KEYENCE

NEW **High-speed 2D/3D Laser Scanner**

LJ-V7000 Series

CE

THE WORLD'S FASTEST AT 64000 PROFILES/SEC.

SPEED THAT MAKES IN PROCESS 3D MEASUREMENT A REALITY!

LJ-V7000 Series

2D/3D LASER SCANNER EVOLVED TO ACHIEVE THE FASTEST SPEED IN THE WORLD

Improving quality, catching defects, and increasing yield. Every day our customers face the increasingly difficult push to raise quality control standards and boost yield despite the growing complexity of parts and manufacturing processes. KEYENCE is proud to present our highest level of quality management designed to perform detailed measurement of any product and any profile in one simple package. The High-speed 2D/3D Laser Scanner LJ-V7000 Series makes these measurements a reality.

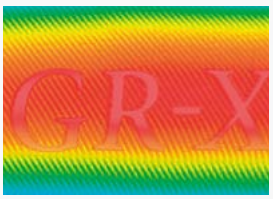
High-speed 2D/3D Laser Scanner
LJ-V7000 Series

WORLD'S FASTEST!

SAMPLING AT 64000 PROFILES/SEC.

The LJ-V Series has realized the fastest sampling speed in the world for 2D laser measuring instruments.* This makes it possible to measure, in high definition, the profiles of products, without missing a single one, that are fed past the measuring instrument at extremely high speeds.
For example, the LJ-V Series can measure targets moving at 6.4 m/s with a 0.1 mm 0.004" pitch. The LJ-V Series doesn't overlook even a single abnormal or defective part.

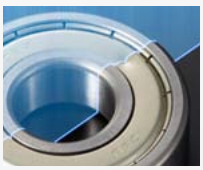
* According to KEYENCE's investigation (as of June 2013)



INDUSTRY'S VARIETY!

OVERWHELMING WORKPIECE RESPONSE CAPABILITIES AND DETECTION STABILITY

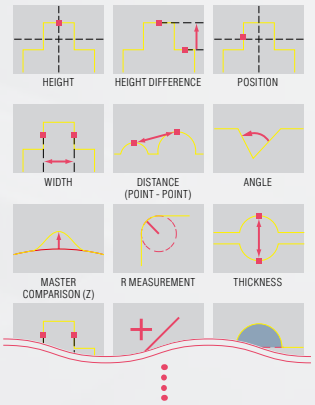
Normally, detection stability is inversely proportional to speed. However, our newly developed HSE³-CMOS wide dynamic range has provided the LJ-V Series with improvements in both speed and detection stability. Profiles are accurately measured even in cases where black surfaces, inclines with low reflectivity and metallic surfaces with high reflectivity are mixed together under the same optical axis.



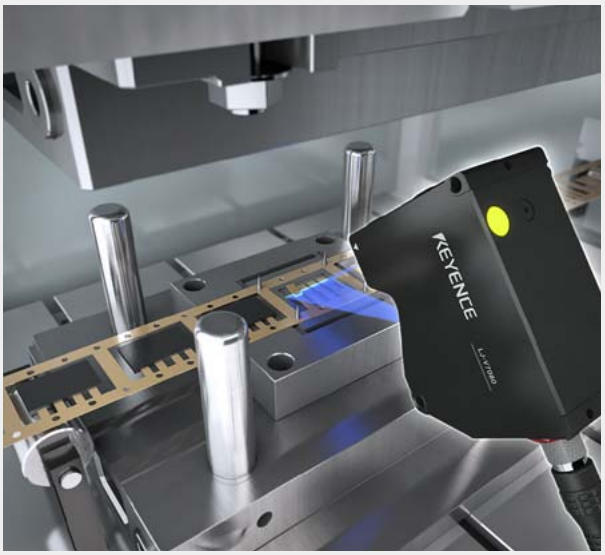
INDUSTRY'S GREATEST VARIETY!

7 TYPES OF SENSOR HEADS AND 74 TYPES OF MEASUREMENT MODES

From small electronic components such as IC pins to automotive components such as bearings and engine blocks to building materials such as lumber and plaster, the LJ-V Series can perform a wide variety of measurements for any product in any industry. What's more, connecting the LJ-V Series to an image processing system makes it possible to process 3D measured data.

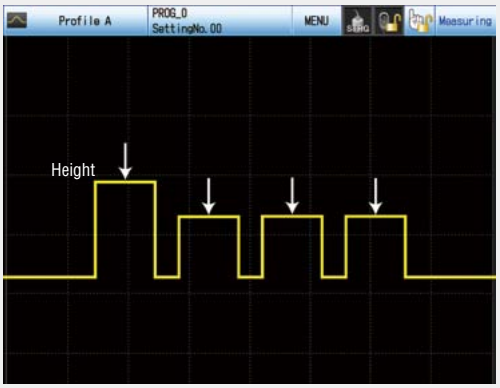


HEIGHT AND STEP HEIGHT

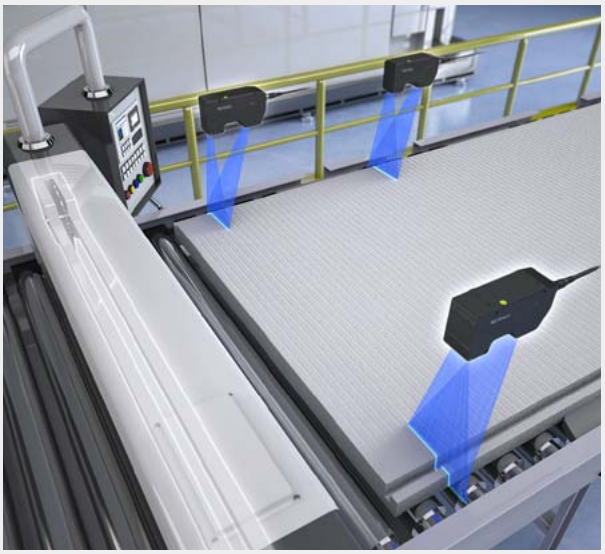


Terminal height measurement

By measuring the height of the terminals used during insert molding, it is possible to detect terminal floating and position offsets. The ultra-high-accuracy type sensor head achieves extremely accurate measurement with repeatability of 0.2 µm 0.01 Mil.



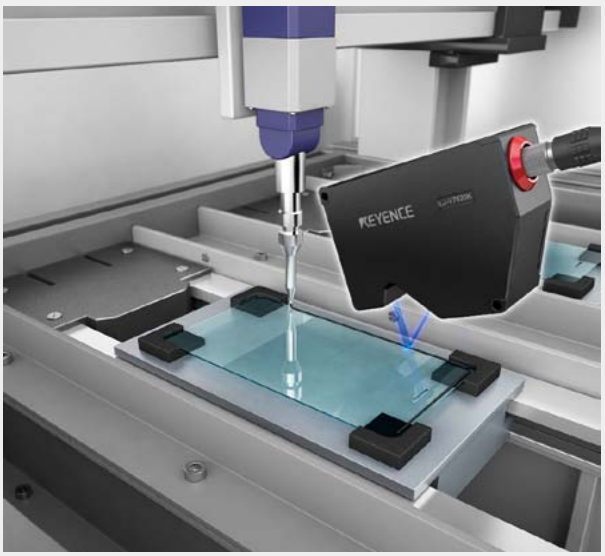
WIDTH AND POSITION



Building material board positioning

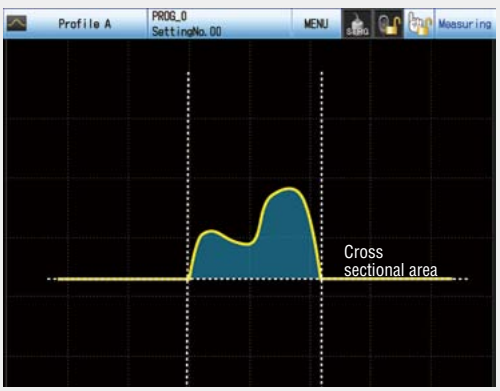
The slope and position of building material is measured when the building material is transported during the cutting process, and the measured results are fed back to the cutting machine. This makes high-speed and accurate control possible when performing work with equipment and robots.

PROFILE AND CROSS SECTIONAL AREA

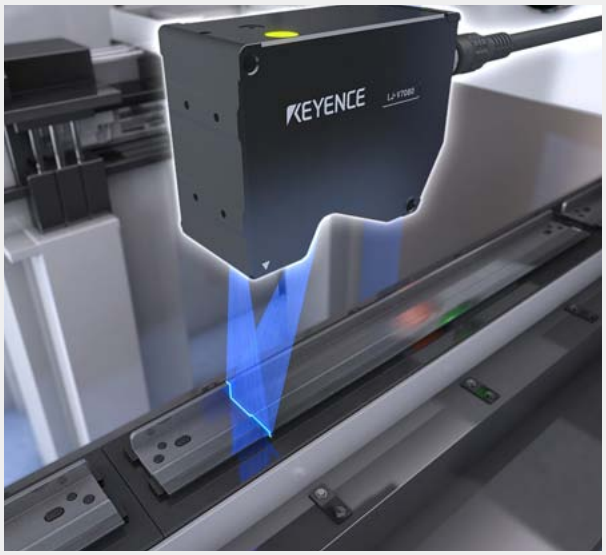


Glass sealant inspection

The amount of sealant applied on glass is measured. A sensor head optimized for transparent objects allows inspection even on a glass substrate. It is also possible to measure the volume.

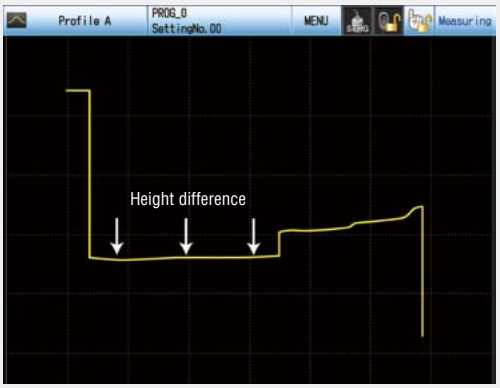


WARPAGE AND FLATNESS



Cleaning blade warpage

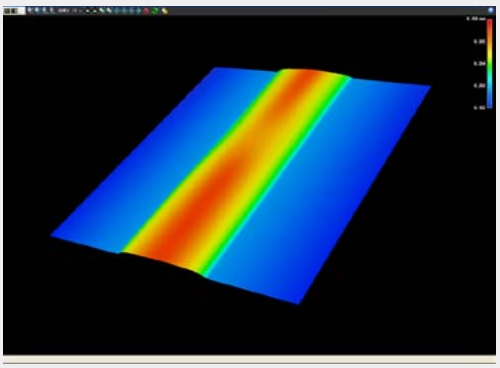
The profiles of the blades are continuously measured during blade transport, and any blade warpage is detected. Because it is possible to measure at speeds of up to 64 kHz, you can perform high-precision measurement at high speed.



PROFILE MEASUREMENT

Welding defects like blow holes

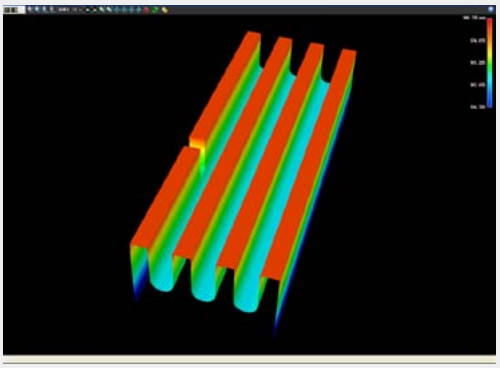
By measuring the profile of the welding mark left during welding processes, the LJ-V Series detects profile defects such as blow holes. Because the light source has been changed from a red to a blue laser, detections can even be performed on discolored metal immediately after welding.



