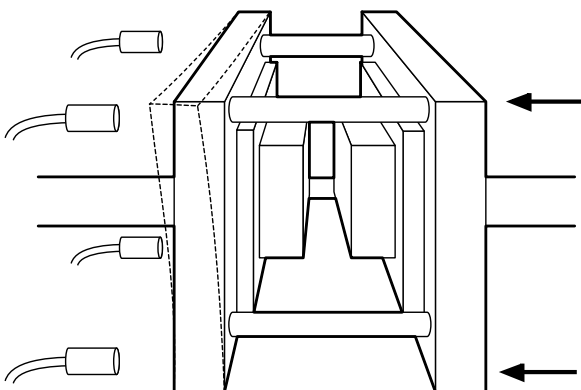
VTR Head Run-Out Measurement

Rotational run-out of VTR heads and leads are measured.

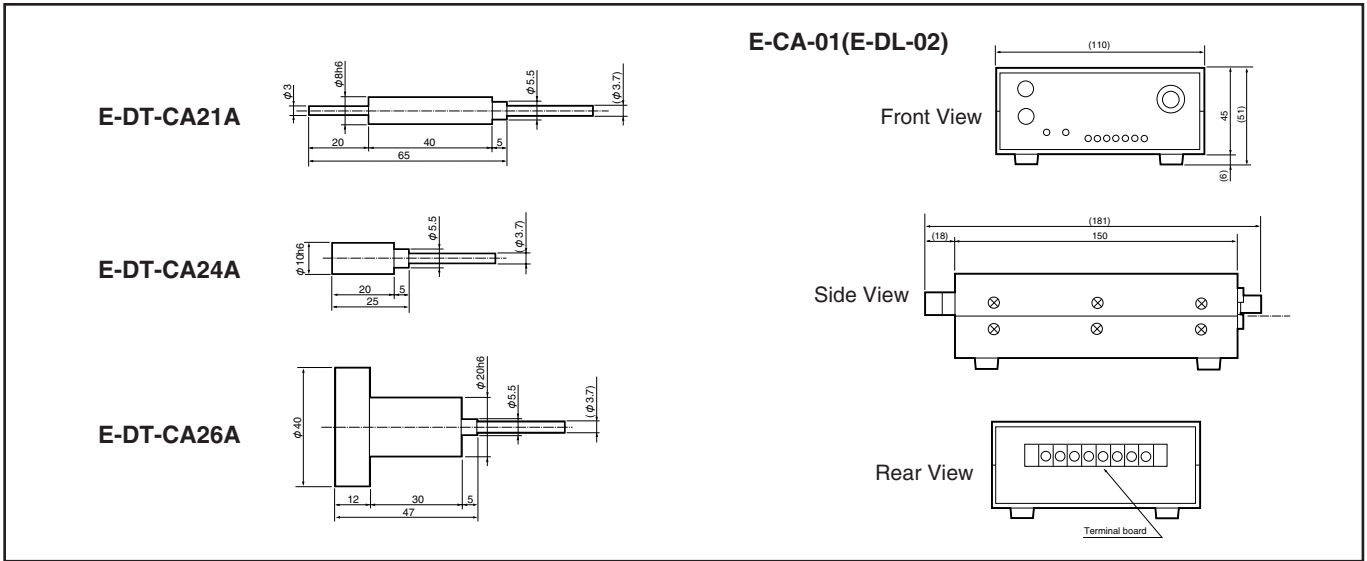


Pressure Control of Injection Molding Machines

Displacement due to the application of pressure is detected.



