Panasonic

Overview Measurement sensors

Laser displacement sensors Contact type displacement sensors Eddy current type displacement sensors



Panasonic Industrial Devices SUNX Over 40 years of invention

Since Panasonic Industrial Devices SUNX had released the world's first reflective type photoelectric sensor using LEDs, we have contributed to total FA solution systems with sensing and control technology over 40 years.

1984

1971

1976

1979



SX series The world's smallest amplifier built-in laser sensors

1994



LX-23 series The industry's first Optical Lamp Fiber Sensor

1999



GP-A series High accuracy eddy current type displacement sensors



2001

GXL series

Micro-size Inductive

proximity sensor

HL-C1 series high-speed laser displacement sensors



EX2 series The world's smallest amplifier built-in laser sensor

1986

2003



TR series Contact-type displacement sensors



RS-120H The world's first reflective type photoelectric sensor using LEDs

1991



FX5 series The world's smallest automatic sensitivity setting fiber sensors





EX-10 series The industry's smallest ultra-slim photoelectric sensors

Measurement

sensors

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Measure sensor products



HL-C2 Ultra High-speed / High-precision Laser Displacement Sensor



HL-G1 Compact Laser Displacement Sensor



HG-C Micro Laser Distance Sensor



HL-D3 High Speed, Multi-Point Laser Displacement Sensor





HL-T1 Ultra-compact Laser Collimated Beam Sensor



HG-S Contact-Type Digital Displacement Sensor





GP-X High Speed / High Accuracy Eddy Current Type Digital Displacement Sensor

Specification

Series		Spot size	Resolution	measurement range	Sampling rate	Features
	HL-C2	Small 20 to 400µm (Line spot type) 700 to 6,500µm	0.01 to 0.2µm	7.2 to 550mm	minimum 10µs	Ultra High-speed • High-precision Laser Displacement Sensor
I	HL-G1	Small 100 to 3,500µm	0.5 to 20µm	24.3 to 400mm	minimum 200µs	Compact Laser Displacement Sensor
F	HG-C	Small 50 to 500µm	Repeatability 10 to 800µm	25 to 600mm	fixed value 500µs	CMOS type Micro Laser Distance Senso
	HL-D3	50µm × 15mm	1µm	40 to 60mm	minimum 80µs	High Speed, Multi-Point Laser Displacement Sensor
N	HL-T1	-	Repeatability 4µm	-	-	Ultra-compact sensor head A high-functionality intelligent controller
	HG-S	Large	0.1 to 0.5µm	10mm	-	Slim & Robust Sensor Unit Introducing Contact-Type Digital Displacement Sensor Featuring optical absolute method in the slim and strong unit body
	GP-X	Large	0.32 to 20µm	0 to 10 mm	fixed value 25µs	Ultra High-speed • High-precision Laser Displacement Sensor

The resolution changes depend on setting of the sampling cycle and the response frequency. And the accuracy also related to the ambient temperature and lineality.

Please consult with our sales when selecting the measurement sensor products.

Product positioning



Principles

Laser displacement sensors

Measures the distance to the object, by using the triangulation principal. (Measures displacement or thickness)



- · Long sensing distance
- Measurement by small beam spot
- · High speed measurement
- Multi-point type allow the profile measurement
- Not usable in harsh environment



Contact-Type sisplacement sensors

Measures the distance by contacting the sensor. As the sensor pushed in, the glass scale inside moves and displacement can be read distance from the glass slit.



- High resolution
- · Not affected by the surface condition
- · High environmental resistance
- · The risk of causing damage by the contacting
- Longer tact time



Eddy current type displacement sensors

Measures the distance by using impedance change from electromagnetic induction.



- · High environmental resistance
- · Suitable for the high-speed moving application
- High resolution
- · Contactless and no damage
- Short measurement distance

Choosing the right measurement sensor

For chooseing your right measurement sensor, you need to consider several conditions.