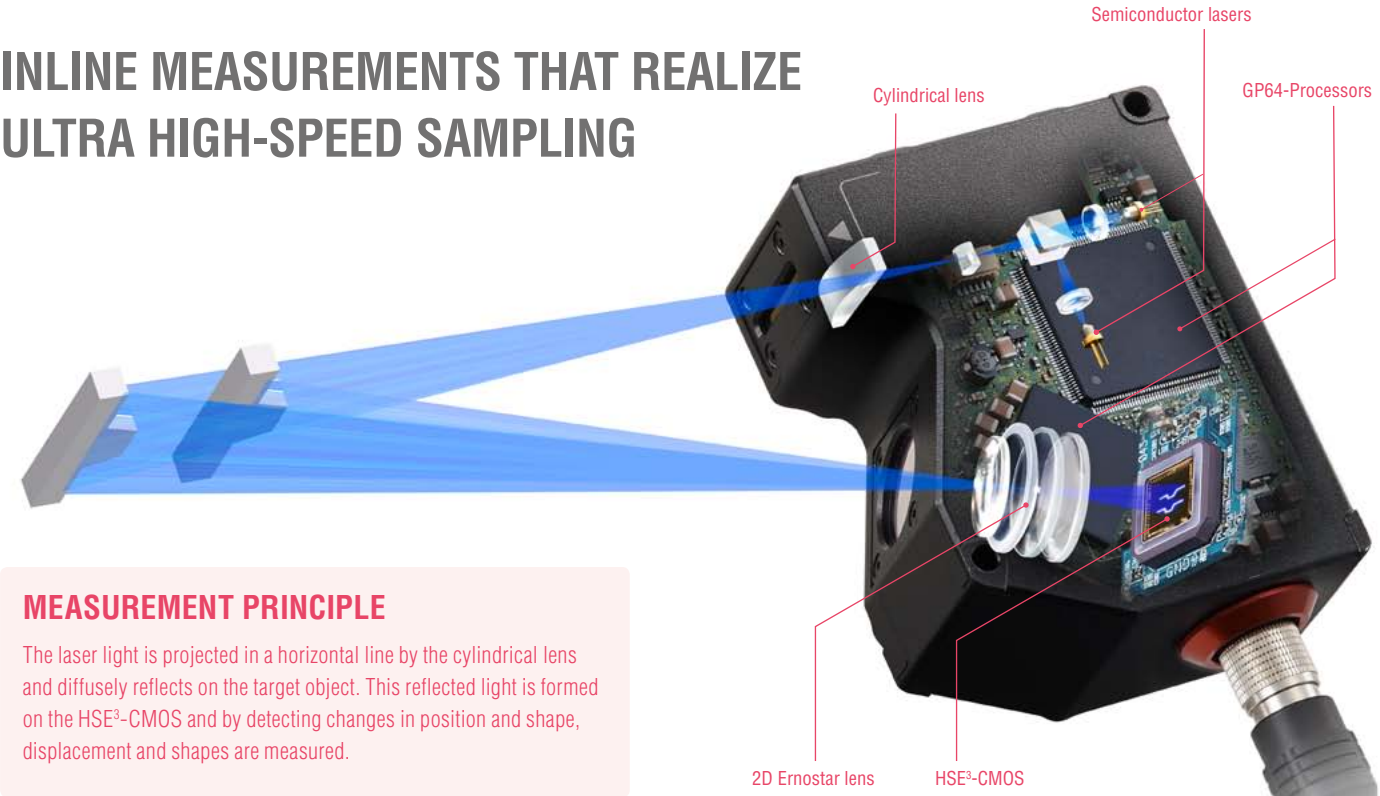
SCRATCHES AND DENTS

Flaw detection on extrusion molded products

The LJ-V Series performs pass/fail measurements of the profiles of molded products that are extruded at high speeds. A wide variety of targets are supported such as rubber, metal, ceramics, concrete, composites, and foodstuffs.



INLINE MEASUREMENTS THAT REALIZE ULTRA HIGH-SPEED SAMPLING



MEASUREMENT PRINCIPLE

The laser light is projected in a horizontal line by the cylindrical lens and diffusely reflects on the target object. This reflected light is formed on the HSE³-CMOS and by detecting changes in position and shape, displacement and shapes are measured.

NEWLY DEVELOPED/WORLD'S GREATEST

MAKING POSSIBLE STABLE MEASUREMENTS OF ANY TARGET EVEN AT ULTRA HIGH SPEED

▷ HSE³-CMOS

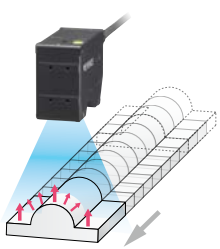
* HS = High Speed, E³ = Enhanced Eye Emulation

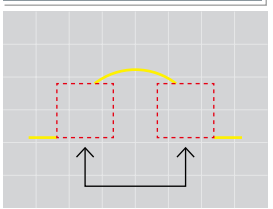
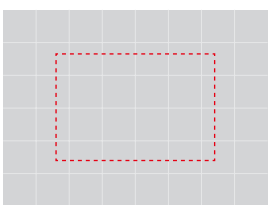
The LJ-V7000 Series is equipped with the newly developed HSE³-CMOS. In addition to improved speed, the dynamic range has been further improved over the established and conventional E³-CMOS. Even with the extremely short exposure time of 64 kHz (15.6 µs) it has achieved sensitivity that allows it to reliably measure a range of surfaces from black (small amount of reflection) surfaces to those with luster (large amount of reflection) as well a wide dynamic range.

STOPPED TARGET

MOVING TARGET

DYNAMIC RANGE
2400×



Conventional model	LJ-V HSE³-CMOS
	
Measurement is impossible due to insufficient light intensity.	All ranges could be measured.
	
Because there is even less light intensity, the measurement could not be performed at all.	Even though the exposure time is short, all ranges could be measured without issue.

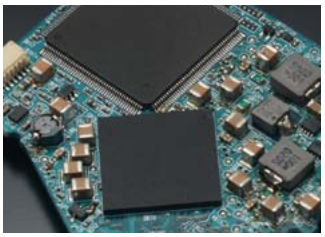
NEWLY DEVELOPED

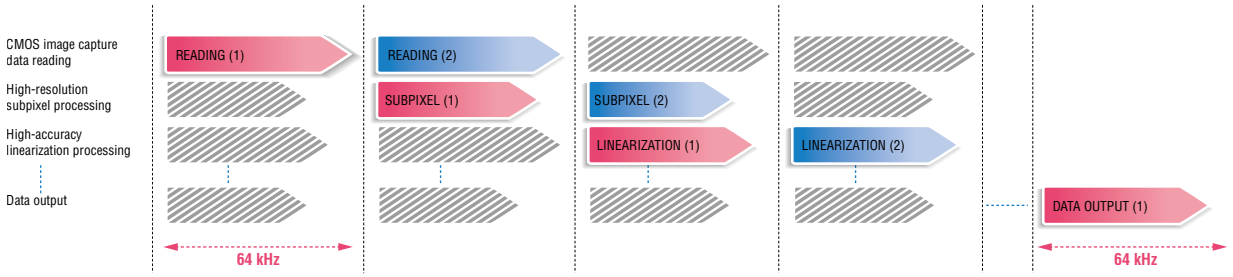
ACHIEVING ULTRA HIGH-SPEED MEASUREMENTS AT 64 KHZ

▷ GP64-Processor*

* G = Generating, P = Profiles

We have developed a new custom IC that can perform ultra-high-speed pipeline processing that in addition to reading CMOS image capture data and performing high-resolution subpixel processing, also performs high-precision linearization and data output. This allows for the measurement of objects moving at high-speeds with room to spare.

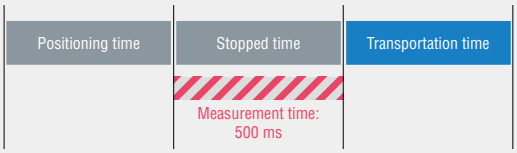




MERITS PROVIDED BY ULTRA HIGH-SPEED SAMPLING

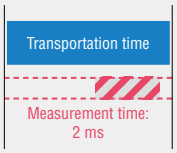
REDUCED INSPECTION CYCLE TIME!

Conventional model



With the conventional method, it takes time to perform the three processes of product positioning, stopping, and transportation and ejection in order to perform an accurate inspection.

LJ-V



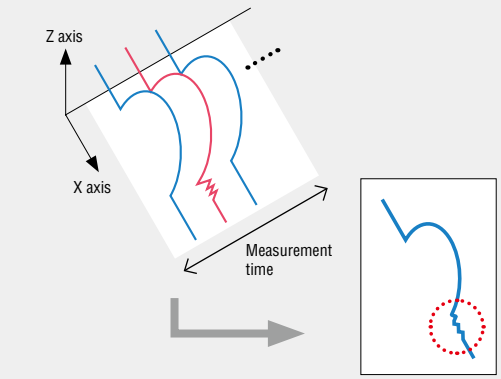
NO POSITIONING TIME AND STOPPED TIME ARE NEEDED!

Measurements are performed during target transportation.

With the LJ-V Series, the measurement time is 240 times shorter than that of the conventional method, which makes it possible to finish inspections within the product transportation time, which leads to improved cycle time.

STABILIZED MEASURED VALUES!

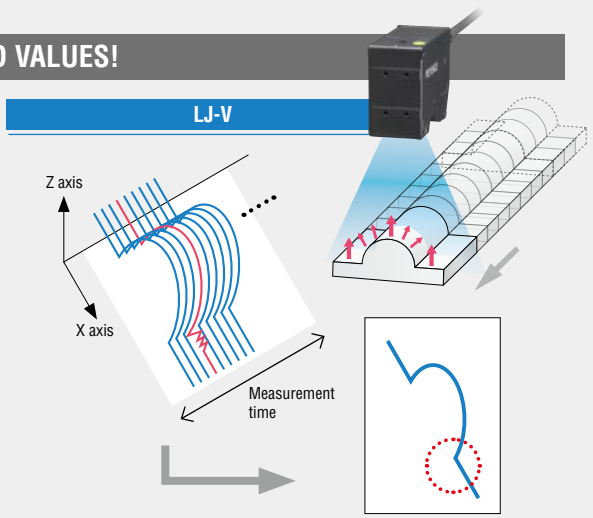
Conventional model



RESULT OF AVERAGING 3 PROFILES

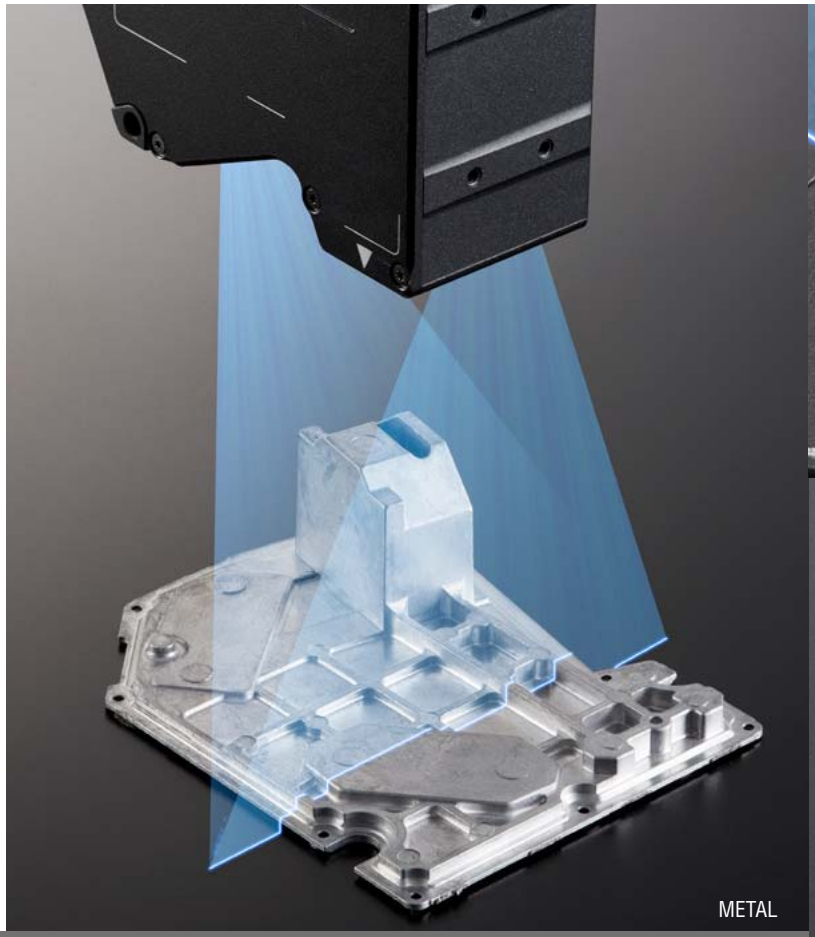
With conventional models, measurement stability was limited due to insufficient sampling speeds necessary to hit the required cycle times.

