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KEYENCE

Ultra High-Speed/High-Accuracy Laser Displacement Sensor

LK-G5000 Series

CE

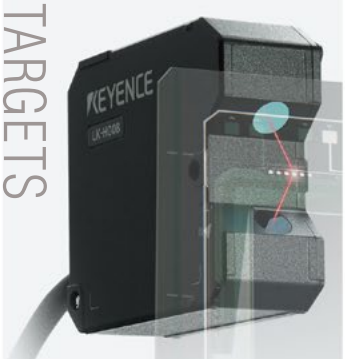
COARSE TARGETS



FINE TARGETS



TRANSPARENT/MIRROR TARGETS





Ability to respond to any situation, reliability stemming from high performance

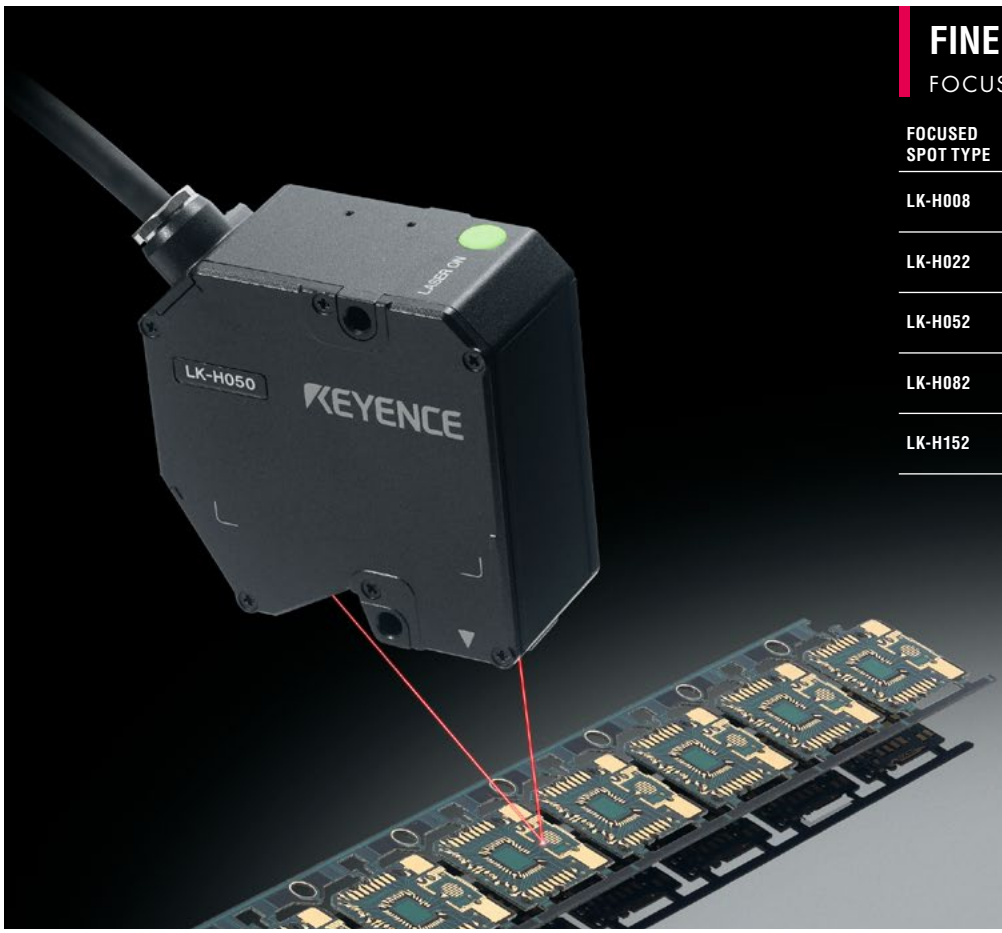
Highest repeatability in it s class	Highest accuracy in its class	Fastest in the world
0.005 μm	±0.02%	392 kHz



COARSE TARGETS

WIDE SPOT TYPE

WIDE SPOT TYPE	Reference Distance & Measurement Range	Repeatability
LK-H008W	8 ±0.5 mm 0.32" ±0.02"	0.005 µm
LK-H027	20 ±3 mm 0.79" ±0.12"	0.02 µm
LK-H057	50 ±10 mm 1.97" ±0.39"	0.025 µm
LK-H087	80 ±18 mm 3.15" ±0.71"	0.1 µm 0.000004"
LK-H157	150 ±40 mm 5.91" ±1.57"	0.25 µm 0.000010"



FINE TARGETS

FOCUSED SPOT TYPE

FOCUSED SPOT TYPE	Reference Distance & Measurement Range	Repeatability
LK-H008	8 ±0.5 mm 0.32" ±0.02"	0.005 µm
LK-H022	20 ±3 mm 0.79" ±0.12"	0.02 µm
LK-H052	50 ±10 mm 1.97" ±0.39"	0.025 µm
LK-H082	80 ±18 mm 3.15" ±0.71"	0.1 µm 0.000004"
LK-H152	150 ±40 mm 5.91" ±1.57"	0.25 µm 0.000010"

Color, materials, surface conditions…
The LK-G5000 Series offers head choices that provide stable measurements on any target



Laser displacement sensors need speed, accuracy, and the capability to provide excellent performance in any application.

In order to become the world's best in every aspect, the LK-G5000 is built with the latest cutting-edge technology.

Highest Repeatability in its Class

0.005 μm

The need to improve product quality makes high performance critical. The LK-G5000 Series provides the highest repeatability in its class and is highly capable in any application.

Highest Accuracy in its Class

±0.02%

High-linearity enhances the LK-G5000's capabilities. By taking advantage of new technology, the series provides high performance with the high accuracy that is increasingly required.

Fastest in the World

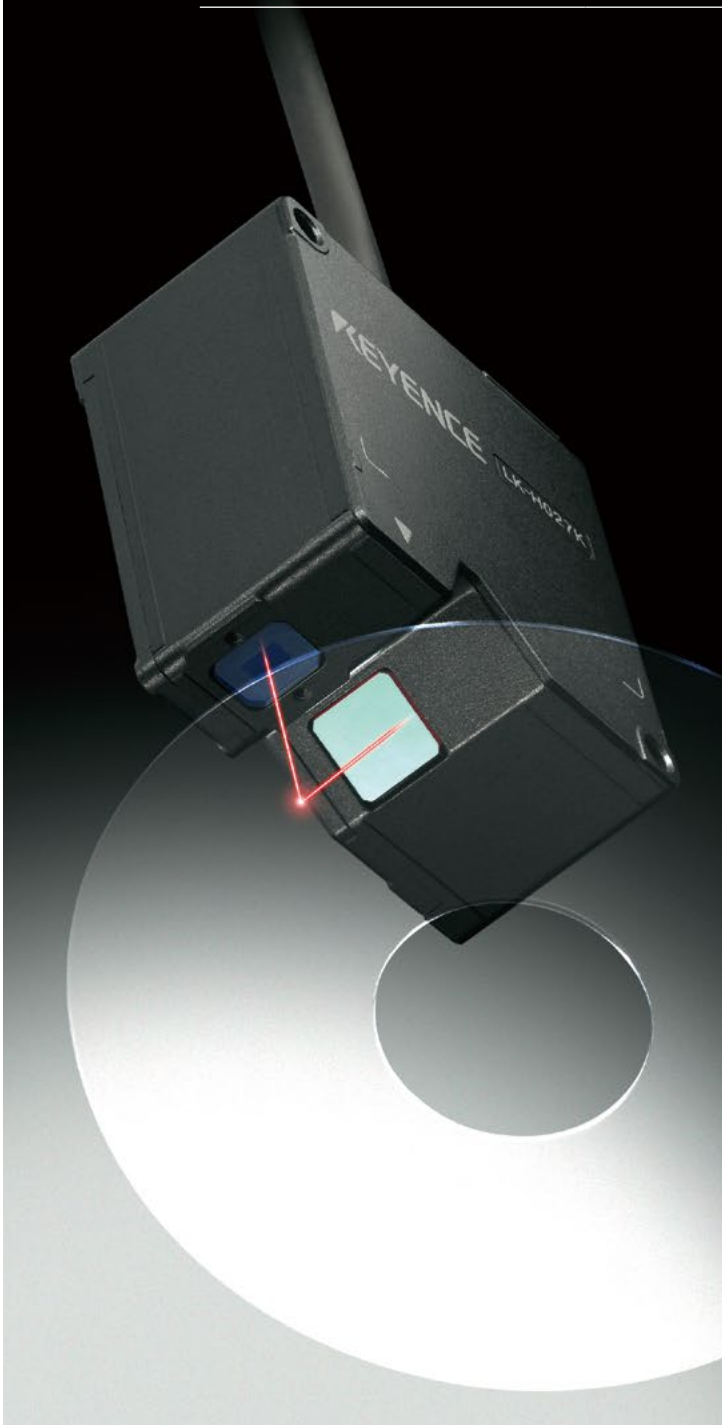
392 kHz

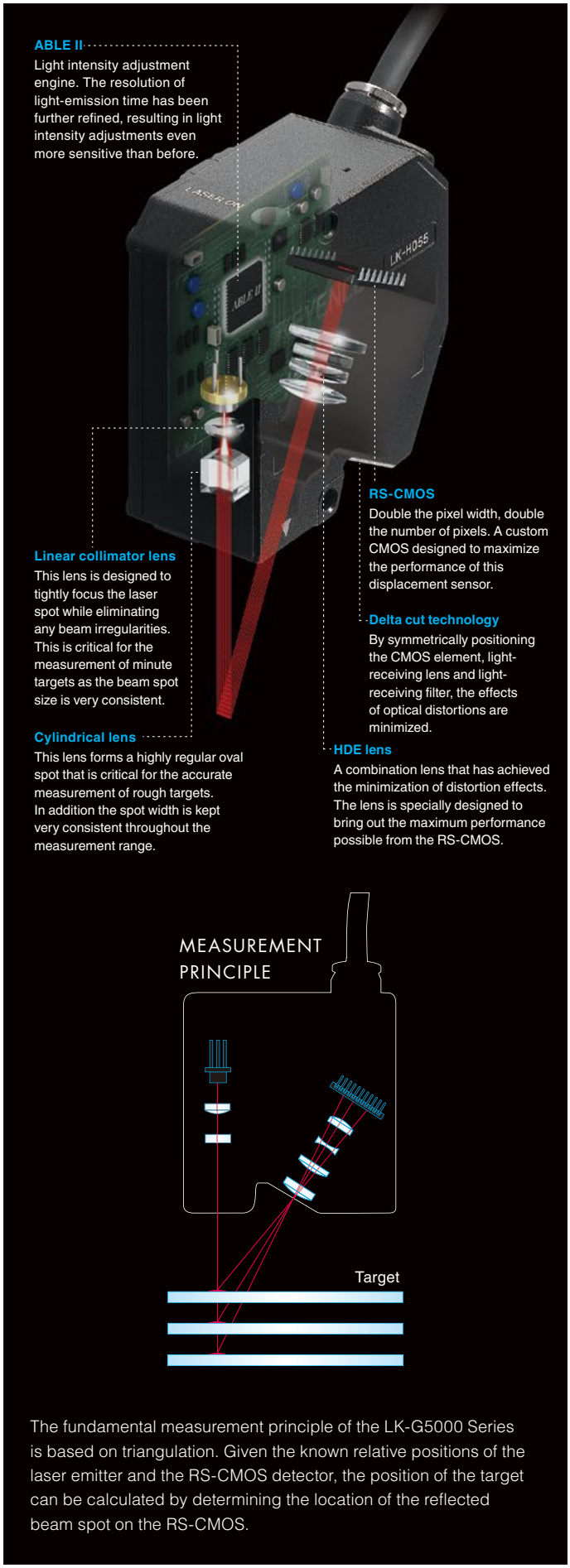
The world's fastest sampling rate not only captures displacement of moving or rotating targets, but also increases stability in all manner of applications.