			Me	tal		Plastic		Gla	ISS	Low refree	tive object	
			Metal (Mirror surface)	Metal (Hairline finished)	Plastics (Transparent)	Plastics (Half transparent)	Oparque plastics	Glass (Transparent)	Glass (Half transparent)	Black rubber	Soft body objects	
Series		Method										
	HL-C2	Distance (1 head)	3	3	3	1 * ^A	3	2	2	2	0	
	112-02	Thickness (2 heads)	Specular reflective	Diffuse reflective	Specular reflective	Specular reflective	Diffuse reflective	Specular reflective	Diffuse reflective	Diffuse reflective	Diffuse reflective	
	HL-G1	Distance (1 head)	3	3	3 Specular reflective	1 Specular reflective	3	2 Specular reflective	2 Diffuse reflective	1	0	
	Thickness (2 heads)	Specular reflective	Diffuse reflective	0	0	Diffuse reflective	0	0	Diffuse reflective	Diffuse reflective		
1		Distance (1 head)	d) 1 ds)	stance (1 head)	2	0	1	2	0	2	1	0
	HG-C	Thickness (2 heads)		3	0	,	3	0	0	I	0	
		Distance (1 head)		2	1*A	1	2	1 *A	2	1	0	
	HL-D3	Thickness (1 head)	2	5	1	,	5		2	, i	U	
N	ні .т1	Distance (1 head)	1	1	0	1	1	0	1	1	1	
Č 🍳	112-11	Thickness (1 head)		ľ	U		ľ	U		ľ		
	HG-S	Distance (1 head)	3	3	3	3	2	2	3	1	0	
1 and	Thickness (2 heads))	5			5	2 5		1 0		
)		Distance (1 head)										
****///	GP-X	Thickness (2 heads)	3	3	0	0	0	0	0	0	0	
				h	mpossible 0	1 2	➤ Possibl 3	e *A:For the gl	ossy surface, measur	eable with Specular r	eflective	





Sampring rate Linearity Resolution 100kHz ±0.02% 0.01µm



Micro Spot Gaussian Beam

Exclusive optical equipment and diaphragm structure sustain laser beam of high quality at a radiant density that is close to ideal in the Gaussian distribution.



High-resolution lens

The light-receiving part can create images at a minimum point from light received from a variety of different angles to produce images with even greater precision.



HDLC-CMOS sensors

High density light-receiving cells and a processing speed which is close to maximum limits result in high resolutions and high speeds which exceed all <u>expectations</u> for laser displacement sensors.



Ultra high-speed calculation processor

All signals are digitalized by a high speed processor while achieving high precision and high speed with its exclusive algorithm.



HL-C2

<text>

Linear beam spot type (-MK)

Even the object which looks flat has some roughness at the surface. This roughness cause the variation with the measurement result. By using line-spot type, averaging the influence and allow the stable measurement even on the rough surface.



Head lineup HL-C203F(MK) HL-C205B(-MK) HL-C208B(-MK) HL-C201F(-MK) HL-C201A-SP2(M) HL-C201A-SP3(M) HL-C211F(-MK) HL-C235BE(-MK) HL-C235CE-W(-MK) HL-C205C(-MK) HL-C208C(-MK) HL-C211F5(-MK) HL-C235CE(-MK) Measurement **85**mm **10**mm **8**mm **15**mm **30**mm **50**mm 110mm 350mm 350mm center distance ±0.8mm **±1**_{mm} **±5**mm **±20**mm ±15_{mm} Measuring ±5mm ±200mm **±1**mm ±50mm range 0.01 µm 0.01µm 0.025µm 0.05µm 0.01µm 0.15µm 0.1 µm 0.5µm 0.5µm Resolution 30µm 70µm 100_{um} **80**µm 250 µm 400 µm **20**um **20**µm **30**µm Beam size

11



2 heads with 1 controller



Calculation function is implemented to the controller. This function allow output of the calculation result from the thickness measurement and 2-point gap measurement directly.

(Typical examples of the calculation) A+B -(A+B) A-B B-A

Easy oparation

Combinning a software tool (Intelligent Monitor HL-C2AiM or Collecting data HL-C2AiG) or Programmable Display GT12, it shows not only

measurement results but also recieved light waveform.

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Top.

Menu

Wave

Setting software HL-C2AiM

Easy waveform monitoring and function setting by PC. The software is available on the website.



Programmable Display GT12

GT12 can be used as the console,

by downloading screen data from website. (Waveform display, setting, etc)









Applications



Measurement of the heights of chip parts



Measurement of HDD surface variations



Detection of deformed narrow pitch connector leg pins



Controling the camera focus



Measurement of disk brake thickness



Measurement of the thickness of copper clad laminate



Gap measurement using an exposure device



Controlling the nozzle height of a dispenser



High resolution and Fast response

Resolution Sampring rate





Timing input and multi input

Inaddition to timing input select the desired input according to your application.

Zero set on/off
Laser control
Teaching
Memory switc

Laser control
Reset
Memory switching
Saving

Featuring 3 outputs and an analog 2 outputs

- HI/GO/LOW judgment output or Alarm output
- Analog output : current and voltage modes



As a self contained sensor, the HL-G1 series offers a space saving configuration by removing the need for an external controller.





IP67 dust- and water-proof protective enclosure

Exclusive optical equipment and diaphragm structure sustain laser beam of high quality at a radiant density that is close to ideal in the Gaussian distribution.