LJ-V

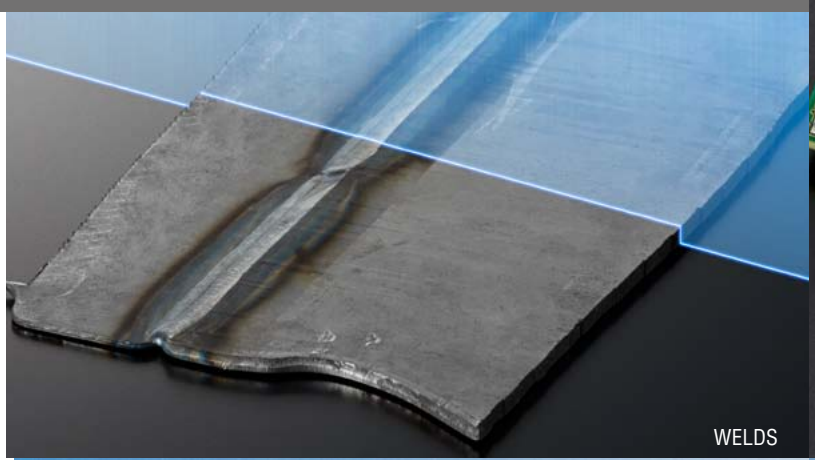


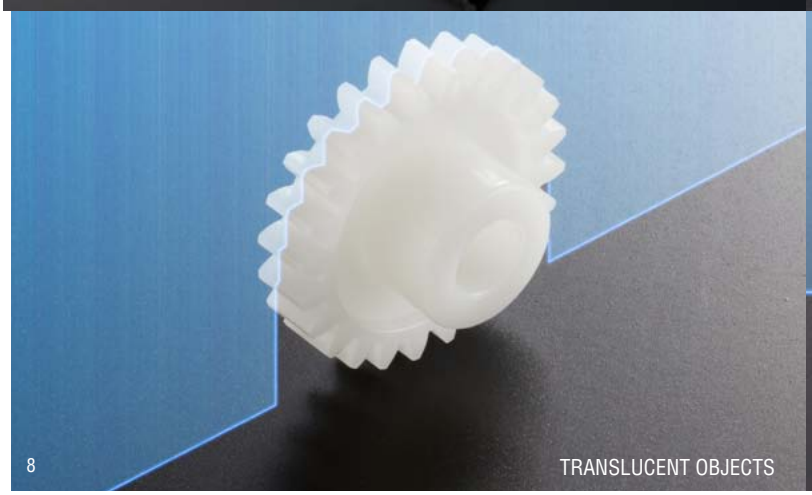
RESULT OF AVERAGING 720 PROFILES

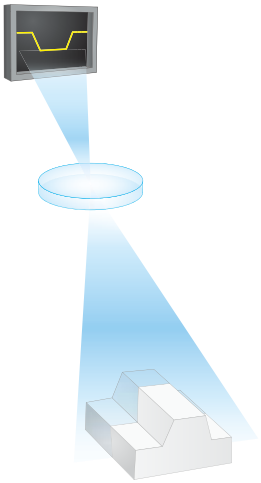
The LJ-V Series provides significantly higher profile stability by utilizing ultra-high-sampling at as high as 240 times that of conventional models to allow for profile averaging as well as abnormal value elimination using median filters.



OVERWHELMING CAPABILITIES







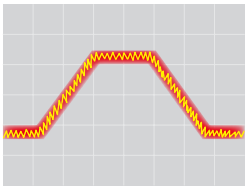
WORLD'S FIRST

FORMS ULTRA-STABLE AND HIGHLY ACCURATE PROFILE IMAGES

▷ Blue laser optical system

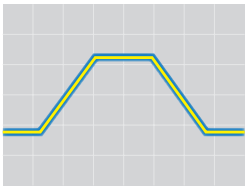
The LJ-V7000 Series is the first 2D laser displacement sensor in the world to adopt a blue laser. A sharp line beam is formed on the light-receiving element by focusing a short wavelength 405 nm laser to its maximum limit with a 2D Ernostar lens. This generates a stabilized high-precision profile. Also, the received light density for the laser has been increased to successfully secure a greater level of received light intensity. This achieves ultra-stable and highly accurate measurement with all types of targets that are typically difficult to detect.

RED LASER (CONVENTIONAL)

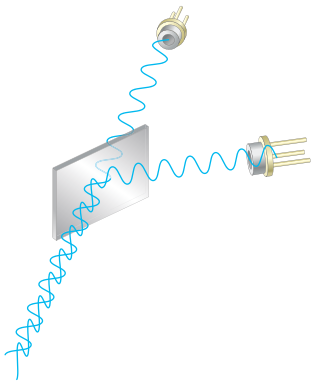


With a conventional red laser, the beam that formed the image is thick, resulting in the generation of variation in the profile.

BLUE LASER (LJ-V)



With a blue laser, the image forming beam becomes sharp to enable the measurement of shapes with excellent accuracy.



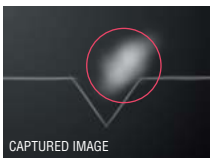
WORLD'S FIRST

IDENTIFIES UNNECESSARY LIGHT REFLECTIONS

▷ Double polarization function

We have developed the world's first double polarization function, which distinguishes and cancels multiple reflection light that acts as an obstacle to measurement. Light is shined on the intersection between the X-polarization and Y-polarization to calculate differences in the amount of received light for each unit of image capture data. Multiple reflection light has the characteristic of generating differences in the amount of received light for X-polarization and Y-polarization, and this characteristic is used to cancel data for areas that have large differences. The power of this function is demonstrated in the measurement of metals with complex shapes and complicated areas.

1. X POLARIZATION

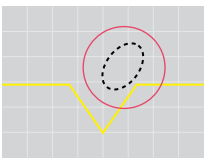


2. Y POLARIZATION

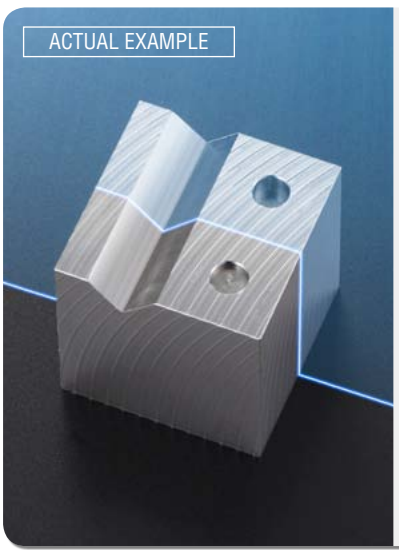
MULTIPLE REFLECTION LIGHT

A large difference in light intensity is generated between 1. and 2.

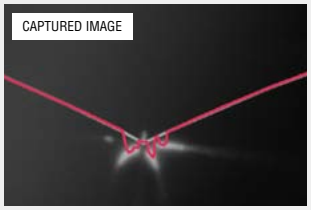
GENERATOR PROFILE



Data with areas that contain large differences is cancelled.

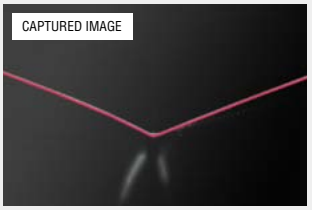


Conventional model



The strong influence of the diffuse reflected light causes errors in the data.

LJ-V



LJ-V Series cancels the diffuse reflected light to perform stable measurements.

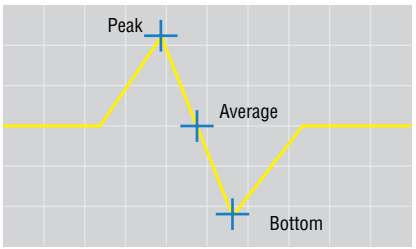
ALL TYPES OF MEASUREMENTS ARE POSSIBLE WITH THIS SINGLE DEVICE

74 types of measurement modes

With 16 types of measurement details and 11 types of measurement target specifications, this single device can handle a total of 74 types of measurements.

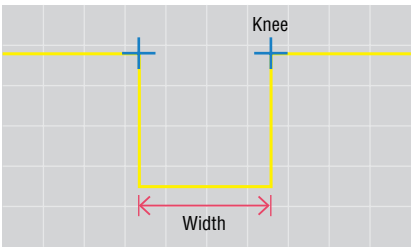
REPRESENTATIVE MEASUREMENT DETAILS

HEIGHT



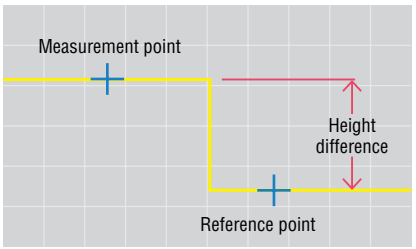
Measures the height within the specified range.

WIDTH AND POSITION



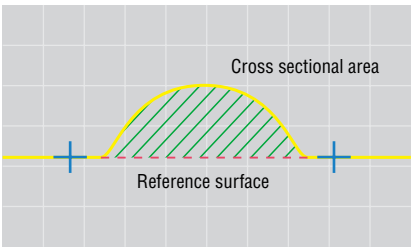
Measures the width and positions under the specified conditions.

HEIGHT DIFFERENCE



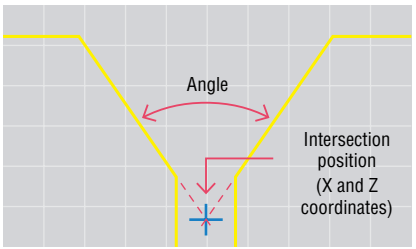
Measures the height difference from a reference point to a measurement point.

CROSS SECTIONAL AREA



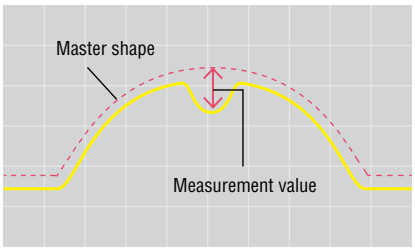
Measures the cross sectional area from a reference surface.

ANGLE AND INTERSECTION



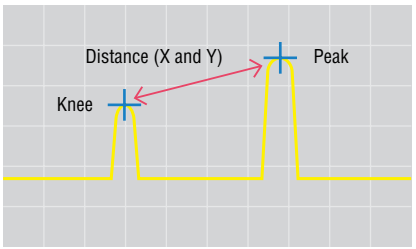
Measures the angle between and the intersection point of a pair of detected straight lines.

MASTER PROFILE COMPARISON



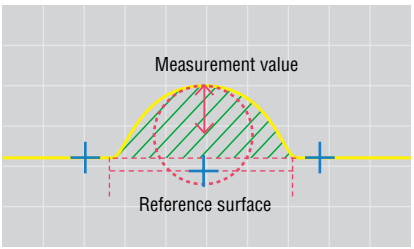
Makes a comparison with the registered master shape and then measures the area with the largest difference in height.

DISTANCE (POINT - POINT)



Measures the distance between two points.

RADIUS AND MIDPOINT



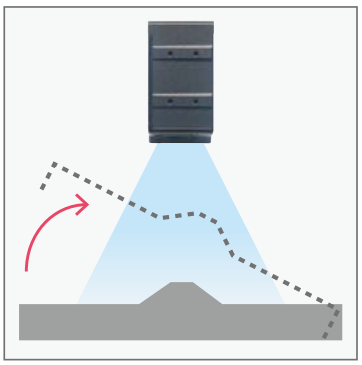
Measures the radius of a curved profile and the coordinates of the center position of a specified point.

AN EMPHASIS ON INLINE MEASUREMENT

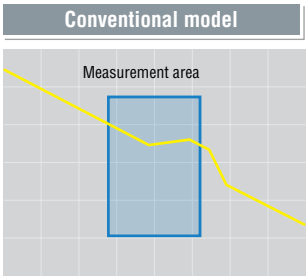
IN-LINE POSITION ADJUSTMENT FUNCTION (X, Y, AND Z)

Corrects positional misalignment of the target, which is directly connected to errors in the measurement results. Even in cases where the target is moving at random or when it is difficult to perform positioning, it is possible to perform measurement without error.

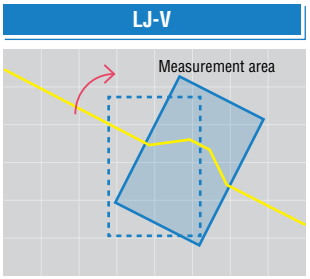
θ → X adjustment (angle then x position)



If the position of the workpiece becomes misaligned...



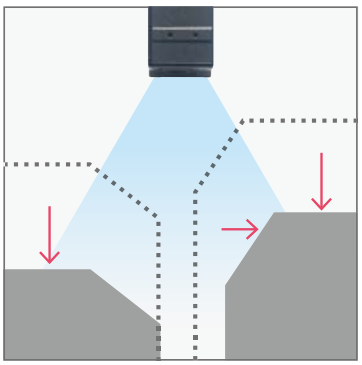
ADJUSTMENT



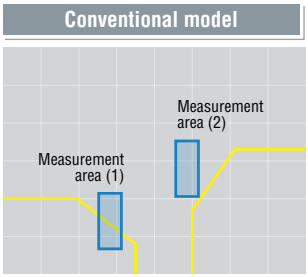
The measurement area tracks the position and rotation misalignment of the target.

DOUBLE XZθ ADJUSTMENT FUNCTION

The LJ-V7000 Series is equipped with a new function that makes it possible to individually set various adjustments in 2 areas. This is effective when measuring gaps, angles, or height differences of two targets that move independently.

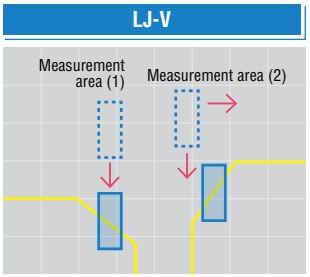


If the position of individual workpieces becomes misaligned...



Because position adjustment was applied to a single side as a reference, measurement could not be properly performed.