TRANSPARENT/MIRROR TARGETS

SPECULAR REFLECTION TYPE

SPECULAR REFLECTION TYPE	Reference Distance & Measurement Range	Repeatability
LK-H008(W)	8 ±0.5 mm 0.32" ±0.02"	0.005 μm
LK-H027K	16.1 ±2.8 mm 0.63" ±0.11"	0.02 μm
LK-H057K	46.3 ±5.2 mm 1.82" ±0.20"	0.025 μm
LK-H087 & LK-F3	76.7 -17.6 mm/+14.5 mm 3.02" -0.69"/+0.57"	0.1 μm 0.000004"
LK-H157 & LK-F2	147.5 -39.5 mm /+24.4 mm 5.81" -1.56"/+0.96"	0.25 μm 0.000010"



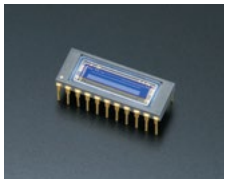


The fundamental measurement principle of the LK-G5000 Series is based on triangulation. Given the known relative positions of the laser emitter and the RS-CMOS detector, the position of the target can be calculated by determining the location of the reflected beam spot on the RS-CMOS.

Technology that has achieved unparalleled accuracy

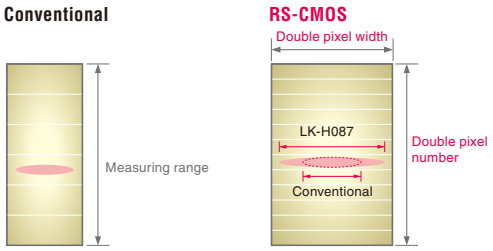
RS-CMOS

R = HIGH-RESOLUTION
S = HIGH-SPEED



High-accuracy has been achieved by doubling the pixel width and doubling the number of pixels in the CMOS.

The optical system has been redesigned not only to increase the width of the beam spot, but to maintain the small height on the receiving element. This optimal beam spot geometry, when combined with the redesigned CMOS, is used to achieve unparalleled accuracy.

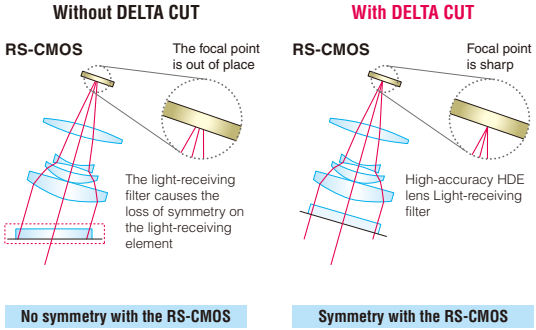


Designed to optimize the spot geometry on the pixel.

HDE Lenses & Delta Cut Technology



The newly developed HDE lens minimizes the effect of distortion of the spot on the light-receiving element. Further, thanks to delta cut technology maintaining the symmetry of the beam spot, a F.S. linearity of 0.02% has been achieved.



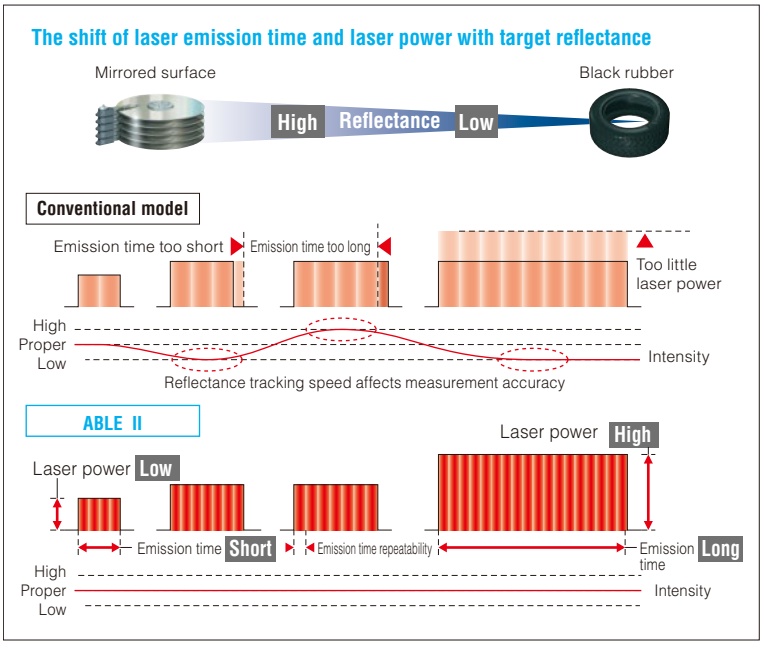
Sophisticated measurement ability to excel in any situation

ABLE II

Active Balanced Laser Control Engine Version II

Better than the conventional model	Higher than the conventional model	Superior to the conventional model
3×	**4×**	**8×**
Dynamic Range	Resolution of Laser Emission Time	High-Speed Tracking Capability

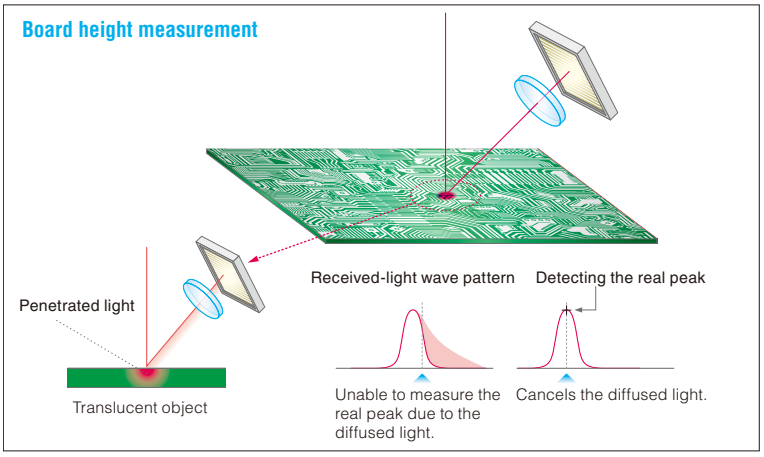
The well-established ABLE control is now even more powerful. ABLE II intelligently optimizes the RS-CMOS capability by balancing the three elements of laser emission time, laser power, and gain. Furthermore, ABLE II has a high-speed tracking ability that is eight times faster than conventional models.



Translucent Object (RPD* ALGORITHM)

A translucent object causes a diffuse reflection beneath the surface when the laser beam penetrates inside the object and the received-light wave pattern gently broadens. The RPD algorithm is able to detect the Real Peak by canceling the impact of the broadened wave patterns.

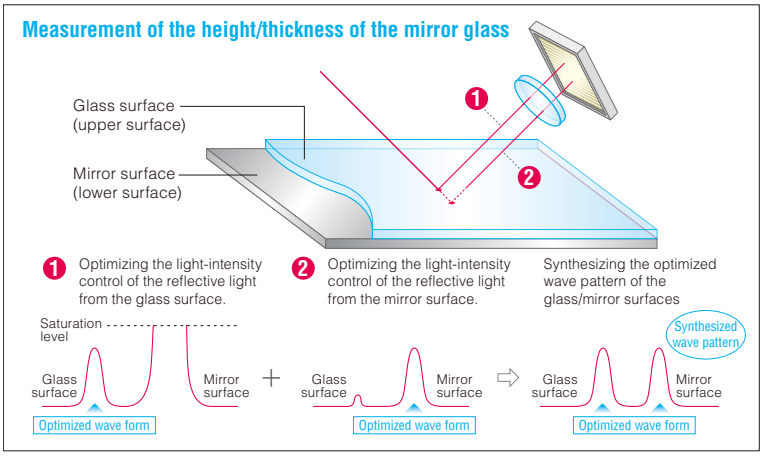
*RPD=Real Peak Detect



Transparent Object (MULTI -ABLE CONTROL)

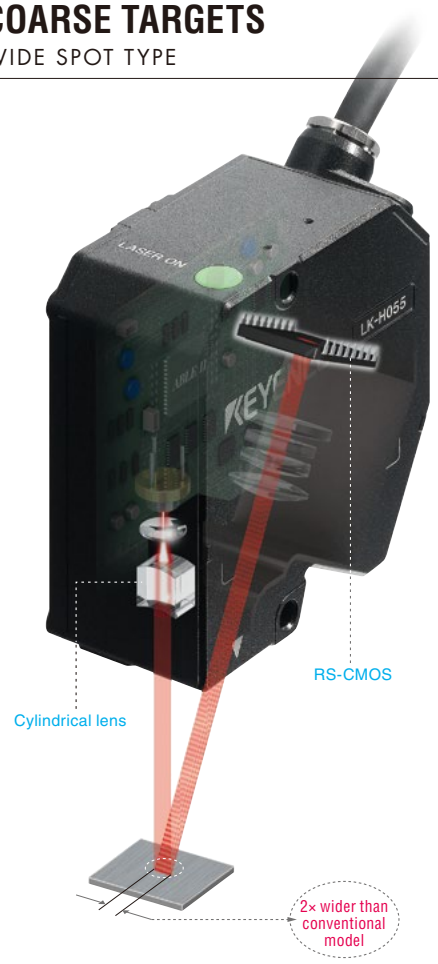
Optimizes the laser intensity by sensing and adjusting to the reflected light for each layer of a transparent object. High accuracy is achieved because the measurement is not affected by each layer's reflectivity.

Optimizes light-intensity control by sensing the reflective light from each layer. By synthesizing the wave patterns, highly accurate measurements with insufficient light or saturation are possible.

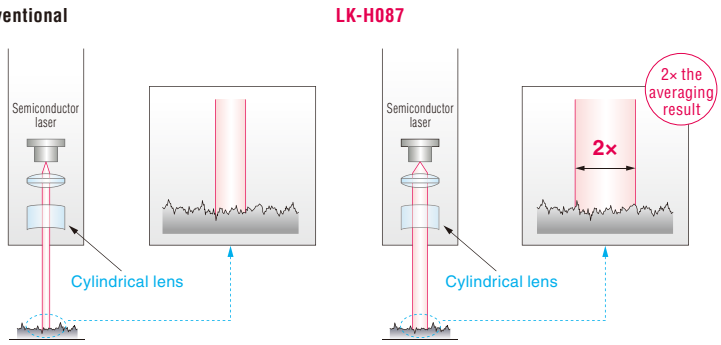


COARSE TARGETS
WIDE SPOT TYPE

Stable measurement on coarse targets



Surfaces that may appear flat, once magnified will often contain minute projections and depressions. This microscopic surface roughness can often cause measurement errors with conventional focused spot sensors. By using a sensor head with a wide beam spot, the effect of the uneven surface is averaged and stable measurements of even coarse targets are possible.