High functionality type

Connect to upper devices of RS-422/485.

The HL-G1 can be connected to upper devices of RS-422/485.

When upper device sends the request command, the HL-G1 series send the response command.



Software tool for sensor

configuration and evaluation

In addition to configuring up to 16 sensors at once, this free tool makes it easy to gather data needed for analysis, including received light waveform monitoring and data buffering. The interface language can be selected at the time of installation.

- Data buffering
- Received light waveform display
- Measured value display

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HMI screen

for the HL-G1 series

The GT02 / GT12 HMI operator pannel can be used in combination with the HL-G1 to allow easy confirmation of sensor status and configuration of sensor settings from a remote location. Japanese, English, Chinese, and Korean are supported.



Meas		mm	Тор
-7.8	8257		
LSR OUT1	Hold	Timing	
AL OUT3	Zero set	Reset	





Applications





RepeatabilityLinearityResponse time10µm±0.1% F.s.1.5ms





A new optical system with a built-in mirror

The HG-C series sensors incorporating a new optical system with a built-in mirror provides smaller sensor depth as well as higher measurement accuracy equivalent to displacement sensors.





Standard equipped analog output

Analog output is provided in addition to control output. It can be used as a simple measurement sensor. Analog voltage output range : 0 to 5 V Analog current output range : 4 to 20mA

Zero set function

The zero point can be set at a desired value. It is useful when measuring steps or tolerance with reference to the height of a sensing object.



OUT

External input setting function

One of four functions, "zero setting function," "teaching function," "emission stopping function" and "trigger function" can be assigned to an external input line.



Zero set Teaching Emission stop Triger

Analog output Selectable either analog voltage output 0 to +5V or analog current output 4 to 20 mA

Analog ground (shielded)

	HG-C1030	HG-C1050	HG-C1100	HG-C1200	HG-C1400
Measurement center distance	30 mm	50 mm	100mm	200 mm	400 mm
Measuring range	± 5 mm	± 15 mm	±35 mm	±80mm	±200mm
Repeatability	10 µm	30 µm	70 µm	200µm	200 to 400 mm 400 to 600 mm 300μm 800μm
Beam diameter	50 µm	70 µm	120 µm	300µm	500µm

Applications



Controlling the mounter head height



Detecting on-vehicle seats



Detecting warpage of a circuit board



Measuring the distance of 3D printer injector and part



Checking of correct pins alignment of connector



Measurement of a remaining functional sheet



Judging front or back of cover of electric parts



Detecting a seam (overlap) of functional sheet

HL-D3 High Speed, Multi-Point Laser Displacement Sensor

High Speed Multi-point Sensing

Resolution

Sampring rate

Z axis

80µs

Measurement range of width

12.5 mm *measurement center

Parallel beam

HL-D3 adopts parallel beam made possible by the latest optical system. The reduced area of shadow that appears when light is emitted on the target object made it possible to accurately sense the shape of the object.



Wide-cell function

When the surface condition is rough, such as with cut metal, sensing of a single point will result in errors due to the uneven surface.

The wide-cell function expands the sensing points for the light receiving side and obtains the mean value (or maximum or minimum value,

depending on the setting) to improve the stability of the measurements.



Multiple Shape Calculation Functions

The HL-D3 series calculates the shapes, including the height difference, width, and cross-sectional area, from the shape waveform based on the received light. At the same time, the displacement sensor uses these calculation results to instantaneously make Hi / Go / Lo judgments based on the present upper and lower limits. Thanks to the two sets of output, different shape calculations can be performed for each output or two sensor heads can be connected and used to output each judgment results.



Multiple Shape Calculation Functions

Height calculation

The height difference between the reference value and measured value is calculated.



Step calculation

The height difference is calculated from 2 measured values.



Width calculation

The width is calculated from 2 measured values.



Cross-sectional area calculation

HL-D3 calculates the cross-sectional area defined by the reference value.



Settings & Monitoring Software HL-D3SMI

Conditions and the monitoring of measurements and judgment results can easily be set up by connecting to the HL-D3C controller and a PC pre-installed with HL-D3SMI using USB cables. The shape waveform based on the saved data can be reproduced on screen, which allows for it to be used as an analytical tool.



- Store displacement shape waveform data, calculated measured values, and judgment results on the memory built into the controller during continuous sensing.
- Provides a stereoscopic representation of the shape by a 3D display of stored data.
- Replay the stored data on the buffering screen at a later time, provided that the stored data is saved in the dedicated file format.
- Allow waveform display and analysis by means of spreadsheet software based on the data saved in CSV file format.