ADJUSTMENT

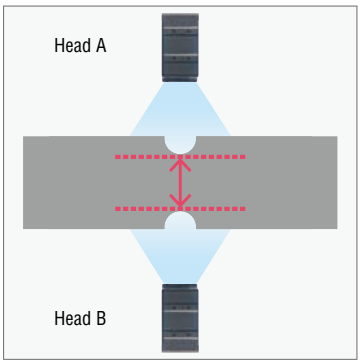


Because original adjustment is applied individually to measurement areas (1) and (2), measurement can be properly performed.

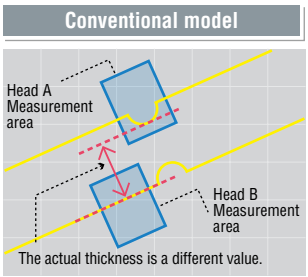
DUAL-HEAD ADJUSTMENT FUNCTION

By understanding the positional relationship of both heads, it is possible to match the θ adjustment center of rotation for both heads. Even when measuring targets with variation or incline changes, it is possible to measure the correct points.

Ex. Minimum thickness measurement

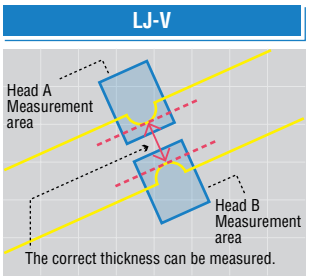


If the workpiece tilts...

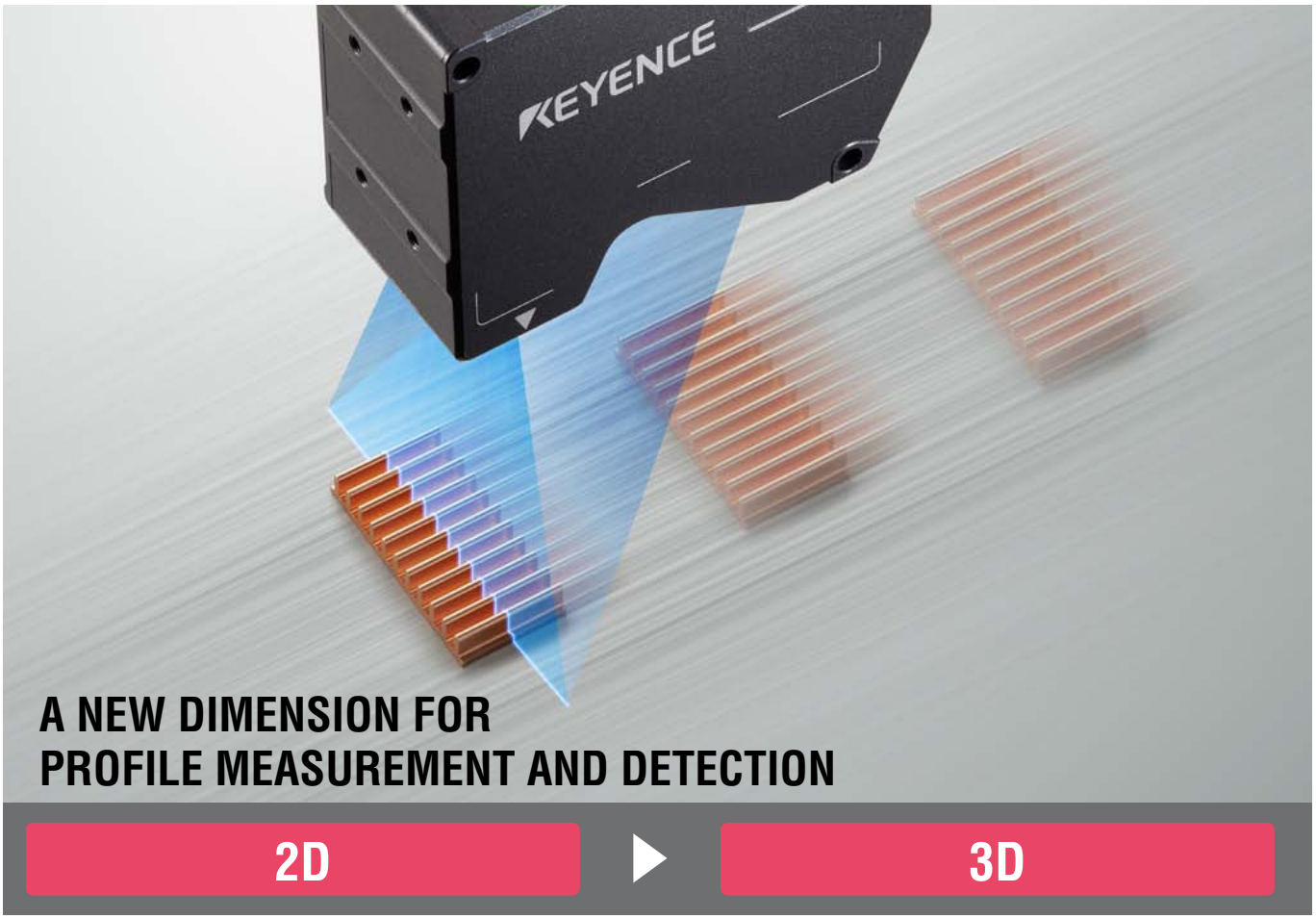


The θ adjustment center of rotation for each head differs, so the measurement area for head B becomes misaligned.

ADJUSTMENT



The θ adjustment center of rotation for both heads match, so the measurement area is not misaligned.



A NEW DIMENSION FOR PROFILE MEASUREMENT AND DETECTION

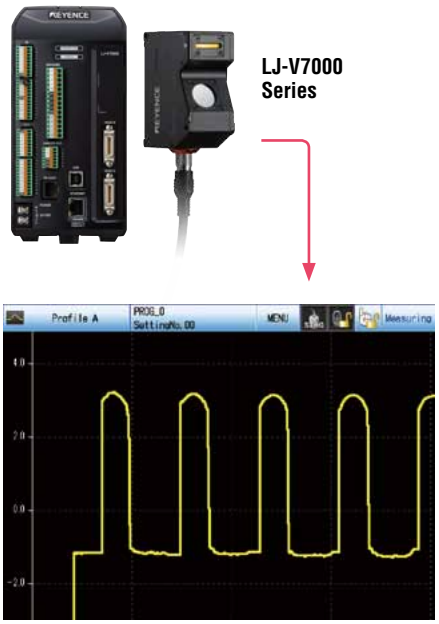
2D ▶ **3D**

3D MAKES NEW INSPECTIONS POSSIBLE

2D MEASURING INSTRUMENT

Highly functional profile measurement mode

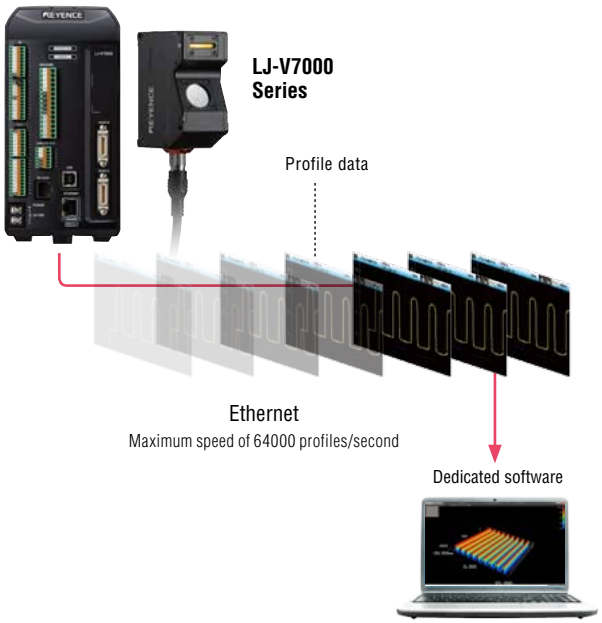
The LJ-V Series provides accurate, stable profiles as high speeds by utilizing the new blue laser optical system and HSE³-CMOS for enhanced dynamic range.



3D MEASURING INSTRUMENT AND IMAGE PROCESSING

High-speed profile output mode

The LJ-V Series can output up to 64000 profiles/second, which makes it possible to perform 3D measurements with stunning accuracy.



3D MEASURING INSTRUMENT AND IMAGE PROCESSING

LJ-V + CV-X

Combining the advanced profiling capabilities of the LJ-V Series with the CV-X Series Image Processing System, imaging processing can be performed on 3D measurement data to open new doors in the realm of quality inspection.

LJ-V7000 Series

Multi-Camera Image Processing System
CV-X Series

MEASURED VALUE ACQUISITION

The continuous profile data measured with the LJ-V Series is loaded into the CV-X Series.

3D DATA

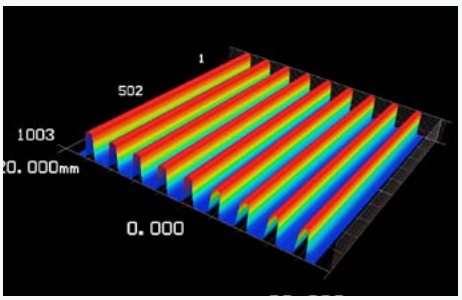
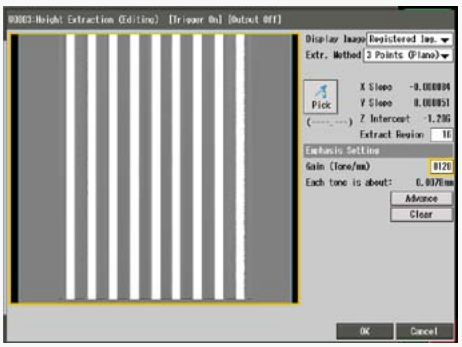


IMAGE PROCESSING

Within the CV-X Series, the height data is converted to a gray-scale image with 256 gradations. The CV-X Series utilizes 21 built-in pre-processing filters, such as real-time gray-scale adjustment and a blob filter to obtain the optimum image for the inspection.

HEIGHT GRAY-SCALE PROCESSING

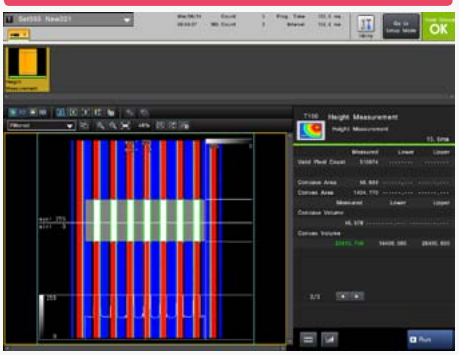


AS FAST AS 2 MS PER INSPECTION!

INSPECTION AND MEASUREMENT

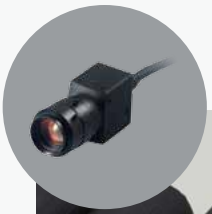
Performing image processing on height data makes a wide range of inspections possible. Not only can you perform accurate measurements utilizing surface planes such as measuring relative heights and volumes, but also detect defects such as scratches and chips on any surface.

IMAGE PROCESSING RESULT

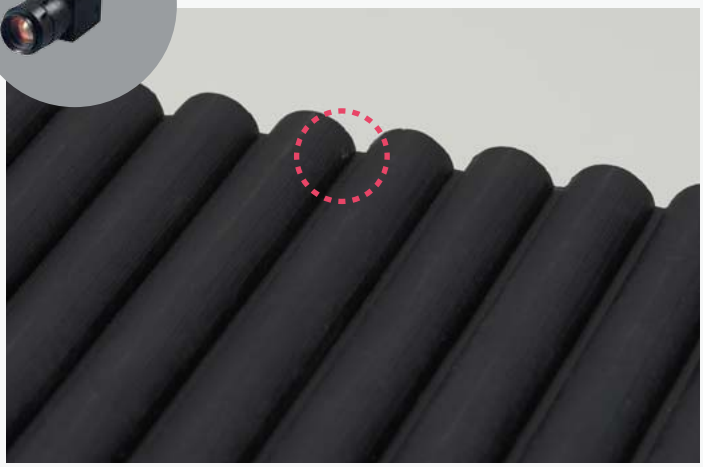


DENTS AND SCRATCHES

CONVENTIONAL METHOD: CAMERA

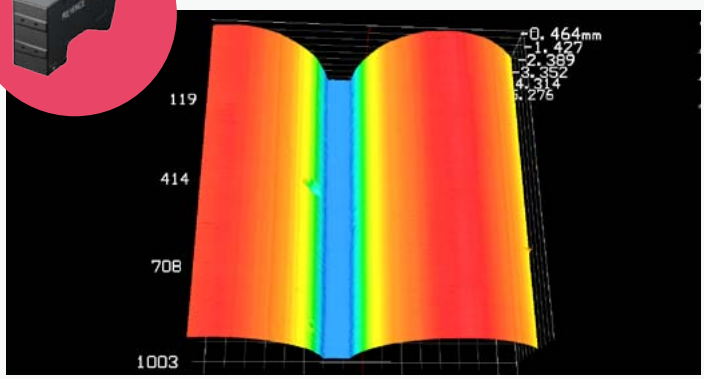


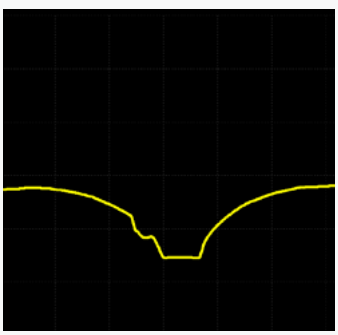
A large amount of work is required to make adjustments related to the type of lighting and the camera position. This method is also easily affected by minor changes in the surface of the target object, so the conditions under which images are taken have to meet very strict guidelines.