Outer Appearance/Dimension Diagram



Specifications

Model	Amplifier unit	E-CA-01		
	Sensor head	E-DT-CA21A	E-DT-CA24A	E-DT-CA26A
Sensor head shape		$\phi 3$ spherical surface	$\phi 10$ spherical surface	$\phi 40$ spherical surface
		$\phi 8$ mount	$\phi 10$ mount	$\phi 20$ mount
Main amplifier dimensions		110(W) × 51(H) × 181(D) (Max. dimensions including rubber feet and sensor connector)		
Measuring length		0.01 – 0.1 mm	0.1 – 1 mm	0.5 – 5 mm
Analog output	Response frequency	4 kHz (–3dB)		
	Linearity	± 0.5% F.S.		
	Output voltage	+0.5 – +5V	+0.5 – +5V	+0.5 – +5V
	Resolution	0.2 % F.S. *1		
Temperature characteristics	Amplifier unit	0.1 % F.S. / °C		
	Sensor head	0.1 % F.S. / °C	0.05 % F.S. / °C	0.05 % F.S. / °C
Power source	Voltage	DC 24 V ± 10%, Allowable ripple: 10% p-p or less		
	Consumption	200 mA or less		
Usage ambient temperature	Amplifier unit	0 – 40°C		
	Sensor head	0 – 40°C		
Usage ambient humidity	Amplifier unit	35 – 80 % R.H. (no condensation)		
	Sensor head	35 – 80 % R.H. (no condensation)		
Display LED		Power (PWR: Yellow), Detection distance (20, 40, 60, 80, 100%: Green, Over: Red)		
Ambient atmosphere		Be careful that water, oil or other contaminants do not get on the sensor head.		
Sensor cable length		3m		
Weight	Amplifier unit	Approx. 680 g		
	Sensor head (including cable)	Approx. 115 g	Approx. 105 g	Approx. 260 g

*: Above specifications are for when the item measured is the standard specimen.
 *: % F.S. is percentage of measuring length upper limit value.
 *: Temperature characteristics are value for 100 % F.S.
 *1: Excluding switching noise (Frequency component 250 kHz or higher)

Power Unit

Model	E-DL-02
Power source	AC100V
Dimensions	110 (W) × 150 (D) × 45 (H) mm

Usage Guidelines

- This unit cannot be used in a location where there is water, oil, chips or other foreign matter.
- The amplifier unit and sensor head units are adjusted in a one-to-one configuration. The precision cannot be guaranteed if this configuration is changed.
- Mount the sensor head unit so that the measuring surface is parallel with the surface to be measured.
- Use the unit in a location that has a minimum of ambient temperature fluctuation.
- Avoid subjecting the sensor head unit to shock or undue force. Take precautions to ensure that the sensor head unit is not scratched.
- The measuring sensitivity and linearity differ depending upon the material that is measured. The amplifier unit must be adjusted for each type of metal.

Non-Contact Detection of Metal Displacement

EDYCOM

Eddy-Current Type Displacement Sensor



Non-Contact Type

The object being measured is not subjected any load since no contact is made, and is free from influence of the vibration mode or rotation.

Wide Response Frequency

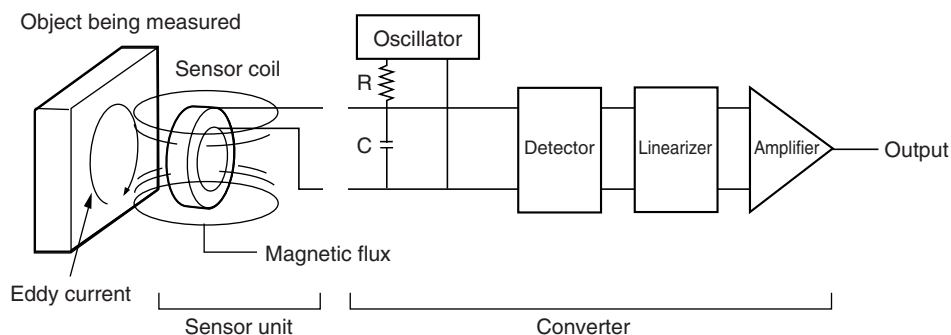
The unit has a wide response frequency, enabling measurement of various types of displacement, from static displacement to high-speed moving bodies. A circuit is used to enhance linearity.

Linear Output

Output is converted into a voltage proportionate to the displacement by a linearizing function, simplifying monitoring, control, recording and data analysis.

■ Detection Principle

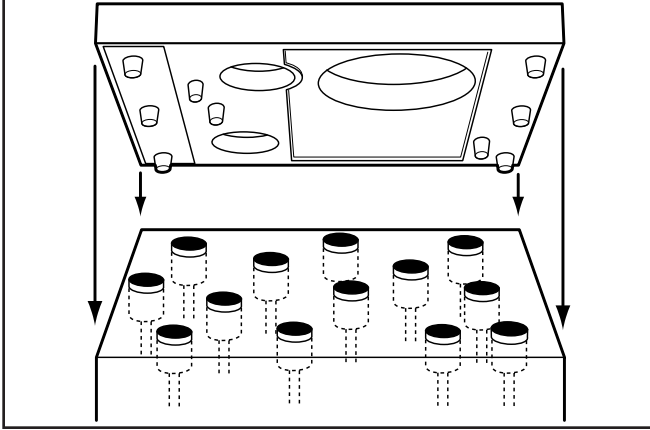
The tip of the sensor incorporates a coil. Supplying this coil with a high-frequency current generates a high-frequency magnetic field. Moving a semiconductor close to this magnetic field generates an eddy current, and the impedance changes proportionately to the distance. The change in output is extracted using an LC resonance circuit created by combining the coil (L) and a condenser (C). The relationship between displacement and voltage is determined after high-frequency detection and linearizing processes.