Applications



Detecting misaligned pins on surface mounted components



Sensing Objects with Sloped Prof



Sensing objects using both gold plates and black resin



Checking for loose screws









HL-T1

Ultra-compact sensor head A high-functionality intelligent controller

Minimum
sensing objectSampling rate4μm8μm150μs



Small sensor head

The most compact size (HL-T1001A/ T1005A) and yet the highest level of performance in their class. These sensors require less space for installation and contribute to overall space savings.



Computations for 2 sensors

The computation unit (option) just needs to be connected between the two controllers to enable computations (addition and subtraction) to be carried out for two sensors. No digital panel controller is needed either.



HL-T1



Applications



Sensing wafer position in wafer cassette



Checking the positioning of chip components



Detecting defective lead frame seating



Distinguishing opacity of glass



Slim and Robust sensor

Resolution

Linearity

0.1µm ±0.25% F.S.

Measurement range

10mm



Sensor head

Slim body

The slim unit body contains plain bearings with 2-point support structure disperses load and achieves superb durability. The sensor head offers long life and reduces maintenance costs dramatically.

2-point support structure

Ball-less bearings are installed at the upper and lower sections of the unit. This ensures excellent strength against lateral loads.

No "value skipping" or "unset zero point"

Displacement is measured by reading a glass scale with a different slit pattern at each reading position using a high-resolution sensor. This eliminates "value skipping" even when measuring at high speed, and there is no concern of "unset zero point".

Hot-swappable

The sensor head can be changed safely without turning off the controller. This reduces the man-hours required for the change of line setup for processing of different workpieces, thus achieving a significant reduction of setup change time.

Controller

Dual display

The 2-line digital display simultaneously shows head measurement (measured value) and judgment value (calculated value).

Intuitive circle meter

Values between allowable maximum and minimum values are indicated in green. Values outside of the allowable range are indicated in orange. This provides at-aglance understanding of the margin to the tolerance limits.



Connection of up to 15 slaves units

One master unit can be connected with up to 15 slave units in any order. This allows easy multi-point calculations.



(Example: Connection of 15 slave units)



*End plates (optional) must be mounted on both sides of the controller after the connection of slave units.





Applications



SC-HG1-C / SC-HG1-CEF

CC-Link / CC-Link IE Field Communication Unit for Digital Displacement Sensors



Direct connect to CC-Link master Program-less transmission of high-precision data Batch change of internal settings via CC-Link



High-precision data

Connection of 1 master unit and up to 14 slave units

CC-Link Communication Unit for Digital Displacement Sensors SC-HG1-C

CC-Link Master

CC-Link IE Field Communication Unit for Digital Displacement Sensors SC-HG1-CEF



RS-485 Communication Unit for Digital Displacement Sensors



Direct transfer of high-precision measurement values Batch change of internal settings via RS-485



RS-485 Communication Unit for Digital Displacement Sensors SC-HG1-485

RS-485 Communication

PLC



Sampring rate Linearity Resolution 25µs ±0.3% F.S. 0.32µm



0.02 % F.S. resolution for highly accurate measurement

With high resolution, 0.02 % F.S. (Note), they can perform highaccuracy measurements of microdisplacements. (Average number of samples: 64) Note: GP-XC3SE and GP-XC5SE Resolution: 0.04 %F.S.

Optimal correction of the output characteristics

Because they perform with a 0.3 % F.S. linearity, they can be used for sensing stainless steel and iron enabling precise measurements not affected by the work's material. Specifications corresponding to each material (stainless steel, iron, aluminum) has already been inputted in the controller enabling the easy selection of the setting that is most suitable for the particular material used.



Applications



Programmable logic controller FP7

FP7 allows building traceability system by the remote monitoring and data logging functions, addition to the equipment control.

Program capacity

196k steps

Ultra high speed processing

11 ns/step

I/O points

Max.4096 Points



Add-on cassettes Analog input unit AFP7FCAD2



2-channel analog input 0–10V/0–5V/0–20mA, resolution 12 bit, conversion speed 1ms/channel (non-insulated)



Programmable controller FP7



FP7 allows data logging of analog output from the digital measurement sensor. Logged data can be monitored by the browser of PC or smart phone.









FP7

Web server

function

Digital

displacement

sensor

Wi-Fi rooter

1

Programmable logic controller FP7



Programmable logic controller

New standard for compact PLCs **FPOR**



Program capacity

32k steps

Ultra high speed processing

80 ns/step

I/O points Max.128 Points



Powerful compact PLC **FPΣ**



32k steps

High speed processing

320 ns/step

I/O points Max.384 Points





Consoles for measurement sensors



Human Machine Interface GT series



Global Network

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