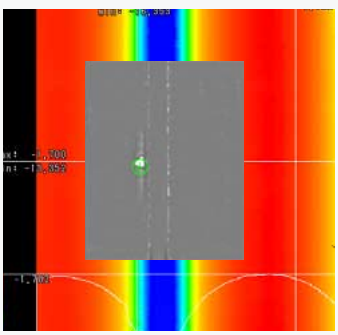


LJ-V Series

The light source and receiver are contained in a single body, which makes on-site adjustments unnecessary. Also, the LJ-V Series is a measuring instrument, so traceablilty is built in.



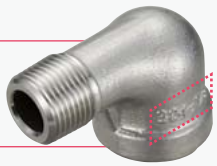




Set thresholds using real-world values!

It is possible to perform inspections by assigning tolerances to measured values such as scratch depth, width, and volume. The LJ-V Series is not a camera but a measuring instrument with guaranteed precision, so it can perform reliable and trustworthy measurements and inspections.

OPTICAL CHARACTER RECOGNITION (OCR)

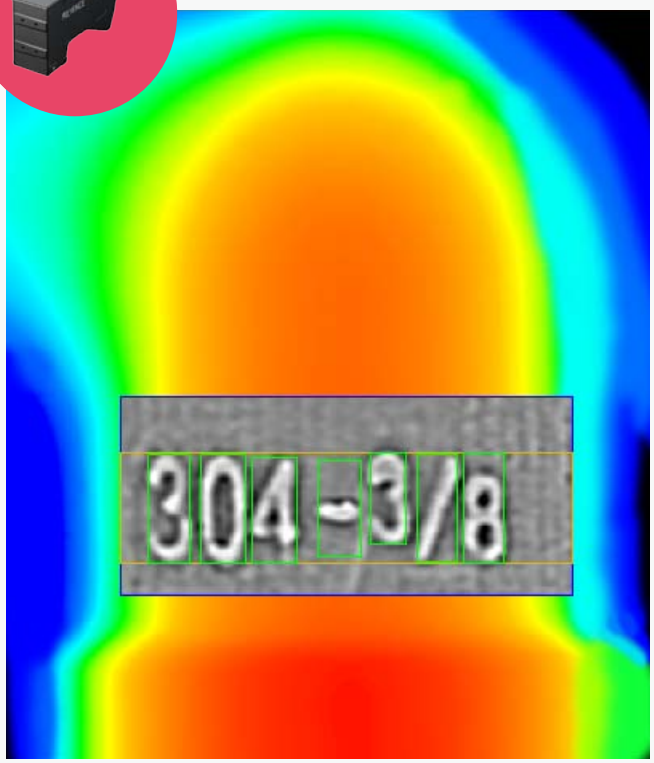


CONVENTIONAL METHOD: CAMERA

It is difficult to determine conditions for curved surfaces and angled surfaces, so it is difficult to isolate characters.

LJ-V Series

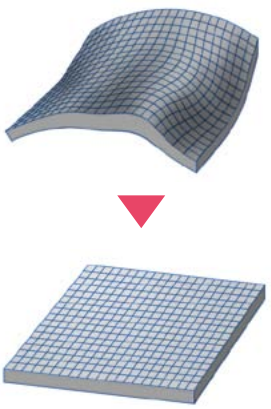
The character heights are measured to create the image, which makes it possible to accurately isolate characters even on curved or angled surfaces.



Characters can be extracted from any kind of curved surface!

It is important for an OCR function to be able to correctly isolate characters. Using the height data from the LJ-V Series to adjust for surface curvature makes it possible to extract the characters.

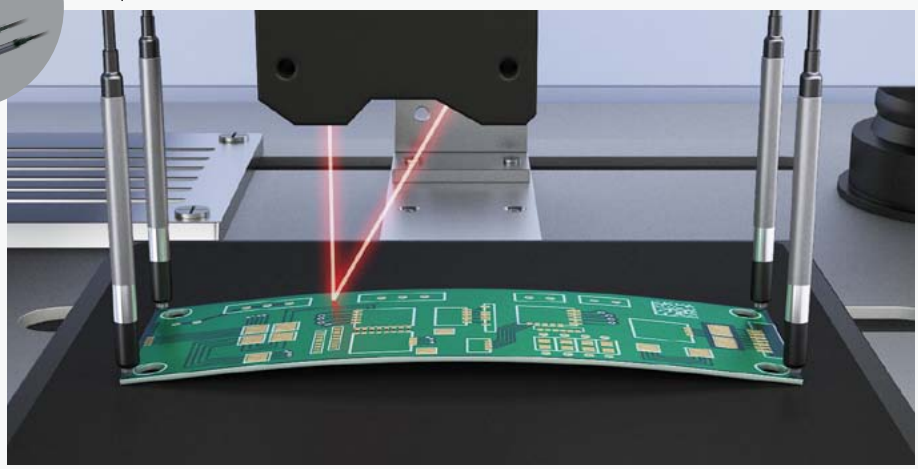
ADJUSTMENT IMAGE



FLATNESS AND WARPAGE

CONVENTIONAL METHOD: LASER DISPLACEMENT SENSOR OR CONTACT-TYPE SENSOR

These are profile measurements using points and lines. For contact-type sensors, in addition to selecting appropriate targets, it is necessary to select a number of heads that matches the number of measurement locations. For laser displacement sensors, scan time for the X and Y axes is required.

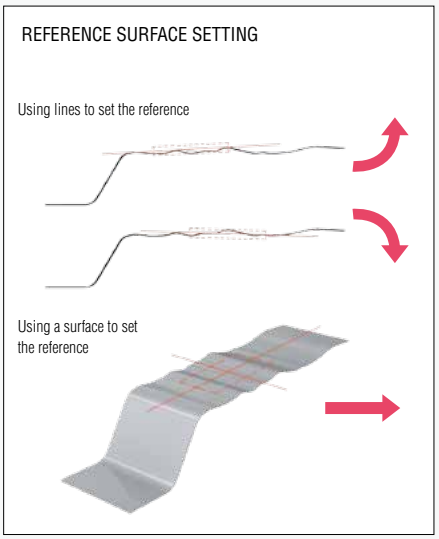


LJ-V Series

The LJ-V Series 3D profiler allows quick and easy flatness and warpage checks. Surfaces can be scanned with a single pass upon which internal profile measurements and surface adjustments can be made.

Surface slant adjustment

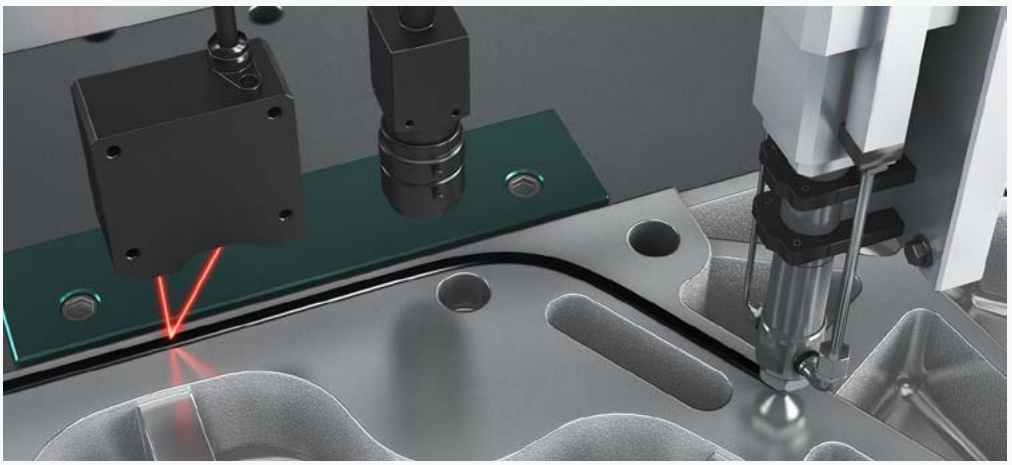
It is difficult to generate accurate reference surface planes using only limited 1D or even 2D data. With the LJ-V Series, 3D data is gathered to allow an accurate reference surface to be generated taking into account part features and irregularities.



VOLUME AND POSITION

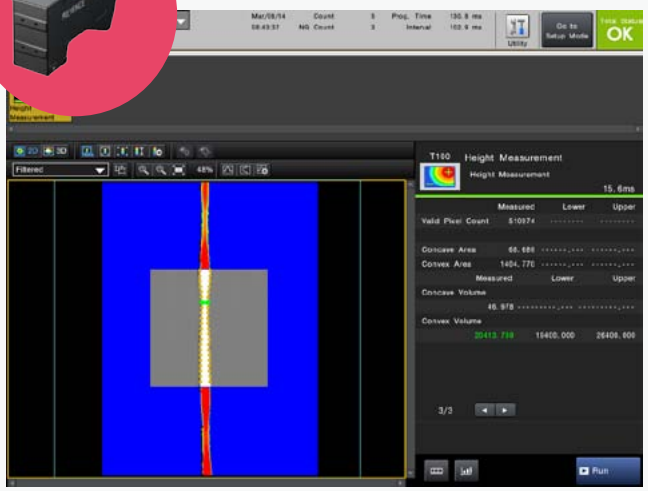
CONVENTIONAL METHOD: LASER DISPLACEMENT SENSOR AND CAMERA

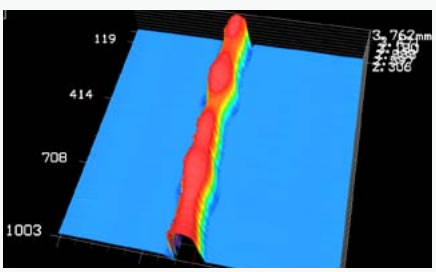
A laser displacement sensor is used to inspect the height and a camera is used to inspect the width and position. The two systems cannot be synchronized so installation can be difficult and must be adjusted if the part geometry changes. This setup also makes it difficult to determine the volume and the cross-sectional area.



LJ-V Series

Measurements such as height, width, position, cross-section area, and volume can be easily measured since 3D data is acquired over the entire area of interest. Target misalignments are also adjusted in real time.





Position adjustment

The LJ-V Series + CV-X Series combination comes equipped with a great number of algorithms to simplify setup. Target misalignment can easily be corrected using a pattern search which searches for a profile pattern or trend edge position can be used to virtual intersection points.

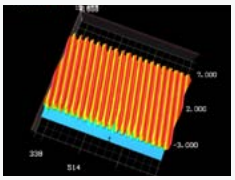
POSITION DETECTION ALGORITHMS

- EDGE POSITION
- EDGE ANGLE
- BLOB
- TREND EDGE POSITION
- PATTERN SEARCH

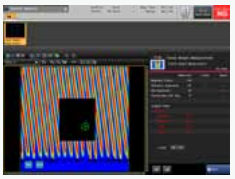
⋮ and more

SCRATCH DETECTION DURING ROTATION

LJ-V Series measured data



CV-X image processing

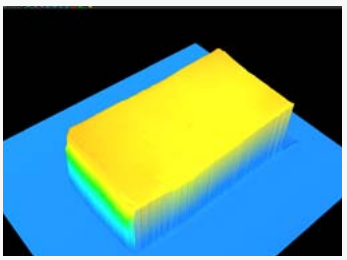


It's possible with 3D image processing

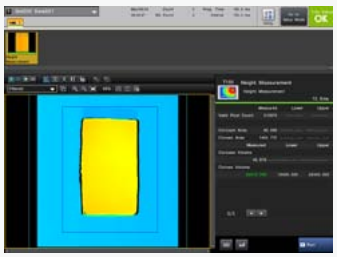
Using just a camera or laser displacement sensor, it has been difficult to detect scratches on the angled tooth surfaces of gears and on rounded surfaces due to the effect of diffuse reflections and varying geometry. By linking together the LJ-V Series, which operates at ultra high speeds and is highly resistant to the effect of diffuse reflections, and with the stain mode of the CV-X Series, these inspections are easily accomplished.