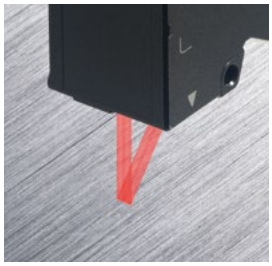
SPOT DIAMETER

LK-H008W	LK-H027	LK-H057	LK-H087	LK-H157
20 × 550 µm 0.000787" × 0.021654"	25 × 1400 µm 0.000984" × 0.055118"	50 × 2000 µm 0.001969" × 0.078740"	70 × 2500 µm 0.002756" × 0.098425"	120 × 4200 µm 0.004724" × 0.165354"

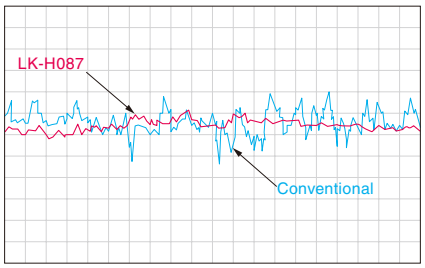
Measurement of metal surfaces

Minimizes the influence of the roughness of a coarse target surface, including that of brushed metal surfaces and rubber surfaces. Never before seen measurement accuracy has now been achieved.

Due to the advanced cylindrical lensing used in the LK-G5000 Series, the wide axis of the beam spot is kept very consistent throughout the measurement range. This allows the averaging area to stay consistent even if the target is moved closer to or further from the sensor head.

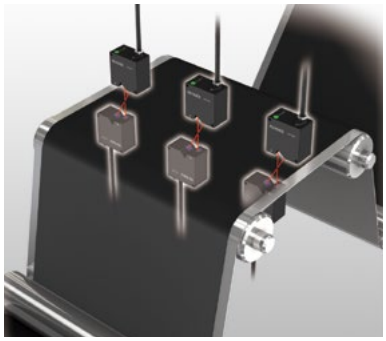


Measurement of a brushed metal surface.

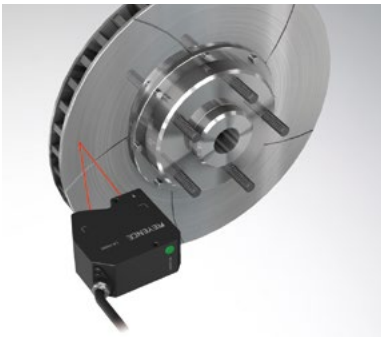


APPLICATION

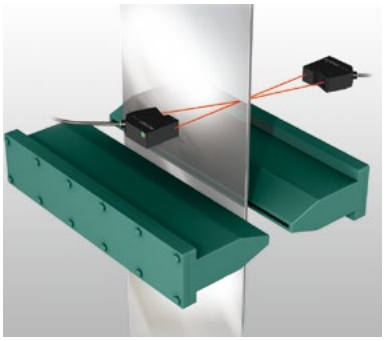
Measurement of electrode thickness



Measurement of the disc-rotor vibration

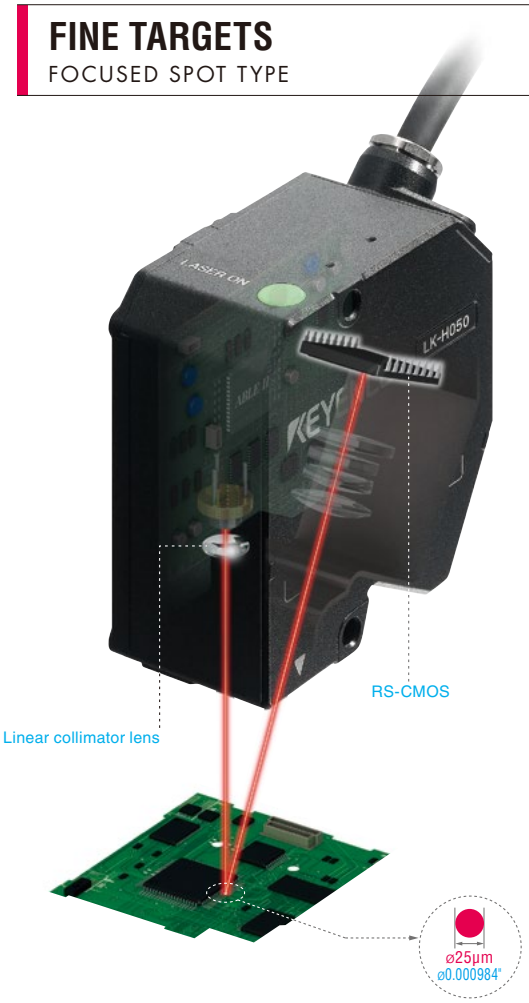


Position control of an air knife

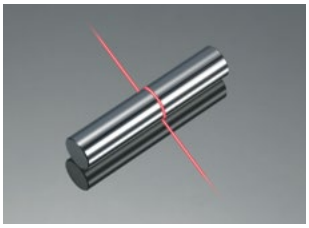


FINE TARGETS
FOCUSED SPOT TYPE

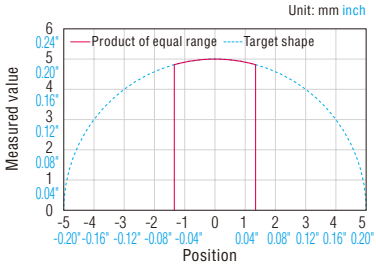
Optimal for fine or profile measurements



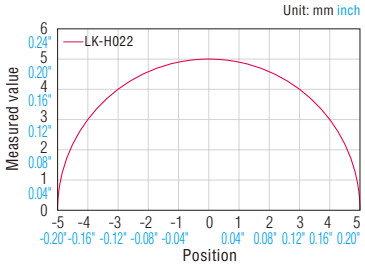
The smallest spot diameter in its class of ø25 µm ø0.000984" (LK-H022) can measure any target, from fine components to profile measurements, with the highest level of accuracy in the industry.


Profile measurement of a metal pin-gage

Product of equal range



LK-H022

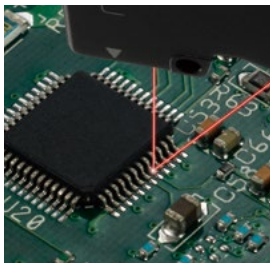


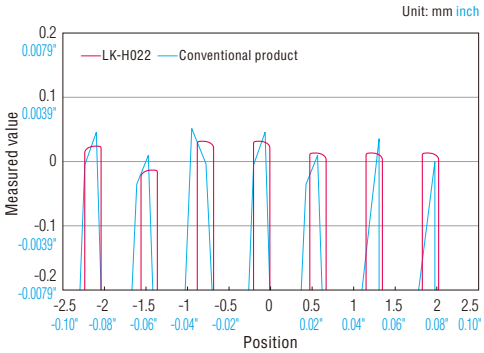
SPOT DIAMETER

LK-H008	LK-H022	LK-H052	LK-H082	LK-H152
ø20 µm ø0.000787"	ø25 µm ø0.000984"	ø50 µm ø0.001969"	ø70 µm ø0.002756"	ø120 µm ø0.004724"

Measurement of the IC pin height

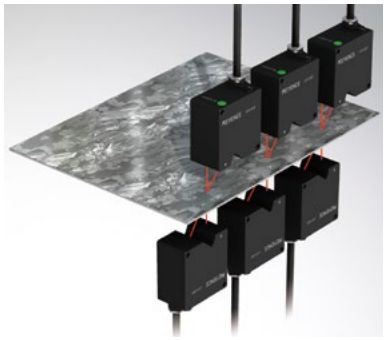
Thanks to delta cut technology, the influence of the distortion caused by the optical filter has been minimized. This and other improvements in the optical system mean that not only is the beam spot focused on the RS-CMOS, it is also very precisely focused on the target area. This allows high precision profile measurements that were not previously possible.


Measurement of the IC pin height



APPLICATION

Active layer measurement of solar modules



Zoom lens assembly accuracy



Measurement of connector height



TRANSPARENT/MIRROR TARGETS

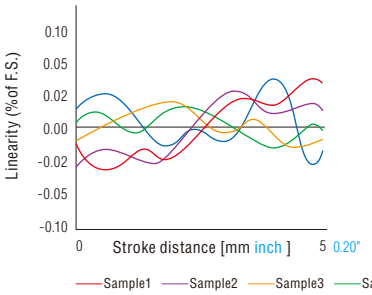
SPECULAR REFLECTION TYPE

Transparent/mirror surface measurement result demonstration

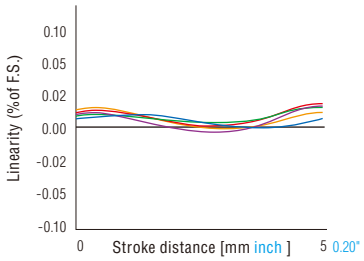


The LK-G5000 Series incudes a group of heads specifically designed for use on highly reflective targets such as glass or other mirror surfaces. These heads are available with wide or focused beam spots and are ideally suited for high accuracy measurements on such surfaces.

Conventional



LK-H052K



SPOT DIAMETER (WIDE TYPE)

LK-H008W	LK-H027K	LK-H057K	LK-H087+LK-F3	LK-H157+LK-F2
20 × 550 µm 0.000787" × 0.021654"	25 × 1400 µm 0.000984" × 0.055118"	50 × 2000 µm 0.001969" × 0.078740"	70 × 2500 µm 0.002756" × 0.098425"	120 × 4200µm 0.004724" × 0.165354"

SPOT DIAMETER (SPOT TYPE)

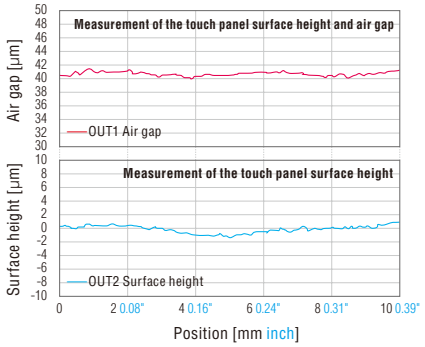
LK-H008	LK-H022K	LK-H052K	LK-H082+LK-F3	LK-H152+LK-F2
ø20 µm ø0.000787"	ø25 µm ø0.000984"	ø50 µm ø0.001969"	ø70 µm ø0.002756"	ø120µm ø0.004724"

Gap measurement of a touch panel

The optical system in these specialized heads has been optimized to obtain the maximum resolution possible on highly specular targets. By further improving the functionality of the receiver element, stable measurements of 20 µm 0.000787" gaps are now possible.



Measurement of the touch panel surface height and air gap.

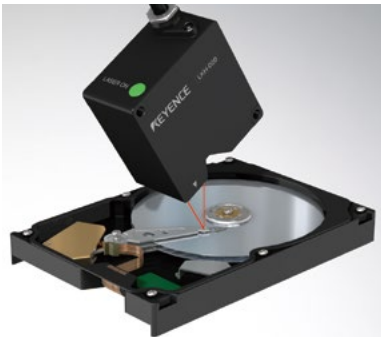


APPLICATION

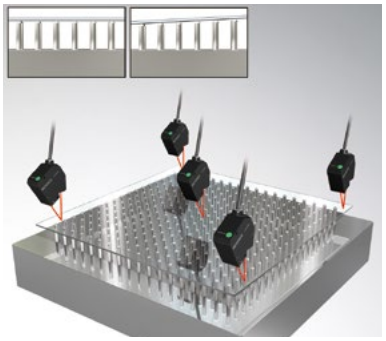
Z-axis positioning of a patterned wafer



Step measurement between the HDD reader arm and the media



Measurements of glass board thickness, warpage and parallelism



CONTROLLER

Interfacing with peripheral equipment and configuring the display style according to need is made easy

3 SELECTABLE STYLES



Remote Control

The controller can be placed up to 10 m 32.81' away from the operation/display units.