Applications

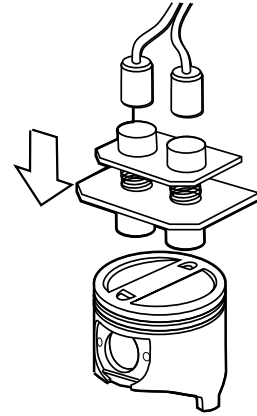
Chassis Parallelness/Warping Measurement

In the event there are any distortions in the chassis, the distance between the chassis and the sensors will change, enabling this to be detected to eliminate defective items.



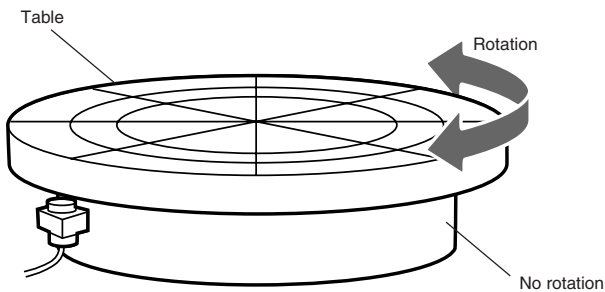
Piston Head Concave Height Measurement

The combustion chamber volume can be checked by measuring the concave portion of the piston. An iron-measuring jig is mounted in front of the sensor, and the volume is measured from the movement distance of the jig when it comes into contact with the piston head.



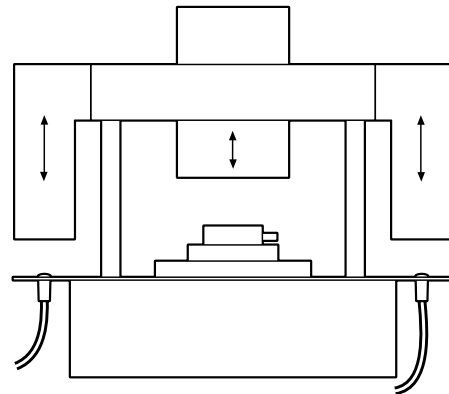
Measuring Height of Large Vertical Lathe Table

Hydraulic pressure is applied to the table support surface to float it, and the table is rotated. It is checked at this time for any change in height.



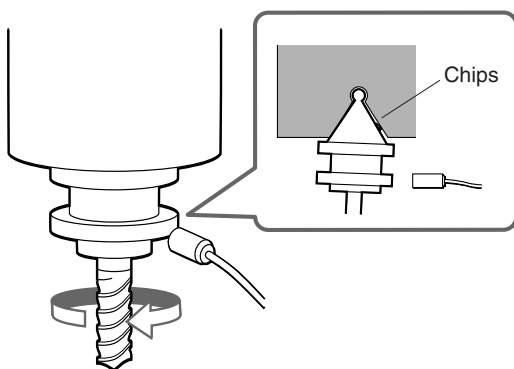
Metal Press Monitoring

By measuring displacement during stamping on a press, it can be monitored to check for defective stamping, stamping scrap or fluctuations in material, and stopped in this event.



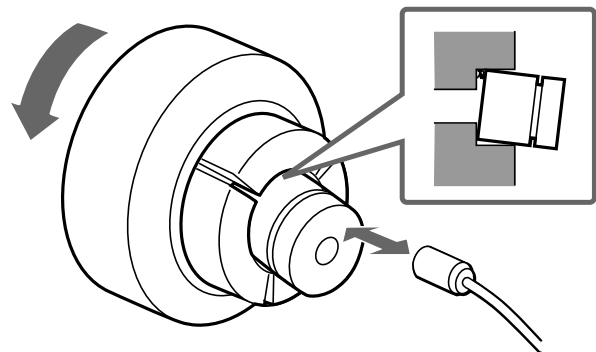
Detection of ATC Chucking Failure

Improper chucking due to the entrance of chips or other foreign matter when the tool shank is inserted can be detected from run-out of the shank flange.