VOLUME MEASUREMENT

Cheese (volume)



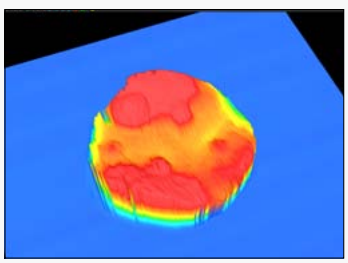
3D image



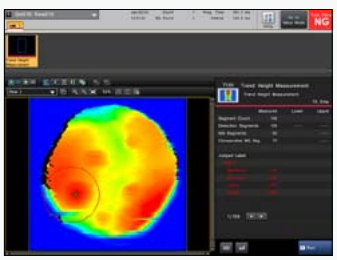
Inspection image

PEAK HEIGHT MEASUREMENT

Rice cracker (peak height)



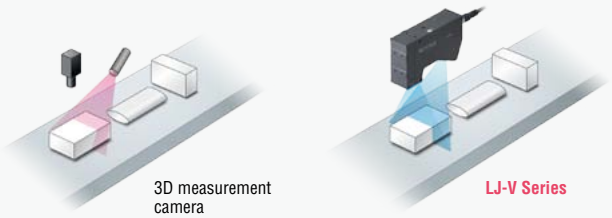
3D image



Inspection image

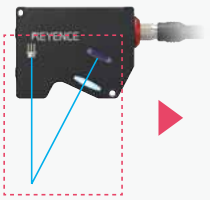
OPTICAL FOCUS AND DEPTH OF FIELD

ADVANTAGES OF THE LJ-V SERIES

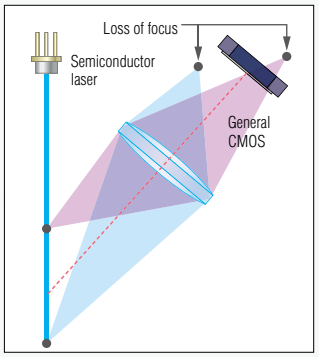


BETTER OPTICAL DESIGN

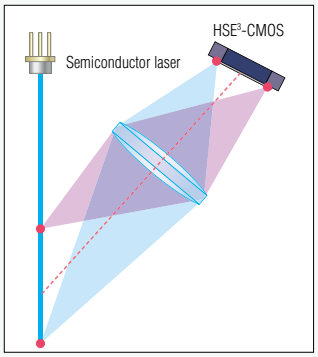
Cameras that are not equipped with auto focus or a similar technology have a set focus position which makes it impossible to obtain an accurate profile if the distance between the camera and target changes. The LJ-V Series uses a special optical system, which enables the LJ-V Series to always capture images that are in the measurement range.



Typical 3D camera



LJ-V Series

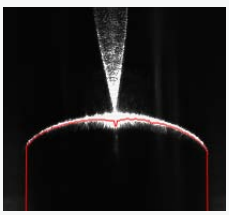


With the LJ-V Series, even if the target's position changes, the image will not go out of focus.

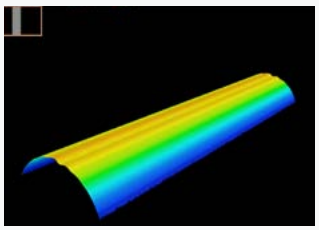
BETTER DYNAMIC RANGE

For general 3D cameras, the light receiving element has a narrow dynamic range leading to measurement errors caused by the amount of light reflected from the target. The LJ-V Series can perform stable measurements without light saturation even if the amount of reflected light is large.

RECEIVED LIGHT WAVEFORM

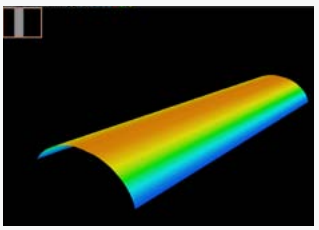


Typical 3D camera



The area around the peak of the target object is saturated.

LJ-V Series

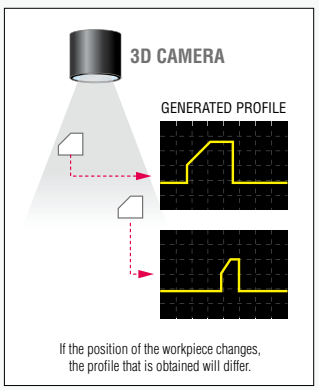


Stable measurements can be performed.

BETTER EASE OF USE

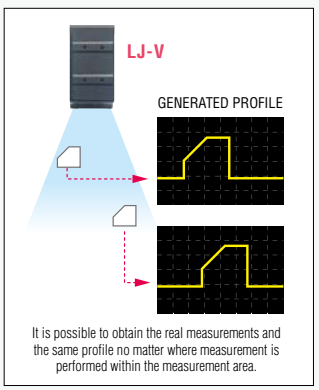
When using a 3D camera, the height and width data of individual pixels differs due to the positional relationship of the laser light source and the receiver, so a calibration must be performed for each pixel. With the LJ-V Series, there is no need for the user to perform additional calibration.

Typical 3D camera



If the position of the workpiece changes, the profile that is obtained will differ.

LJ-V Series

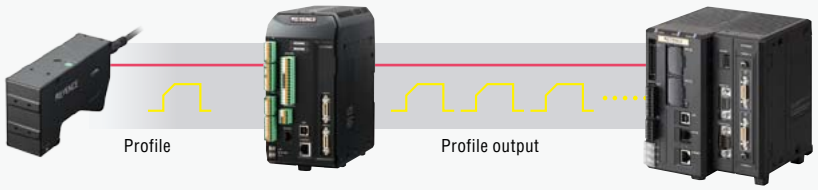


It is possible to obtain the real measurements and the same profile no matter where measurement is performed within the measurement area.

TWO TYPES OF SELECTABLE 3D MEASUREMENT SYSTEMS

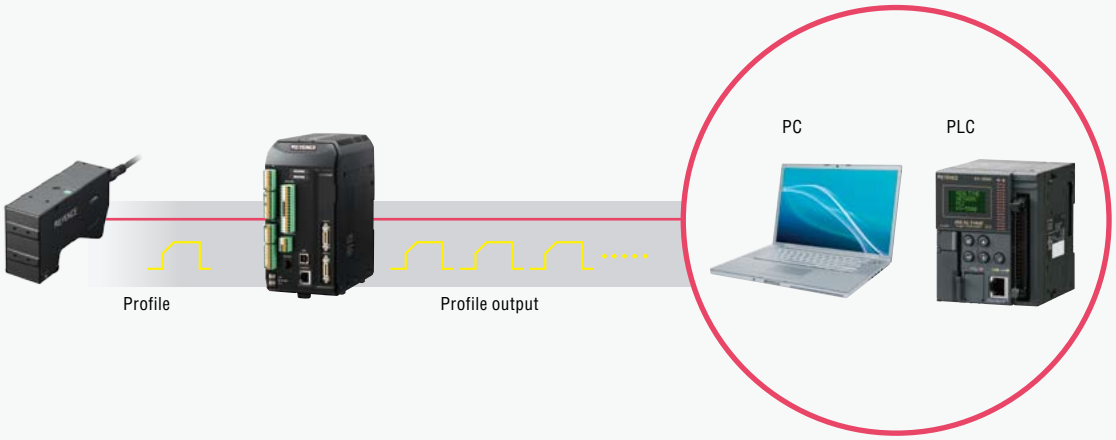
1 LJ-V SERIES + CV-X SERIES

By loading LJ-V Series measured profiles into the CV-X controller, we have made possible image processing of 3D images.



2 LJ-V SERIES + PC

We have made it possible for users to load LJ-V Series profile output into a PC or similar device on which user-made proprietary programs run.



OUR AIM IS ON-SITE EASE OF USE

SELECTABLE 3-WAY OPERATION

A touch panel has been prepared so that it is possible to perform on-site monitoring or setting operations during measurement. It is also possible to perform operation using a PC or a controller that is connected to a touch panel or LCD color monitor.

Touch panel HMI
CA-MP120T

PC

LCD color monitor
CA-MP120

VARIOUS SPECIFICATIONS THAT INCLUDE ALL ON-SITE NEEDS

SUPPORTS ENCODER INPUT

Can perform encoder synchronized measurement up to a top speed of 64 kHz. Can measure shapes in the direction of movement with high-speed and with an accurate pitch.

HIGH-FLEX CABLE

Has adopted a high flex cable as standard. Can be installed on robots and other movable parts without worry.

IP67 RATED SENSOR HEAD AND CONNECTION CABLE

In addition to the sensor head, the connection cable also supports an IP67 enclosure rating. There are no problems even in environments like processing plants where spray easily comes on to the product.

PASSES IMPACT RESISTANCE TEST IEC 60068-2-27

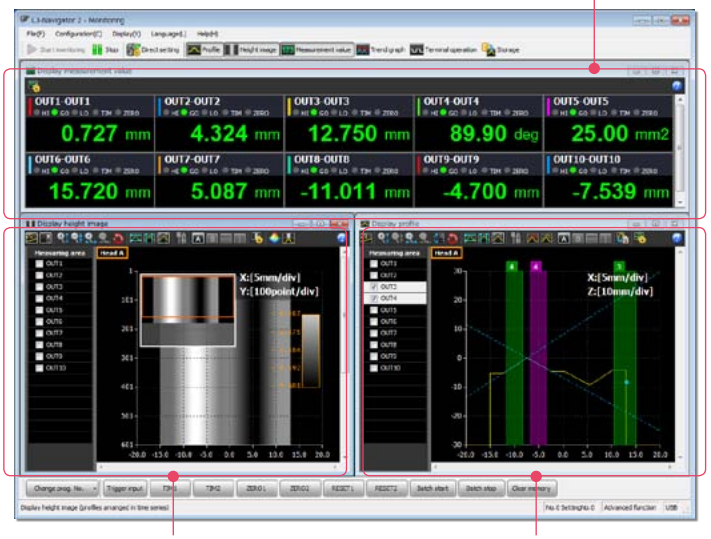
Equipped with high shock resistance that is necessary for industrial robots.

EASY AND CONVENIENT!
PC SOFTWARE THAT HAS THOROUGHLY CONSIDERED USABILITY

MULTI-SCREEN FUNCTION

It is possible to simultaneously check your favorite screens, including measurement values, measurement profiles, height image displays (grayscale displays), and measurement value trend graphs. It is possible to freely determine the screen size and placement to construct your own custom screen.

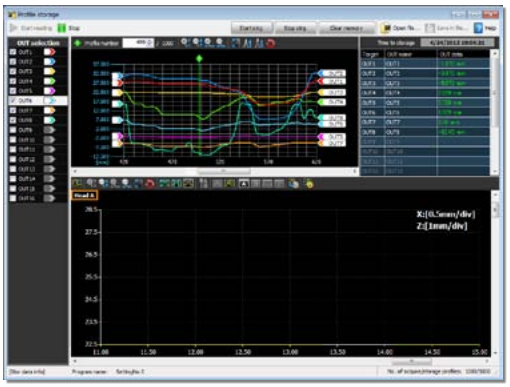
MEASUREMENT VALUE MONITOR



HEIGHT IMAGE DISPLAY
(Grayscale display)

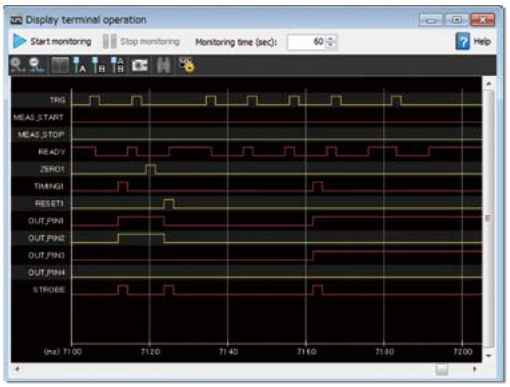
PROFILE DISPLAY

PROFILE STORAGE FUNCTION



It is possible to store approx. 160000 profiles. You can also store measurement values for 16 outputs at the same time. The LJ-V7000 Series is equipped with various analysis functions, which is useful for the verification of defects and for research and development.

TERMINAL OPERATION MONITOR FUNCTION

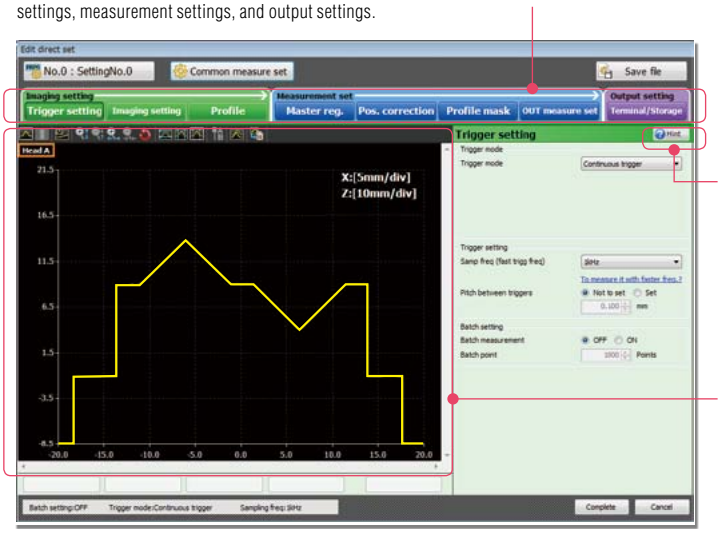


Can check the ON/OFF status of controller I/O terminal in a list. It is possible to greatly reduce the time and effort needed for troubleshooting.