Direct Control

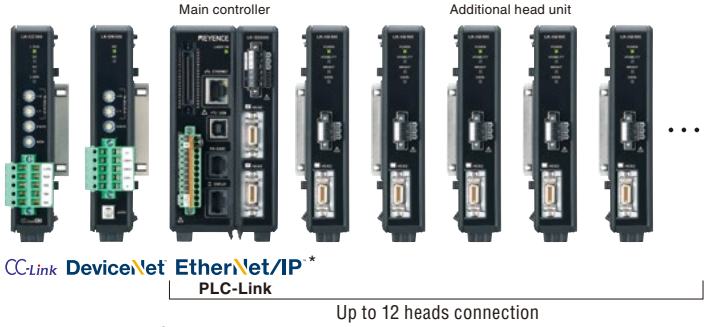
The compact controller with a built-in display can be operated directly via easy to use push buttons incorporated directly into the unit.

Touch Panel Control

By using the dedicated touch panel, it is easy to setup and view the received light wave patterns and measured values.

Connect up to 12 sensor heads/network capable

By connecting the main controller to additional head units, it is possible to measure simultaneously with up to 12 heads. Furthermore, it is compatible with EtherNet/IP™, PLC-Link, CC-Link or DeviceNet™, making it possible to place the system in the same network as other manufacturer's units.



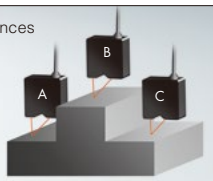
* The EtherNet/IP™ and PLC-Link interfaces cannot be used when a CC-Link unit or a DeviceNet™ unit is installed.

Convenient calculation functions

Instantly calculates values based on measurements obtained by more than one head, enabling the user to easily set complicated calculations inside the controller that were conventionally done with PLCs or PCs.

Standard Step Measurement

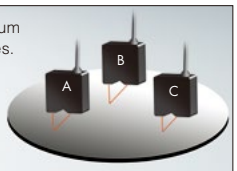
Calculates the differences between a reference point and each measuring point.



Measured value1=B-A Measured value2=B-C
Measured value3=A-C...

Maximum/Minimum Measurement

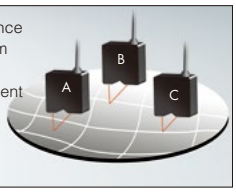
Calculates the maximum and/or minimum values.



Measured value1=MAX(A,B,C...)
Measured value2=MIN(A,B,C...)

Flatness Measurement

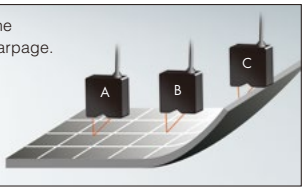
Calculates the difference between the maximum and minimum values among the measurement points.



Measured value1=MAX(A,B,C...)−MIN(A,B,C...)...

Warpage Measurement

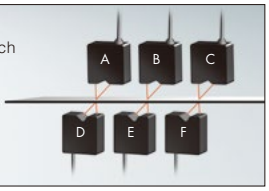
Calculates the amount of warpage.



Measured value1=B-(A+C)/2...

Multi-Point Thickness Measurement

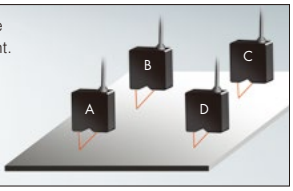
Calculates the thickness with each pair of sensors.



Measured value1=X+(A+D) Measured value2=Y+(B+E)
Measured value3=Z+(C+F)...

Average Height Measurement

Calculates the average height.

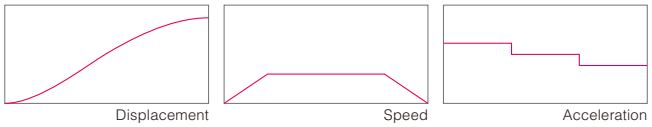


Measured value1=Ave(A,B,C,D,...)

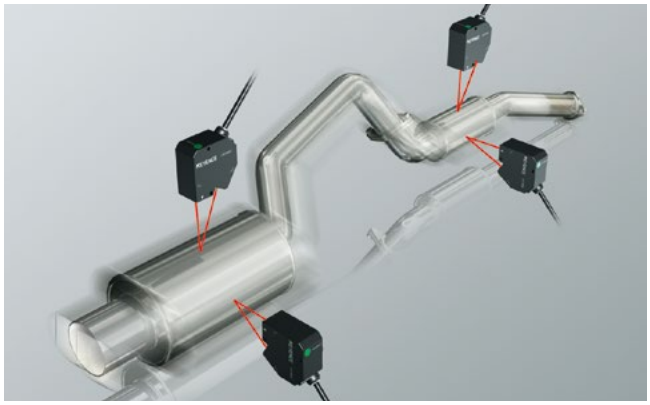
Measurement of Speed (m/s), Acceleration (m/s^2)

The LK-G5000 Series is equipped with a function to directly measure the speed (m/s) and acceleration (m/s^2) of targets. Just select the type of measurement: “displacement”, “speed”, or “acceleration”. Since the differential processing circuit is inside the controller, it is possible to directly output or evaluate measurements that were previously calculated externally. The LK-G5000 Series is suitable for lightweight, easily deformed, and high-temperature targets which are difficult to measure with contact accelerometers.

Example of measurement of stage movement



Vibration test of high-temperature-muffler

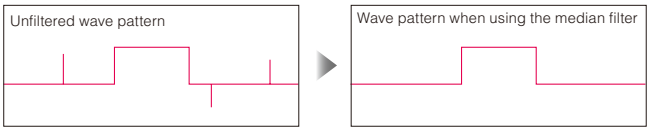


Data filter functions made easy

4 types of easy to use data processing filters are incorporated directly in the controller. The filters are user selectable for ease of use.

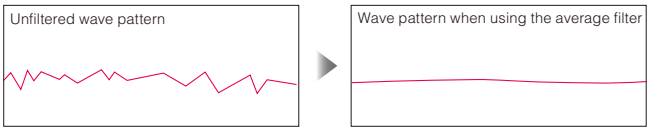
Median filter

Removes any intermittent noise in the values.



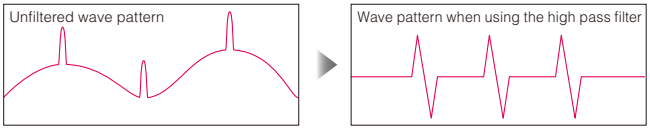
Movement average filter

Averages the measured values to reduce high the overall noise level in the measurement.



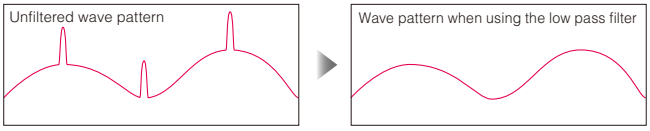
High pass filter

Captures sudden changes and removes low frequency variations.



Low pass filter

Captures moderate changes while removing high frequency noise.

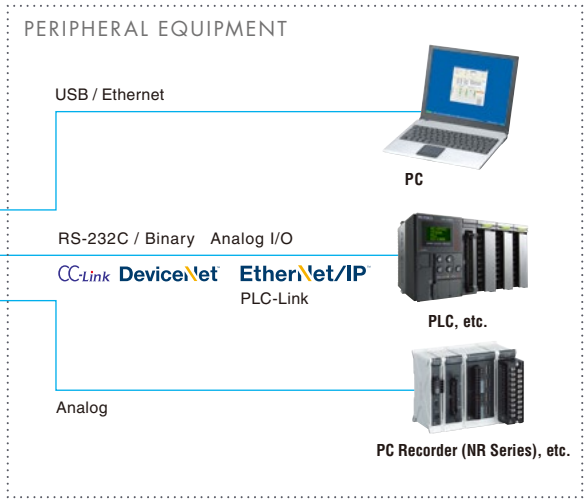


Multi I/O

Eight different types of I/O are included as standard on every controller including EtherNet/IP™. Furthermore, communication with CC-Link or DeviceNet™ systems is also possible through the use of an expansion unit. This breadth of communication methods makes it possible to always have the right I/O for the job.

USB | EtherNet/IP™ | Ethernet
RS-232C | Binary | Analog
I/O | CC-Link | DeviceNet™





High-flex cables

High-flex cables are standard on the LK-G5000 Series. These cables allow the sensors to be safely attached to robots etc.



Universal sensor head compatibility

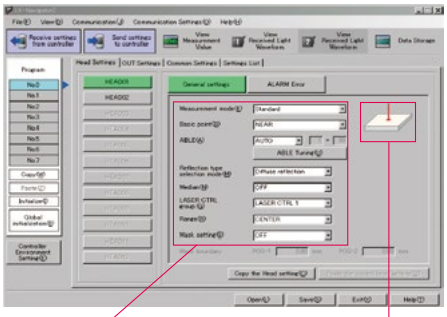
Because individual head adjustment data is stored within the head itself, all LK-G5000 Series heads are cross-compatible. This makes it possible to use any LK-G5000 Series sensor head with any LK-G5000 Series controller.



Easy configuration/analysis with a PC

Easy Configuration

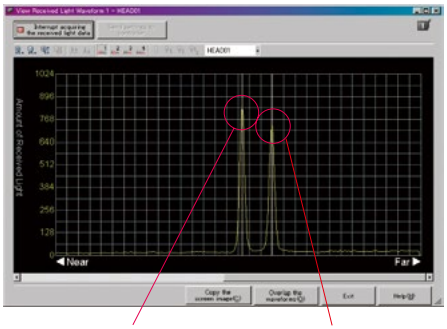
Configuration menu



The easy to use menus make configuring the system simple.

Simplified Troubleshooting

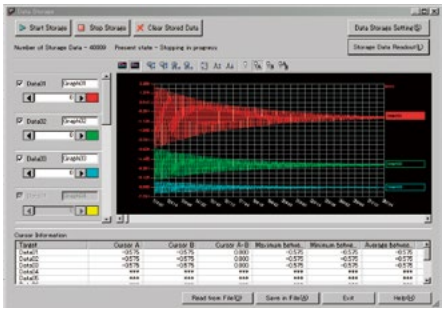
The intensity distribution pattern for transparent glass



Mounting errors and stray laser reflections are easy to identify and correct using a simple waveform graph.

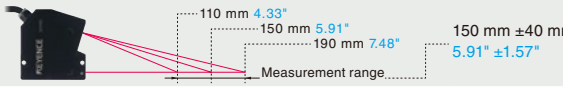
High-Capacity Data Storage

The displacement data of a vibrating target

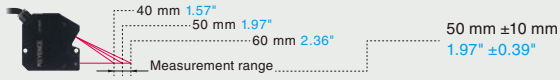
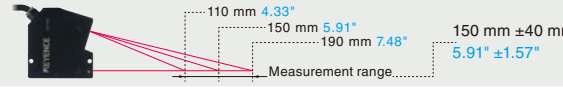


The LK-G5000 can store 1.2 million data points internally. In addition these can be exported and easily analyzed without lengthy data processing.