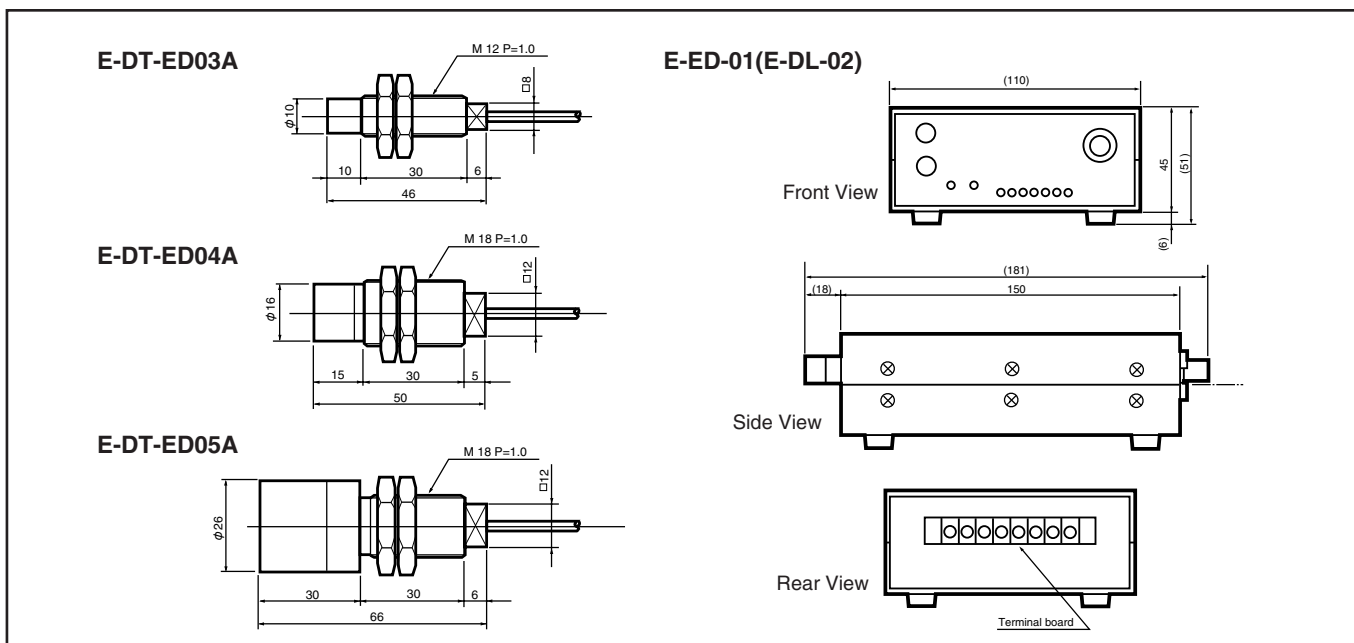


Detection of Run-Out Due to Improper Chucking

The parallelness of the workpiece is lost in the event foreign matter gets inside when the workpiece to be machined is chucked. Run-out when the workpiece is rotated at this time can be detected.



Outer Appearance/Dimension Diagram



Specifications

Model	Amplifier unit	E-ED-01		
	Sensor head	E-DT-ED03A	E-DT-ED04A	E-DT-ED05A
Sensor head shape		Not shielded	Not shielded	Not shielded
		φ10 spherical surface	φ15 spherical surface	φ26 spherical surface
		M12 mount	M18 mount	M18 mount
Main amplifier dimensions		110(W) × 51(H) × 180 (D) (Max. dimensions including rubber feet and sensor connector)		
Measuring length		0.05 – 2 mm	0.1 – 4 mm	1 – 8 mm
Analog output	Response frequency	10 kHz (–3dB)		
	Linearity	± 0.5% F.S.		
	Output voltage	+0.125 – +5V	+0.125 – +5V	+0.625 – +5V
	Resolution	0.3% F.S. *1		
Temperature characteristics	Amplifier unit	0.075% F.S. / °C		
	Sensor head	0.05% F.S. / °C	0.05% F.S. / °C	0.05% F.S. / °C
Power source	Voltage	DC 24 V ± 10%, Allowable ripple: 10% p-p or less		
	Consumption	200 mA or less		
Usage ambient temperature	Amplifier unit	0 – 40°C		
	Sensor head	0 – 40°C		
Usage ambient humidity	Amplifier unit	35 – 80% R.H. (no condensation)		
	Sensor head	35 – 80% R.H. (no condensation)		
Display LED		Power (PWR: Yellow), Detection distance (20, 40, 60, 80, 100%: Green, Over: Red)		
Protective structure (sensor head)		IP67		
Sensor cable length		3m		
Weight	Amplifier unit	Approx. 630 g		
	Sensor head (including cable)	Approx. 110 g	Approx. 175 g	Approx. 210 g