EASY SETTINGS

EASY NAVIGATION SETTINGS

Anyone can perform setting intuitively and by following the navigation in the order of image capture settings, measurement settings, and output settings.



HINT FUNCTIONS THAT DON'T REQUIRE THE MANUAL

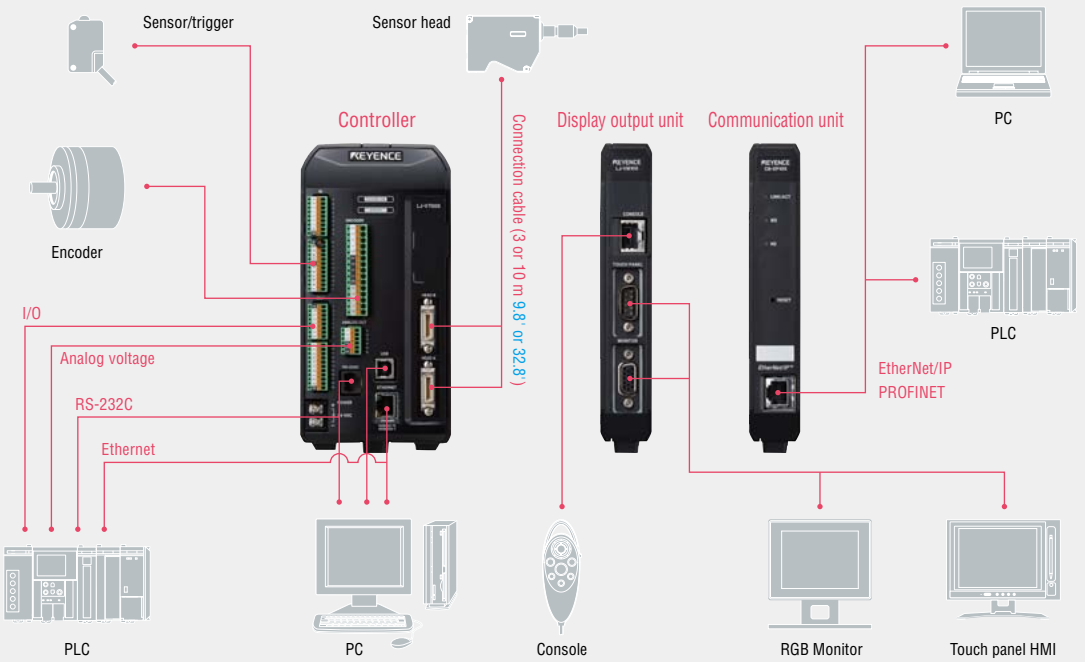
"Hint" icons have been prepared for each screen.

SETTINGS APPLIED IN REAL-TIME

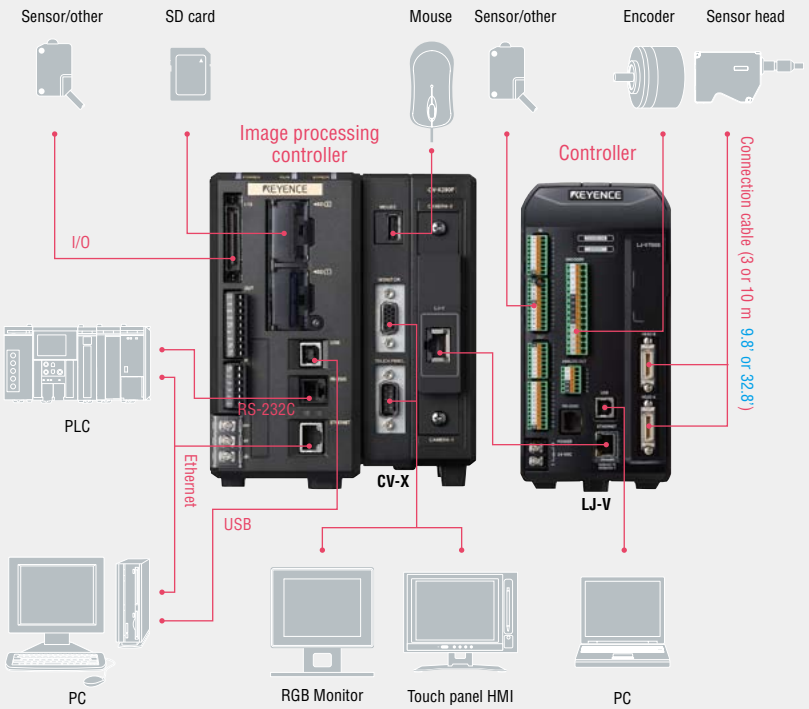
The measurement conditions are applied to the settings screen profile in realtime.
There is no need to return to the measurement screen for confirmation, making it possible to greatly reduce the time and effort spent on setting up.

SYSTEM CONFIGURATION

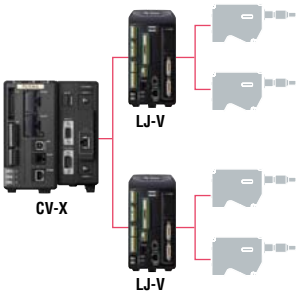
LJ-V



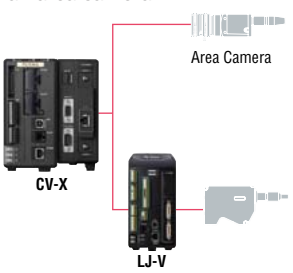
LJ-V + CV-X



Can be connected with up to four sensor heads



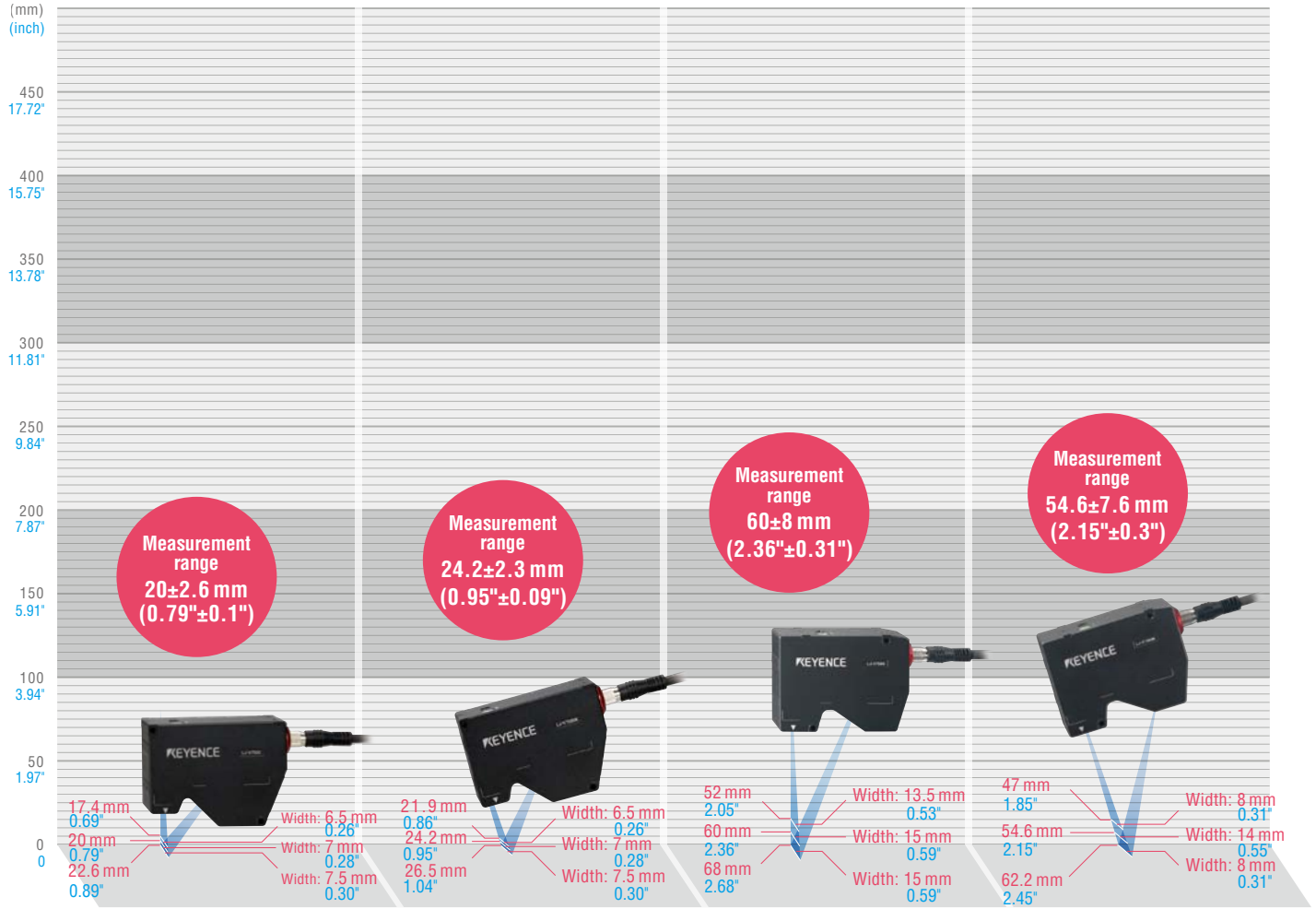
Can also be connected with an area camera



SELECTION GUIDE

SENSOR HEAD

Ultra high-accuracy	Ultra high-accuracy specular reflection	High-accuracy	High-accuracy specular reflection
LJ-V7020	**LJ-V7020K**	**LJ-V7060**	**LJ-V7060K**



Measurement range	Z-axis 20±2.6 mm 0.79"±0.1" X-axis 7 mm 0.28"	Measurement range	Z-axis 24.2±2.3 mm 0.95"±0.09" X-axis 7 mm 0.28"	Measurement range	Z-axis 60±8 mm 2.36"±0.31" X-axis 15 mm 0.59"	Measurement range	Z-axis 54.6±7.6 mm 2.15"±0.30" X-axis 14 mm 0.55"
Repeatability	Z-axis 0.2 µm 0.01 Mil X-axis 2.5 µm 0.10 Mil	Repeatability	Z-axis 0.2 µm 0.01 Mil X-axis 2.5 µm 0.10 Mil	Repeatability	Z-axis 0.4 µm 0.02 Mil X-axis 5 µm 0.20 Mil	Repeatability	Z-axis 0.4 µm 0.02 Mil X-axis 5 µm 0.20 Mil

CONTROLLER

Controller
LJ-V7001(P)