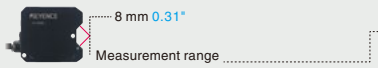
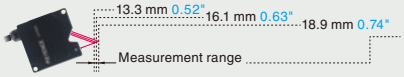
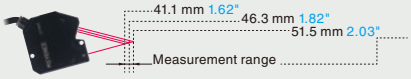
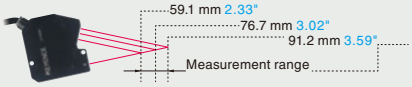
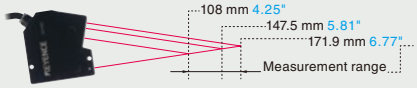
Coarse target measurement (wide spot type)

Laser Class II	Laser Class IIIa	Reference distance & Measurement range	Repeatability	Beam spot dimensions
LK-H027	LK-H025	 20 mm ±3 mm 0.79" ±0.12"	0.02 µm	25 µm × 1400 µm 0.000984" × 0.055118"
LK-H057	LK-H055	 50 mm ±10 mm 1.97" ±0.39"	0.025 µm	50 µm × 2000 µm 0.001969" × 0.078740"
LK-H087	LK-H085	 80 mm ±18 mm 3.15" ±0.71"	0.1 µm 0.000004"	70 µm × 2500 µm 0.002756" × 0.098425"
LK-H157	LK-H155	 150 mm ±40 mm 5.91" ±1.57"	0.25 µm 0.000010"	120 µm × 4200 µm 0.004724" × 0.165354"

Fine target measurement (focused spot type)

Laser Class II	Laser Class IIIa	Reference distance & Measurement range	Repeatability	Beam spot dimensions
LK-H022	LK-H020	 20 mm ±3 mm 0.79" ±0.12"	0.02 µm	ø25 µm ø0.000984"
LK-H052	LK-H050	 50 mm ±10 mm 1.97" ±0.39"	0.025 µm	ø50 µm ø0.001969"
LK-H082	LK-H080	 80 mm ±18 mm 3.15" ±0.71"	0.1 µm 0.000004"	ø70 µm ø0.002756"
LK-H152	LK-H150	 150 mm ±40 mm 5.91" ±1.57"	0.25 µm 0.000010"	ø120 µm ø0.004724"

Transparent/mirror target measurement (specular reflection type)

Spot type	Laser Class II	Laser Class IIIa	Reference distance & Measurement range	Repeatability	Beam spot dimensions
Wide	LK-H008W	—	 8 mm ±0.5 mm 0.32" ±0.02"	0.005 µm	20 µm × 550 µm 0.000787" × 0.021654"
Spot	LK-H008	—			ø20 µm ø0.000787"
Wide	LK-H027K	—	 16.1 mm ±2.8 mm 0.63" ±0.11"	0.02 µm	25 µm × 1400 µm 0.000984" × 0.055118"
Spot	LK-H022K	—			ø25 µm ø0.000984"
Wide	LK-H057K	—	 46.3 mm ±5.2 mm 1.82" ±0.20"	0.025 µm	50 µm × 2000 µm 0.001969" × 0.078740"
Spot	LK-H052K	—			ø50 µm ø0.001969"
Wide	LK-H087 +LK-F3	LK-H085 +LK-F3	 76.7 mm 3.02" +14.5 mm +0.57" -17.6 mm -0.69"	0.1 µm 0.000004"	70 µm × 2500 µm 0.002756" × 0.098425"
Spot	LK-H082 +LK-F3	LK-H080 +LK-F3			ø70 µm ø0.002756"
Wide	LK-H157 +LK-F2	LK-H155 +LK-F2	 147.5 mm 5.81" +24.4 mm +0.96" -39.5 mm -1.56"	0.25 µm 0.000010"	120 µm × 4200 µm 0.004724" × 0.165354"
Spot	LK-H152 +LK-F2	LK-H150 +LK-F2			ø120 µm ø0.004724"

Coarse target measurement (wide spot type)

Model			LK-H008W	LK-H025	LK-H027	LK-H055	LK-H057	LK-H085	LK-H087	LK-H155	LK-H157
Mounting mode			Specular reflection	Diffuse reflection	Diffuse reflection	Diffuse reflection	Diffuse reflection	Diffuse reflection	Diffuse reflection	Diffuse reflection	Diffuse reflection
Reference distance			8 mm 0.32"	20 mm 0.79"	20 mm 0.79"	50 mm 1.97"	50 mm 1.97"	80 mm 3.15"	80 mm 3.15"	150 mm 5.91"	150 mm 5.91"
Measurement range*1			±0.5 mm ±0.02"	±3 mm ±0.12"	±3 mm ±0.12"	±10 mm ±0.39"	±10 mm ±0.39"	±18 mm ±0.71"	±18 mm ±0.71"	±40 mm ±1.57"	±40 mm ±1.57"
Light source			Red semiconductor laser								
Light source	Wavelength		655 nm	650 nm	650 nm	650 nm	650 nm	655 nm	650 nm	655 nm	650 nm
Light source	Laser class	IEC 60825-1	Class 1	Class 3R	Class 2	Class 3R	Class 2	Class 3R	Class 2	Class 3R	Class 2
Light source	Laser class	FDA(CDRH)21CFR Part 1040.10	Class II	Class IIIa	Class II	Class IIIa	Class II	Class IIIa	Class II	Class IIIa	Class II
Light source	Output		0.3mW	4.8mW	0.95mW	4.8mW	0.95mW	4.8mW	0.95mW	4.8mW	0.95mW
Spot diameter (at reference distance)			20 µm × 550 µm 0.000787" × 0.021654"	25 µm × 1400 µm 0.000984" × 0.055118"		50 µm × 2000 µm 0.001969" × 0.078740"		70 µm × 2500 µm 0.002756" × 0.098425"		120 µm × 4200 µm 0.004724" × 0.165354"	
Linearity*2			±0.05% of F.S. (F.S.=1 mm 0.04")	±0.02%of F.S. (F.S.= 6 mm 0.24")		±0.02% of F.S. (F.S.= 20 mm 0.79")		±0.02% of F.S. (F.S.= 36 mm 1.42")		±0.02% of F.S. (F.S.= 80 mm 3.15")	
Repeatability*3			0.005 µm (0.001 µm)	0.02 µm (0.01 µm)		0.025 µm		0.1 µm 0.000004"		0.25 µm 0.000010"	
Sampling cycle			2.55/5/10/20/50/100/200/500/1000 µs (9 steps selectable)								
Temperature fluctuation			0.02% of F.S./°C (F.S.=1 mm 0.04")	0.01% of F.S./°C (F.S.= 6 mm 0.24")		0.01% of F.S./°C (F.S.= 20 mm 0.79")		0.01% of F.S./°C (F.S.= 36 mm 1.42")		0.01% of F.S./°C (F.S.= 80 mm 3.15")	
Environment resistance	Enclosure rating		IP67								
Environment resistance	Ambient light		Incandescent lamp or fluorescent lamp: 10000 lux max.								Incandescent lamp or fluorescent lamp : 5000 lux max.
Environment resistance	Ambient temperature		0 to +50°C 32 to 122°F *4	0 to +50°C 32 to 122°F				0 to +50°C 32 to 122°F *4			
Environment resistance	Relative humidity		35 to 85%RH (No condensation)								
Environment resistance	Vibration resistance		10 to 55 Hz, 1.5 mm 0.06" double amplitude in X, Y, and Z directions, 2 hours respectively								
Material			Aluminum die-cast								
Weight			Approx. 240 g	Approx. 230 g		Approx. 260 g		Approx. 280 g		Approx. 300 g	

*1 Measurement range when the sampling cycle is 20 µs or more. *2 This value is obtained when the KEYENCE standard target (White diffuse workpiece or workpiece with a metal mirror surface only for the LK-H008W) is measured in the normal measurement mode.
*3 This value is obtained when the KEYENCE standard target (White diffuse workpiece or workpiece with a metal mirror surface only for the LK-H008W) is measured at the reference distance with the number of averaging measurements set to 16384.
The value in parentheses is a typical example of a measurement with the number of averaging measurements set to 65536 and the sampling cycle to 200 µs. *4 When the ambient temperature rises to 40°C 104°F or more, mount this on a metal plate before use.

Fine target measurement (focused spot type)

Model			LK-H008	LK-H020	LK-H022	LK-H050	LK-H052	LK-H080	LK-H082	LK-H150	LK-H152
Mounting mode			Specular reflection	Diffuse reflection	Diffuse reflection	Diffuse reflection	Diffuse reflection	Diffuse reflection	Diffuse reflection	Diffuse reflection	Diffuse reflection
Reference distance			8 mm 0.32"	20 mm 0.79"	20 mm 0.79"	50 mm 1.97"	50 mm 1.97"	80 mm 3.15"	80 mm 3.15"	150 mm 5.91"	150 mm 5.91"
Measurement range*1			±0.5 mm ±0.02"	±3 mm ±0.12"	±3 mm ±0.12"	±10 mm ±0.39"	±10 mm ±0.39"	±18 mm ±0.71"	±18 mm ±0.71"	±40 mm ±1.57"	±40 mm ±1.57"
Light source			Red semiconductor laser								
Light source	Wavelength		655 nm	650 nm	650 nm	650 nm	650 nm	655 nm	650 nm	655 nm	650 nm
Light source	Laser class	IEC 60825-1	Class 1	Class 3R	Class 2	Class 3R	Class 2	Class 3R	Class 2	Class 3R	Class 2
Light source	Laser class	FDA(CDRH)21CFR Part 1040.10	Class II	Class IIIa	Class II	Class IIIa	Class II	Class IIIa	Class II	Class IIIa	Class II
Light source	Output		0.3mW	4.8mW	0.95mW	4.8mW	0.95mW	4.8mW	0.95mW	4.8mW	0.95mW
Spot diameter (at reference distance)			ø20 µm ø0.000787"	ø25 µm ø0.000984"		ø50 µm ø0.001969"		ø70 µm ø0.002756"		ø120 µm ø0.004724"	
Linearity*2			±0.05% of F.S. (F.S.=1 mm 0.04")	±0.02% of F.S. (F.S.= 6 mm 0.24")		±0.02% of F.S. (F.S.= 20 mm 0.79")		±0.02% of F.S. (F.S.= 36 mm 1.42")		±0.02% of F.S. (F.S.= 80 mm 3.15")	
Repeatability*3			0.005 µm (0.001 µm)	0.02 µm (0.01 µm)		0.025 µm		0.1 µm 0.000004"		0.25 µm 0.000010"	
Sampling cycle			2.55/5/10/20/50/100/200/500/1000 µs (9 steps selectable)								
Temperature fluctuation			0.02% of F.S./°C (F.S.=1 mm 0.04")	0.01% of F.S./°C (F.S.= 6 mm 0.24")		0.01% of F.S./°C (F.S.= 20 mm 0.79")		0.01% of F.S./°C (F.S.= 36 mm 1.42")		0.01% of F.S./°C (F.S.= 80 mm 3.15")	
Environment resistance	Enclosure rating		IP67								
Environment resistance	Ambient light		Incandescent lamp or fluorescent lamp: 10000 lux max.								Incandescent lamp or fluorescent lamp : 5000 lux max.
Environment resistance	Ambient temperature		0 to +50°C 32 to 122°F *4	0 to +50°C 32 to 122°F				0 to +50°C 32 to 122°F *4			
Environment resistance	Relative humidity		35 to 85%RH (No condensation)								
Environment resistance	Vibration resistance		10 to 55 Hz, 1.5 mm 0.06" double amplitude in X, Y, and Z directions, 2 hours respectively								
Material			Aluminum die-cast								
Weight			Approx. 240 g	Approx. 230 g		Approx. 260 g		Approx. 280 g		Approx. 300 g	

*1 Measurement range when the sampling cycle is 20 µs or more. *2 This value is obtained when the KEYENCE standard target (White diffuse workpiece or workpiece with a metal mirror surface only for the LK-H008) is measured in the normal measurement mode.
*3 This value is obtained when the KEYENCE standard target (White diffuse workpiece or workpiece with a metal mirror surface only for the LK-H008) is measured at the reference distance with the number of averaging measurements set to 16384.
The value in parentheses is a typical example of a measurement with the number of averaging measurements set to 65536 and the sampling cycle to 200 µs. *4 When the ambient temperature rises to 40°C 104°F or more, mount this on a metal plate before use.