*: Above specifications are for when the item measured is the standard specimen.
 *: % F.S. is percentage of measuring length upper limit value.
 *: Resolution is the value when the specimen is stainless steel.
 *: Temperature characteristics are value when specimen is stainless steel and output voltage is 50% F.S.
 *: *1: Excluding switching noise (Frequency component 250 kHz or higher)

Power Unit

Model	E-DL-02
Power source	AC100V
Dimensions	110 (W) × 150(D) × 45 (H) mm

Usage Guidelines

- The amplifier unit and sensor head units are adjusted in a one-to-one configuration. The precision cannot be guaranteed if this configuration is changed.
- Mount the sensor head unit so that the measuring surface is parallel with the surface to be measured.
- In order to achieve good measurement precision, the tip of the head unit must be separated from the object to be measured by a distance at least three times the diameter of the tip.
- The power input (+5V) for the amplifier unit is to be provided by the customer, or a separate power unit needs to be ordered.
- Use the unit in a location that has a minimum of ambient temperature fluctuation.
- Avoid subjecting the sensor head unit to shock or undue force. Take precautions to ensure that the sensor head unit is not scratched.
- The measuring sensitivity and linearity differ depending upon the material that is measured. The amplifier unit must be adjusted for each type of metal.

PULCOM opto 30A/60B

Non-Contact Laser Outer Diameter Measuring Instruments



■ Features

Multi-Point/Multi-Item Measurement

Simultaneous measurement and judgment of four items at two locations can be performed.

Ideal for Centerless Grinder

The edge of the workpiece that is continuously fed is automatically detected, facilitating automatic control of the measurement timing.

Quick Response / High Precision

The provision of an 18-surface polygon scanner enables 1,500 scans to be performed per second, achieving high-precision measurements in a very short time.

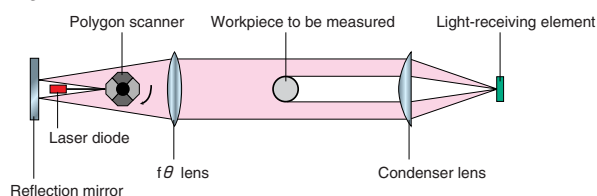
Error Removal Filter

The provision of a dedicated digital signal processor-based error removal filter enables data errors due to water drops, foreign matter or scratches on the workpiece to be removed, enhancing data precision.

■ Principle

The laser beam emitted from the semiconductor laser is scanned by the polygon scanner and converted into parallel scanning light by the $f\theta$ lens after it is reflected by the reflection mirror.

This light is condensed after the workpiece is scanned and converted into an electrical signal. The workpiece diameter is calculated by measuring the dark time.



Specifications

Set Model		Opto 30A-600	Opto 60B-600
Model	Measuring unit	E-LH-S30A	E-LH-S60B
	Control unit	E-LC-S600	
Measuring range		0.3 – 30 mm	0.6 – 60 mm
Light source		Red semiconductor laser (670 nm)	
Number of laser scans		1,500 times/second	
Laser scanning rate		100 m/s	200 m/s
Min. display value		Select: 0.01 μm , 0.1 μm or 1 μm	
Input/output connector (including options)		Control I/O (Select individual judgment output or BCD output), RS232C, analog output	
Pass/fail judgment signal		Max. 20 ranks	
Number of measuring heads		1	
Usage temperature range		0 – 40°C	
Usage humidity range		90% or less	
Power source		AC 85 – 250 V, 50/60 Hz	
Power consumption		25 VA	
Weight	Measuring unit	3.2 kg	5.5 kg
	Control unit	4.5 kg	