Transparent/mirror target measurement (mirror type)

Model			LK-H008	LK-H008W	LK-H022K	LK-H027K	LK-H052K	LK-H057K	LK-H082	LK-H087	LK-H152	LK-H157
Mounting mode			Specular reflection	Specular reflection	Specular reflection	Specular reflection	Specular reflection	Specular reflection	Specular reflection*4		Specular reflection*4	
Reference distance			8 mm 0.32"	8 mm 0.32"	16.1 mm 0.63"	16.1 mm 0.63"	46.3 mm 1.82"	46.3 mm 1.82"	76.7 mm 3.02"		147.5 mm 5.81"	
Measurement range*1			±0.5 mm ±0.02"	±0.5 mm ±0.02"	±2.8 mm ±0.11"	±2.8 mm ±0.11"	±5.2 mm ±0.20"	±5.2 mm ±0.20"	−17.6 mm to +14.5 mm -0.69" to +0.57"		−39.5 mm to +24.4 mm -1.56" to +0.96"	
Light source			Red semiconductor laser									
Light source	Wavelength		655 nm		650 nm							
Light source	Laser class	IEC 60825-1	Class 1		Class 2							
Light source	Laser class	FDA(CDRH)21CFR Part 1040.10	Class II									
Light source	Output		0.3mW		0.95mW							
Spot diameter (at reference distance)			ø20 µm ø0.000787"	20 µm × 550 µm 0.000787" × 0.021654"	ø25 µm ø0.000984"	25 µm × 1400 µm 0.000984" × 0.055118"	ø50 µm ø0.001969"	50 µm × 2000 µm 0.001969" × 0.078740"	ø70 µm ø0.002756"	70 µm × 2500 µm 0.002756" × 0.098425"	ø120 µm ø0.004724"	120 µm × 4200 µm 0.004724" × 0.165354"
Linearity*2			±0.05% of F.S.(F.S.= 1 mm 0.04")		±0.02% of F.S.(F.S.= 6 mm 0.24")		±0.02% of F.S.(F.S.= 20 mm 0.79")		±0.02% of F.S. (F.S.= 36 mm 1.42")		±0.02% of F.S. (F.S.= 80 mm 3.15")	
Repeatability*3			0.005 µm (0.001 µm)		0.02 µm (0.01 µm)		0.025 µm		0.1 µm 0.000004"		0.25 µm 0.000010"	
Sampling cycle			2.55/5/10/20/50/100/200/500/1000 µs (9 steps selectable)									
Temperature fluctuation			0.02% of F.S./°C (F.S.=1 mm 0.04")		0.01% of F.S./°C (F.S.= 6 mm 0.24")		0.01% of F.S./°C (F.S.= 20 mm 0.79")		0.01% of F.S./°C (F.S.= 36 mm 1.42")*6		0.01% of F.S./°C (F.S.= 80 mm 3.15")*6	
Environment resistance	Enclosure rating		IP67									
Environment resistance	Ambient light		Incandescent lamp or fluorescent lamp: 10000 lux max.								Incandescent lamp or fluorescent lamp : 5000 lux max.	
Environment resistance	Ambient temperature		0 to +50°C 32 to 122°F *5		0 to +50°C 32 to 122°F				0 to +50°C 32 to 122°F *5			
Environment resistance	Relative humidity		35 to 85% RH (No condensation)									
Environment resistance	Vibration resistance		10 to 55 Hz, 1.5 mm 0.06" double amplitude in X, Y, and Z directions, 2 hours respectively									
Material			Aluminum die-cast									
Weight			Approx. 240 g		Approx. 230 g		Approx. 260 g		Approx. 280 g		Approx. 300 g	

*1 Measurement range when the sampling cycle is 20 µs or more. *2 This value is obtained when the KEYENCE standard target (White diffuse workpiece or workpiece with a metal mirror surface only for the LK-H008/LK-H008W) is measured in the normal measurement mode.
*3 This value is obtained when the KEYENCE standard target (White diffuse workpiece or workpiece with a metal mirror surface only for the LK-H008/LK-H008W) is measured at the reference distance with the number of averaging measurements set to 16384. The value in parentheses is a typical example of a measurement with the number of averaging measurements set to 65536 and the sampling cycle to 200 µs.
*4 Use one of the following dark filters when measuring a transparent or mirror surface object: LK-H082/LK-H087: LK-F3, LK-H152/LK-H157: LK-F2 *5 When the ambient temperature rises to 40°C 104°F or more, mount this on a metal plate before use.
*6 Value measured at an event of diffuse reflection installation. Please contact us for the case of specular reflection installation.

Main unit/head expansion unit

Model	Single unit type	LK-G5001V	LK-G5001PV	LK-HA100
	Separate type	LK-G5001/LK-HD500	LK-G5001P/LK-HD500	
Designation		Main controller		Head expansion unit
Sensor head compatibility		Compatible		
No. of connectable sensor heads		2		1
Display (LK-HD500)	Minimum display unit	0.001 µm		N/A
	Display range	±999.999 µm to ±9999.99 mm (7 settings selectable)		
	Display cycle	Approx. 10 times/sec.		
Display interface	Display port	Either the display unit (LK-HD500) or dedicated touch panel (LK-HD1001) can be connected		N/A
	LED indicator	LASER ON		POWER ON, STABILITY, BRIGHT, DARK
Terminal block	Analog voltage output	±10 V output, Output impedance: 100 Ω		
	Analog current output	4 to 20 mA, Maximum load resistance: 350 Ω		
	No. of analog outputs	2		1
	TIMING1 input*1	Non-voltage input	Voltage input	N/A
	RESET1 input*1	Non-voltage input	Voltage input	
	Auto-zero1 input*1			
	Laser control input*2			
	Laser remote input	Non-voltage input		
	Alarm output	NPN open-collector output	PNP open-collector output	
	General comparator output			
Expansion connector	TIMING input	Non-voltage input	Voltage input	N/A
	RESET input	Non-voltage input	Voltage input	
	Auto-zero input			
	Program switch input			
	Binary selection input			
	Alarm output	NPN open-collector output	PNP open-collector output	
	Comparator output			
	Binary output			
RS-232C interface		Baud rate: 9600 to 115200 bps Data length: 8 bits Stop bit length: 1 bit Parity: None/even/odd		N/A
USB interface		USB 2.0 Hi-Speed compliant*3		
Ethernet interface*4		100Base-TX/10Base-T		
EtherNet/IP™ interface*5		Cyclic communication (implicit messaging) Message communication (explicit messaging): UCMM and Class3 Number of connections: 32 Complies with conformance test version CT14		N/A
PLC-Link		The following PLCs are supported: Mitsubishi Electric: MELSEC iQ-R Series, iQ-F Series, Q Series, L Series, FX Series EtherNet/IP™, CC-Link, and DeviceNet™ cannot be used in conjunction with PLC-Link		
Head expansion unit connector		Up to 10 head expansion units can be connected to one main controller		
Expansion unit connector		Either of the CC-Link unit (LK-CC100) or DeviceNet™ unit (LK-DN100) can be connected		N/A
Power supply	Power supply voltage	24 VDC ±10%		24 VDC ±10% (Supplied from the controller)
	Maximum current consumption	0.6 A or less with 1 head/3.5 A or less with 12 heads		
Environment resistance	Ambient temperature	When one or less head expansion unit is connected: 0 to 50°C 32 to 122°F When two or more head expansion units are connected: 0 to 40°C 32 to 104°F		
	Relative humidity	35 to 85%RH (No condensation)		
Weight		Approx. 600 g		Approx. 300 g

*1 This input is applied to all of the synchronized OUT.
*2 When the laser class 3B sensor head is connected, a key-operated switch must be used for the input to this terminal. The laser is emitted only when the key-operated switch is set to the ON position. (Select a key which can be removed only when it is set to the OFF position.) When the laser class 2/3R sensor head is connected, the laser turns on when this terminal is opened and turns off when it is short-circuited.
*3 When a PC supporting USB 1.1 or USB 2.0 full speed is connected, the data refresh cycle and other operations may slow down.
*4 Use the Ethernet interface only for direct connections with a PC or for local network connections with a PC or LK-G5000 Series units.
• NPN open-collector output rating: 50 mA max. (40 V max.), Residual voltage: 0.5 V max.
• PNP open-collector output rating: 50 mA max. (30 V max.), Residual voltage: 0.5 V max.
• Non-voltage input rating: ON voltage: 1 V max., OFF current: 0.6 mA max.
• Voltage input rating: Maximum input rating: 26.4 V, ON voltage: 10.2 V, OFF current: 0.6 mA
• Part of the input/output circuit of the LK-G5000 Series is internally common. Be careful that no potential difference is generated between the internally common terminals due to the potential difference between the cables/external devices. For details, refer to "Precautions on wiring" in the User's Manual.
*5 The EtherNet/IP™ interface cannot be used when a CC-Link unit or a DeviceNet™ unit is installed.
EtherNet/IP™ is supported by the latest controllers. For details on which controllers support EtherNet/IP™, contact your nearest KEYENCE office.

LK-H2(LK-Navigator2) Operating environment

CPU	Pentium III 1 GHz or higher (1.7 GHz or higher recommended)
Supported OS	Windows 10*1 Windows 7 (SP1 or later)*2 Windows Vista (SP2 or later)*3 Windows XP (SP3 or later)*4
Memory capacity	256 MB or more (1 GB or more recommended)
Display resolution	1024 × 768 pixels, 24-bit full color or better
Available hard disk space	1 GB or more
Interface	The PC must be equipped with one of these interfaces: • USB: 2.0 Hi-Speed (USB 1.1 compatible full speed)*5 • LAN: 100BASE-TX, 10BASE-T*6

* Use under an environment that exceeds the recommended environment of the your OS.
*1 Home, Pro, and Enterprise editions are supported.
*2 Home Premium, Professional, and Ultimate editions are supported.
*3 Ultimate, Business, Home Premium, and Home Basic editions are supported.
*4 Professional and Home editions are supported.
*5 Connection through a USB hub is not included in the guarantee.
*6 Connection to LAN and connection via a router is not included in the guarantee.

PRODUCT LINEUP & OPTIONS

Main controller

Built-in type
LK-G5001(P)V



Separate display type
LK-G5001(P)



Additional head unit
LK-HA100



CC-Link unit
LK-CC100



DeviceNet™ unit
LK-DN100



Display

Touch panel display
LK-HD1001



Compact display
LK-HD500



Configuration Software



LK-Navigator2
LK-H2

Cable

Sensor head-to-controller cable
(0.7, 2, 5, 10, 20, 30 m)
(2.30', 6.56', 16.4', 32.81', 65.62', 98.43')
CB-Axx

Extension cable between the head and cable
(5, 10 m)
(16.4', 32.81')
CB-AxxE

Controller-to-display connection cable
0.33 m 1.08' : **OP-84427**
3 m 9.84': **OP-51655**
10 m 32.81': **OP-51656**

I/O Cable and Connector
OP-51657

Ethernet cable
OP-66843

Neutral density filter

Neutral density filter for the **LK-H08x**
LK-F3

Neutral density filter for the **LK-H15x**
LK-F2

SPECIFICATIONS

LK-G5000 Series Touch Panel Display

Model		LK-HD1001
Name		LK-G5000 Series Touch Panel Display
Display panel	Display elements	TFT color LCD
	Display color	32,768 colors
	Pixels (W × H pixels)	640 × 480
	Display area (W × H mm)	170.9 × 128.2 6.73" × 5.05"
	Service life (normal temperature and humidity)	Approx. 50,000 hours
Backlight lamp	Type	White LED
	Service life	Approx. 50,000 hours
Touch switch	Number of switches	40 × 30 per 1 image
	Mode	Matrix resistance membrane mode
	Operating force	0.98N or less
	Service life	More than one million times
Communication function		Available only with the LK-G5000 Series
Structure		Panel built-in type, IP65f equivalent dust-proof, waterjet-proof on only front panel
Operating environment		Limit dust and corrosive gas
Ambient temperature		0 to 50°C 32 to 122°F
Ambient humidity		35 to 85%RH (no condensation) When the ambient temperature is higher than 40°C 104°F, limit the absolute humidity to 85%RH at 40°C 104°F.
Storage temperature		-10 to +60°C 14 to 140°F (no icing)
Storage humidity		35 to 85%RH (no condensation) When the ambient temperature is higher than 40°C 104°F, limit the absolute humidity to 85%RH at 40°C 104°F.
Vibration resistance		10 to 57 Hz, 0.3 mm 0.01" double amplitude/57 to 500 Hz, 2G, 3 hours in each direction (X, Y, and Z)
Weight		Approx. 1150 g
Rated voltage		24 VDC ±10%
Current consumption		1A or less

Sensor head-to-controller cable

Model	CB-A07	CB-A2	CB-A5	CB-A10	CB-A20	CB-A30
Cable length	0.7 m 2.30'	2 m 6.56'	5 m 16.40'	10 m 32.81'	20 m 65.62'	30 m 98.43'
Weight	Approx. 100 g	Approx. 200 g	Approx. 400 g	Approx. 750 g	Approx. 1400 g	Approx. 2000 g

Extension cable between the head and cable

Model	CB-A5E	CB-A10E
Cable length	5 m 16.40'	10 m 32.81'
Weight	Approx. 400 g	Approx. 750 g

SPECIFICATIONS

LK-CC100 (CC-Link unit)

Model		LK-CC100
Designation		CC-Link communication unit dedicated to LK-G5000 Series
Network connection	Supported CCLink*1 version	Ver. 1.10 (Extended cyclic setting: Single) Ver. 2.00 (Extended cyclic setting: Double or more)*2
	Master unit	CLPA-certified master unit (CC-Link Ver. 2.00/Ver. 1.10)
	No. of occupied stations	1 to 4
	Communication speed	156 kbps, 625 kbps, 2.5 Mbps, 5 Mbps, 10 Mbps
	Connection cable	Dedicated CC-Link cable supporting Ver. 1.10 (Shielded 3-core twisted-pair cable: OP-79426, OP-79427)
	Maximum total cable extension length	156 kbps: 1200 m 3937', 625 kbps: 900 m 2952.7', 2.5 Mbps: 400 m 1312.3', 5 Mbps: 160 m 524.93', 10 Mbps: 100 m 328.08'
	Station type	Remote device station
Environment resistance	Ambient temperature	When one or less head expansion unit is connected: 0 to 50°C 32 to 122°F. When two or more head expansion units are connected: 0 to 40°C 32 to 104°F.
	Relative humidity	35 to 85%RH (No condensation)
Rated voltage		24 VDC ±10% (supplied from controller)
Current consumption		200 mA max.
Weight		Approx. 300 g

*1 CC-Link is a registered trademark of Mitsubishi Electric Corporation.
*2 The LK-G5000 Series supports the "extended cyclic transmission" and "station-to-station cable length relaxation" of CC-Link Ver. 2.00.

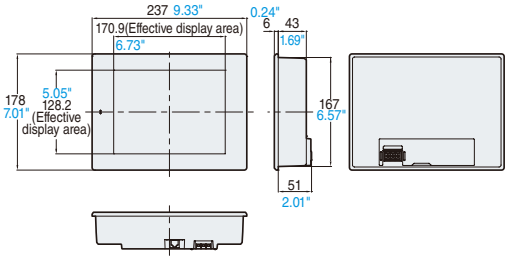
LK-DN100 (DeviceNet™ unit)

Model		LK-DN100
Designation		DeviceNet™ communication unit dedicated to LK-G5000 Series
Network connection	Communication protocol	DeviceNet™*1 compliant
	Master unit	ODVA-certified master unit
	Transmission speed	500 kbps, 250 kbps, 125 kbps
	Device type	Generic
	Transmission medium	Dedicated 5 cables (2 signal cables, 2 power supply cables, 1 shielding cable)
	Maximum trunk line cable length	Thick cable: 500 m 1640.4' (at transmission speed of 125 kbps)/250 m 820.21' (at 250 kbps)/ 125 m 410.11' (at 500 kbps) Thin cable: 100 m 328.08' (at all transmission speed settings)
	Communication type	I/O communication (Poll) Explicit message communication
	Power supply	11 VDC to 25 VDC
	Current consumption	10 mA max. (when network power supply 24 V is applied)
Environment resistance	Ambient temperature	When one or less head expansion unit is connected: 0 to 50°C 32 to 122°F. When two or more head expansion units are connected: 0 to 40°C 32 to 104°F.
	Relative humidity	35 to 85%RH (No condensation)
Rated voltage		24 VDC ±10% (supplied from controller)
Current consumption		200 mA max.
Weight		Approx. 300 g

*1 DeviceNet™ is a registered trademark of ODVA (Open DeviceNet Vendor Association).

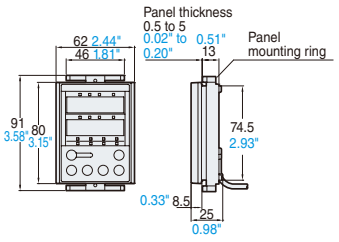
DIMENSIONS

LK-HD1001 Touch Panel Display

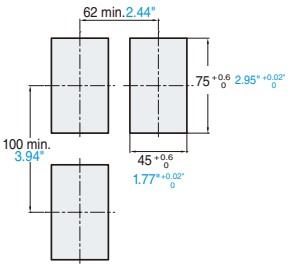


LK-HD500

Unit: mm inch



PANEL CUTOUT DIMENSIONS



WARNING

The LK-G Series conforms to the following FDA and IEC standards:

Model	LK-H008/ LK-H008W	LK-H022/H022K/H027/H027K/H052/H052K/ H057/H057K/H082/H087/H152/H157	LK-H020/H025/H050/H055/ LK-H080/H085/H150/H155
FDA (CDRH) 21CFR Part 1040.10	Laser Class II	Laser Class II	Laser Class IIIa
IEC60825-1	Laser Class 1	Laser Class 2	Laser Class 3R

FDA



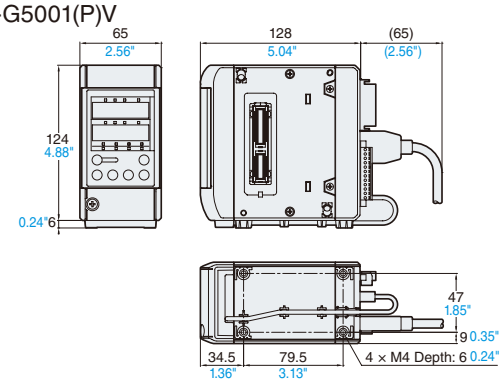
IEC



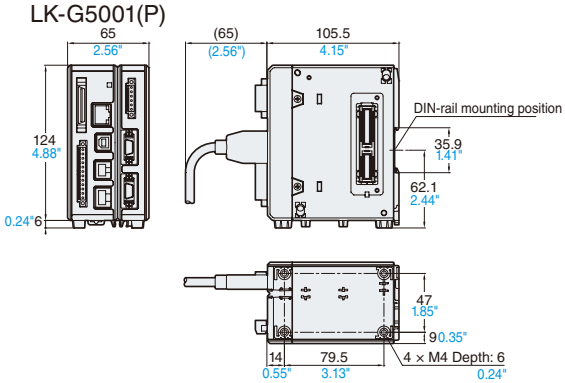
Controller

Unit: mm inch

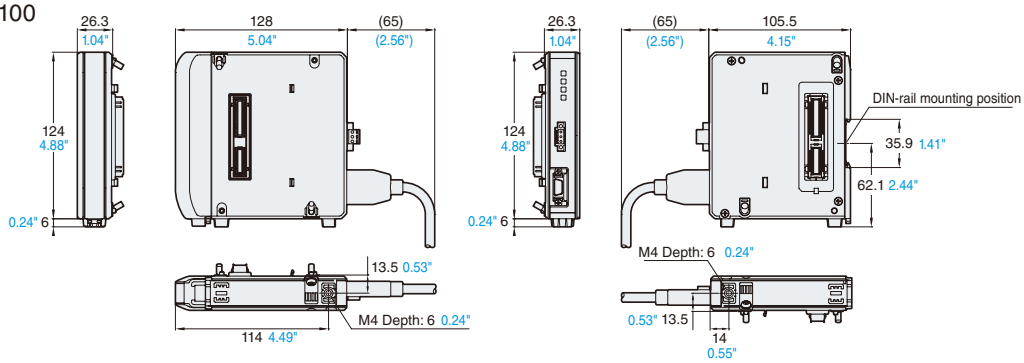
LK-G5001(P)V



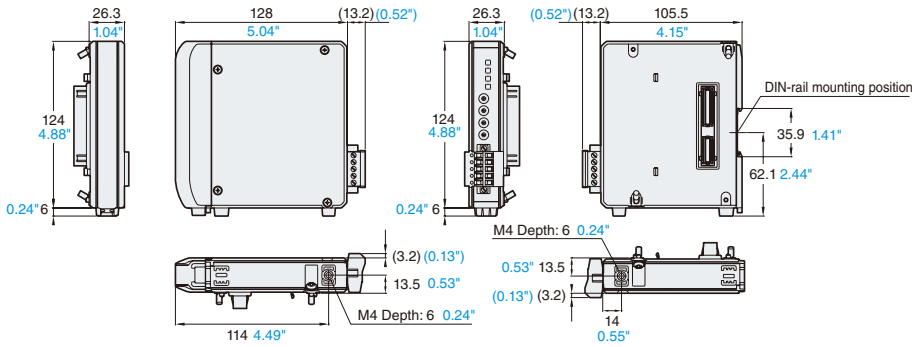
LK-G5001(P)



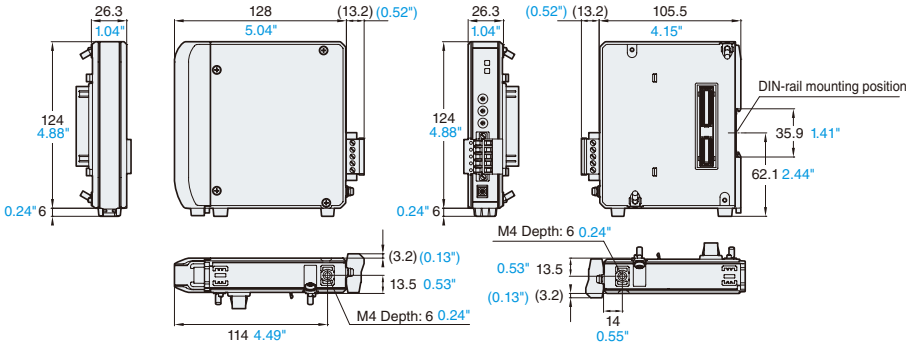
LK-HA100



LK-CC100



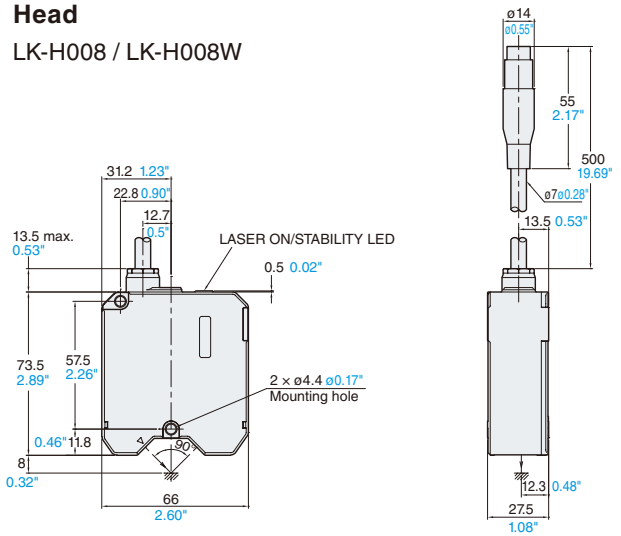
LK-DN100



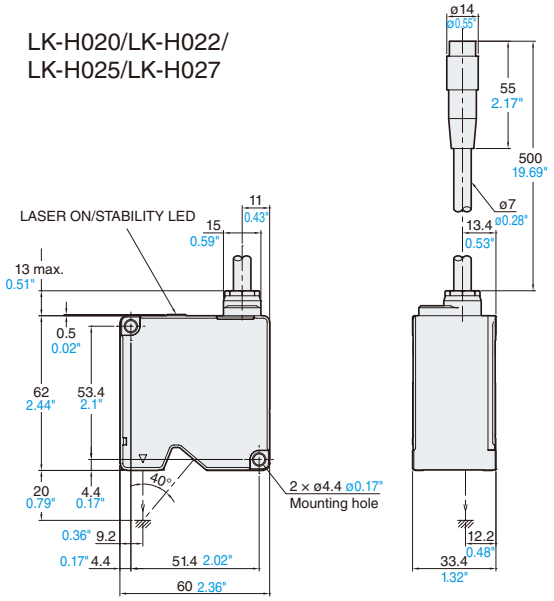
Unit: mm inch

Head

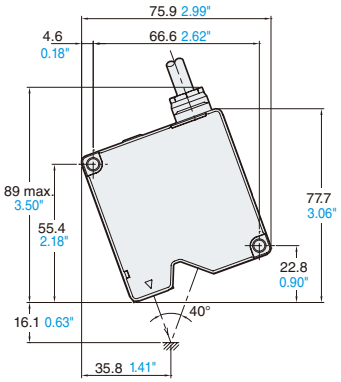
LK-H008 / LK-H008W



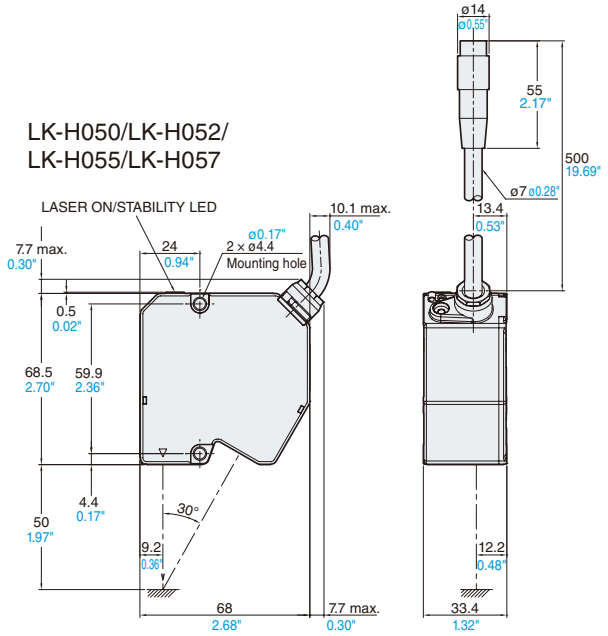
LK-H020/LK-H022/ LK-H025/LK-H027



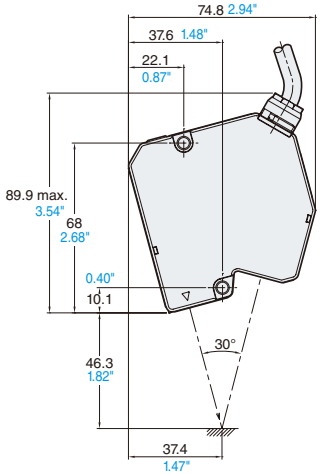
LK-H022K/LK-H027K



LK-H050/LK-H052/ LK-H055/LK-H057

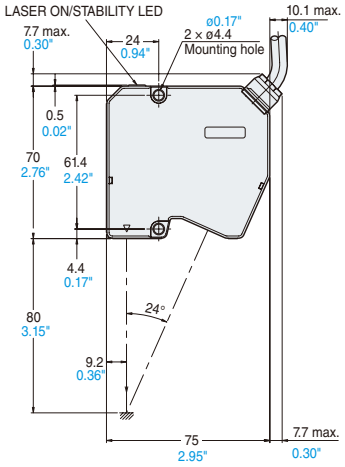


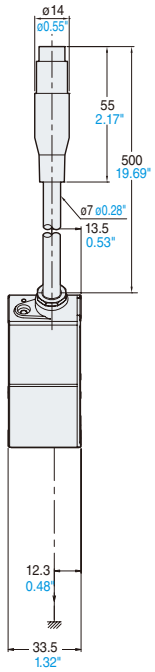
LK-H052K/LK-H057K

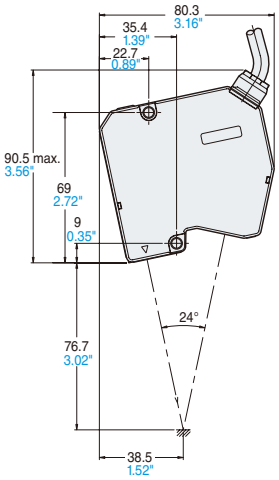


Unit: mm inch

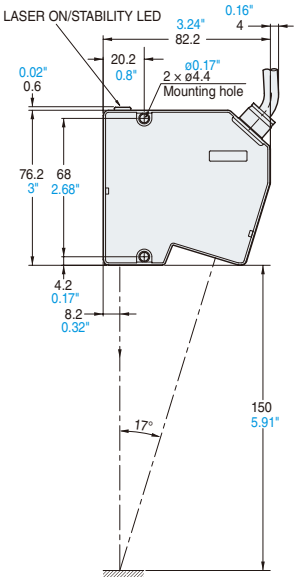
LK-H080 / LK-H082/ LK-H085 / LK-H087

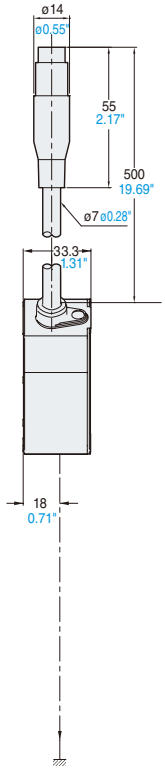


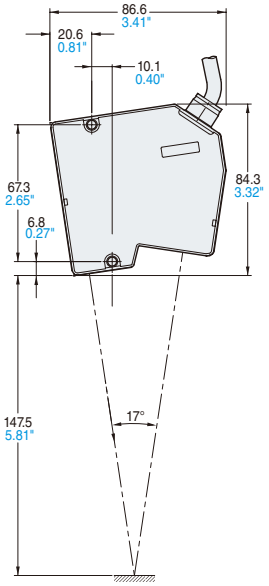




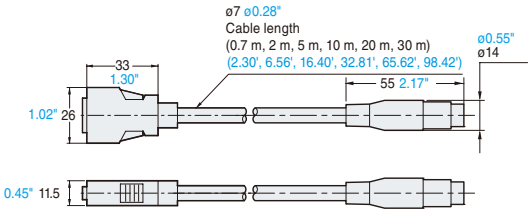
LK-H150 / LK-H152/ LK-H155 / LK-H157



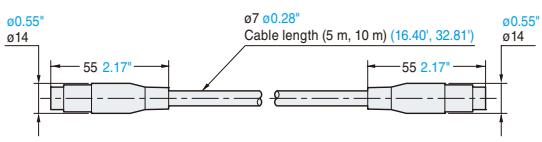




Sensor head to controller cable
CB-A07/CB-A2/CB-A5/CB-A10/ CB-A20/CB-A30



Extension cable
[Cable between the head and cable]
CB-A5E/CB-A10E



LK-G3000 SERIES

HIGH-SPEED, HIGH-ACCURACY CCD LASER DISPLACEMENT SENSOR

LONG RANGE TYPE LINEUP

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WIDE-RANGE MEASUREMENT

UP to 1000 mm 39.37"

HIGH-ACCURACY

±0.02%

WIDE PRODUCT LINEUP

50 kHz

REPEATABILITY

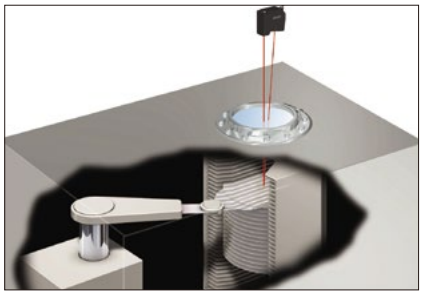
2 µm 0.000079"



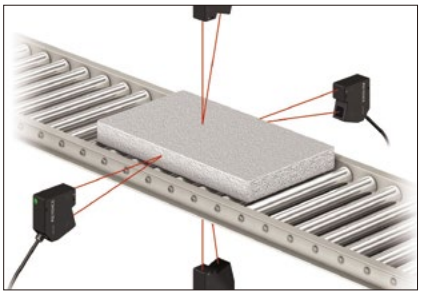
High-speed Long range
LK-G402/407

Ultra long-range
LK-G502/507

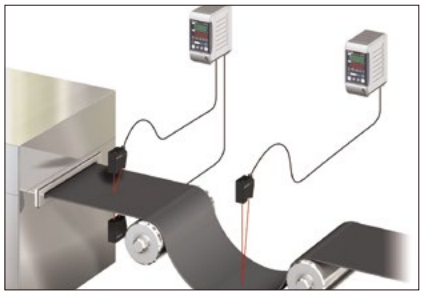
Type	Spot type	Model	Reference distance & Measurement range	Repeatability	Beam spot dimensions
High-speed Long Distance	Spot	LK-G402	400 mm 15.75" 500 mm 19.69" / 300 mm 11.81" / Measuring range 400 ±100 mm 15.75"±3.94"	2 µm 0.000079"	ø290 µm ø0.011417"
	Wide	LK-G407			290 × 8300 µm 0.011417" × 0.326772"
Ultra Long Distance	Spot	LK-G502	500 mm 19.69" 1000 mm 39.37" / 250 mm 9.84" / Measuring range 500-250/+500 mm 19.69"-9.84"/+19.69"	2 µm 0.000079"	ø300 µm ø0.011811"
	Wide	LK-G507			300 × 9500 µm 0.011811" × 0.374016"



Detecting displacement of a water



Measuring the thickness/width of a steel plate



Thickness measurement/loop control of a rubber sheet

KEYENCE

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SAFETY INFORMATION
Please read the instruction manual carefully in order to safely operate any KEYENCE product.

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KA1-1049

LKG5-KA-C3-US 1069-2 611H36

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