Controller variation

NPN output type	LJ-V7001
PNP output type	LJ-V7001P

Settings monitor software
LJ-H2

USB cable (LJ-H2 accessory)
OP-66844

Display output unit
LJ-VM100

EtherNet/IP unit
CB-EP100

PROFINET unit
CB-PN100

Console
OP-87504

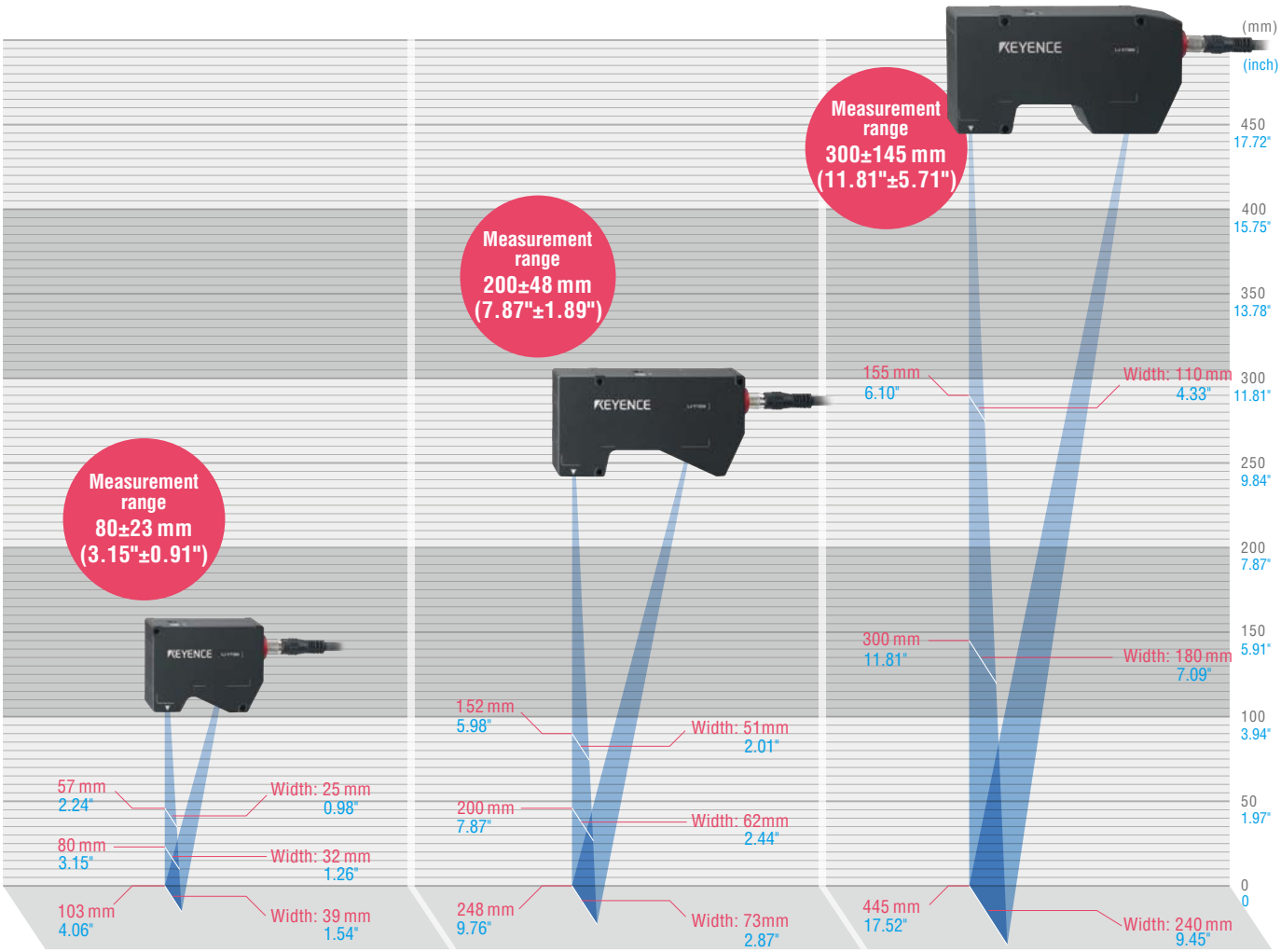
MONITOR

Touch panel HMI
CA-MP120T

LCD color HMI
CA-MP120

Specialized monitor stand
OP-87262

Middle range	Long range	Ultra-long range
LJ-V7080	**LJ-V7200**	**LJ-V7300**



	Middle range	Long range	Ultra-long range
Measurement range	Z-axis 80±23 mm 3.15"±0.91" X-axis 32 mm 1.26"	Z-axis 200±48 mm 7.87"±1.89" X-axis 62 mm 2.44"	Z-axis 300±145 mm 11.81"±5.71" X-axis 180 mm 7.09"
Repeatability	Z-axis 0.5 µm 0.02 Mil X-axis 10 µm 0.39 Mil	Z-axis 1 µm 0.04 Mil X-axis 20 µm 0.79 Mil	Z-axis 5 µm 0.20 Mil X-axis 60 µm 2.36 Mil

CABLES

Head connection cable
CB-B3 (3 m 9.8')
CB-B10 (10 m 32.8')

Head connection extension cable
CB-B5E (5 m 16.4')
CB-B10E (10 m 32.8')
CB-B20E (20 m 65.6')

Touch panel HMI extension cable
OP-87258 (3 m 9.8')
OP-87259 (10 m 9.8')

Display monitor connection cable
OP-66842 (3 m 9.8')
OP-87055 (10 m 32.8')

LJ-V connection Ethernet cable
OP-87736 (2 m 6.6')

RS-232C cable
OP-96368 (2.5 m 8.2')

D-sub 9 pin connector
OP-26401

CONTROLLER

Model		LJ-V7001	LJ-V7001P
No. of connectable sensors		Max. 2 units	
Display	Minimum display unit	0.1 µm 0.004 Mil, 0.00001 mm², 0.01°	
	Maximum display range	±99999.9 mm 3937.00", ±999999 mm²	
Input terminal block	Laser remote interlock input	Non-voltage input	
	Encoder input	NPN/PNP open-collector output (5 V, 12 V, 24 V), line-driver output	
	Trigger inputs	Non-voltage input	Voltage input
	Timing 1, 2 input		
	Auto-zero1, 2 input		
	Reset 1, 2 input		
	Start measurement/stop input		
	Start storage/stop input		
	Clear memory input		
	Laser OFF input		
	Program switch input	Non-voltage input x 4 inputs	Voltage input x 4 inputs
Output terminal block	Analog voltage output	±10 V x 2 outputs, Output impedance: 100 Ω	
	OUT comparator output	NPN open collector output x 12 outputs (Can freely assign 16 OUTs x 3 stage judgment results)	PNP open collector output x 12 outputs (Can freely assign 16 OUTs x 3 stage judgment results)
	Strobe output	NPN open collector output	PNP open collector output
	Disable trigger output		
	Memory FULL output		
	Ready output		
	Error output	NPN open collector output (N.C.)	PNP open collector output (N.C.)
Ethernet interface		1000BASE-T/100BASE-TX	
USB Interface		USB 2.0 high speed compliant (USB 1.1 Full-SPEED compatible)	
RS-232C interface		Measurement data output and control I/O (Can select a baud rate of up to 115200 bits/s)	
Rating	Voltage	24 VDC, including ±10% ripple (P-P)	
	Maximum current consumption	1.3 A or less when connected to 1 head/ 1.9 A or less when connected to 2 heads	
Environmental resistance	Operating ambient temperature	0 to +50°C 32 to 122°F	
	Operating ambient humidity	20 to 85% RH (No condensation)	
Weight		Approx. 1500 g	

- The rating for NPN open-collector output is up to 50 mA (40 V or less), residual voltage of up to 1 V
- The rating for PNP open-collector output is up to 50 mA (30 V or less), residual voltage of up to 1 V
- The rating for non-voltage input is up to 1 V for ON voltage and up to 0.6 mA for OFF current
- The rating for voltage input is a maximum input voltage of 26.4 V, a minimum ON voltage of 10.8 V, and up to 0.6 mA for OFF current

DISPLAY OUTPUT UNIT

Model		LJ-VM100
Monitor output		Analog RGB XGA (1024×768) Touch panel monitor (CA-MP120T), specialized connector included
Voltage		Supplied from the controller
Power consumption		2.5 W or less
Environmental resistance	Operating ambient temperature	0 to +50°C 32 to 122°F
	Operating ambient humidity	20 to 85% RH (No condensation)
Weight		Approx. 400 g

LJ-H2 (LJ-NAVIGATOR 2) OPERATION SYSTEM ENVIRONMENT

Item		Minimum system requirements
PC Interface	Ethernet*1	1000BASE-T/100BASE-TX
	USB*1	USB 2.0 high speed compliant (USB 1.1 Full-SPEED compatible)
Supported OS		Windows7 (Home Premium, Professional, Ultimate) Windows Vista (Home Basic, Home Premium, Business, Ultimate) Windows XP (SP2 or later) (Home Edition, Professional Edition)
Supported languages		Japanese, English, German, French, Simplified Chinese, Traditional Chinese
CPU		Core i3 2.3 GHz or higher
Memory capacity		2GB or more
2D cache memory		2MB or more
Free space on hard disk		10GB or more
Display resolution		XGA (1024 x 768) or higher
Weight		Approx. 400 g

*1 Connections through a hub are not covered under warranty.

- Windows is a registered trademark of the Microsoft Corporation, U.S.A.
- Core is a registered trademark of the Intel Corporation.

Sensor Head/communication unit

PROFINET UNIT

Model		CB-PN100
Compatible network		PROFINET IO communication
Ethernet	Compliant standards	IEEE 802.3u*1
	Transmission speed	100 Mbps, full duplex (100BASE-TX)
	Transmission media	STP or Category 5e or higher UTP
	Maximum cable length	100 m 328.1'
PROFINET IO	Supported functions	Data I/O communication
		Record data communication
	Number of connectable PROFINET IO controllers	1
	Update time	2 ms to 2048 ms
	GSDML	Version 2.25
	Conformance class	Conformance Class A compliant
	Conformance test version	Based on Version 2.2.4
	Applicable protocol	LLDP, DCP
Power supply voltage		24 V ±10% (supplied from the controller unit of the laser scanner)
Power consumption		0.12 A max.
Weight		Approx. 470 g

*1 Although this unit conforms to IEEE 802.3u and can establish 100 Mbps full duplex communication using AutoNegotiation function, it does not have AutoCrossOver and AutoPolarity functions that are normally required for the PROFINET IO standard. Select a straight or cross cable according to the Ethernet port of the device to be connected.

EtherNet/IP UNIT

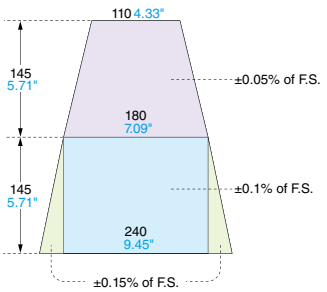
Model		CB-EP100
Compatible network		EtherNet/IP and displacement sensor-specific protocols (socket communication)
Ethernet	Compliant standards	IEEE 802.3 (10BASE-T), IEEE 802.3u (100BASE-TX)
	Transmission speed	10 Mbps (10BASE-T), 100 Mbps (100BASE-TX)
	Transmission media	STP or Category 3 or higher UTP (10BASE-T), STP or Category 5 or higher UTP (100BASE-TX)
	Maximum cable length	100 m 328.1' (Distance between the unit and Ethernet switch)
	Maximum number of connectable hubs*1	4 hubs (10BASE-T), 2 hubs (100BASE-TX)
EtherNet/IP	Supported functions	Cyclic communication (Implicit messaging), Message communication (Explicit messaging), Compatible with UCMM and Class 3
	Number of connections	64
	RPI	0.5 ms to 10000 ms (in 0.5 ms)
	Tolerable communication bandwidth for cyclic communication	6000 pps
	Message communication	UCMM, Class 3
	Conformance test	Compatible with Version A9
Power supply voltage		24 VDC, including ±10% ripple (P-P) (supplied from the controller unit of the laser scanner)
Power consumption		0.12 A max.
Environmental resistance	Operating ambient temperature	0 to +50°C 32 to 122°F
	Operating ambient humidity	20 to 85% RH (No condensation)
Weight		Approx. 470 g

*1 The number of connectable hubs is not limited when using a switching hub.

SENSOR HEAD UNIT

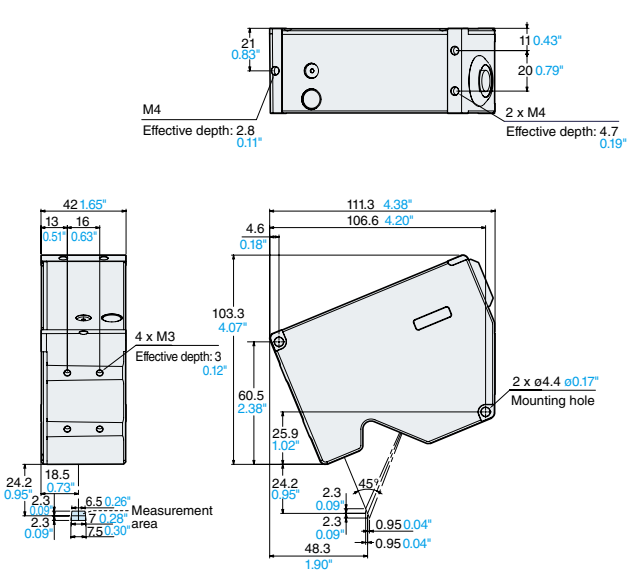
Model		LJ-V7020K*11	LJ-V7020*11	LJ-V7060K	LJ-V7060	LJ-V7080	LJ-V7200	LJ-V7300
Mounting conditions		Specular reflection	Diffuse reflection	Specular reflection	Diffuse reflection			
Reference distance		24.2 mm 0.95"	20 mm 0.79"	54.6 mm 2.15"	60 mm 2.36"	80 mm 3.15"	200 mm 7.87"	300 mm 11.81"
Measurement range	Z-axis (height)	±2.3 mm 0.09" (F.S.=4.6 mm 0.18")	±2.6 mm 0.10" (F.S.=5.2 mm 0.20")	±7.6 mm 0.30" (F.S.=15.2 mm 0.60")	±8 mm 0.31" (F.S.=16 mm 0.63")	±23 mm 0.91" (F.S.=46 mm 1.81")	±48 mm 1.89" (F.S.=96 mm 3.78")	±145 mm 5.71" (F.S.=290 mm 11.42")
	X-axis (width) NEAR side	6.5 mm 0.26"	6.5 mm 0.26"	8 mm 0.31"	13.5mm 0.53"	25 mm 0.98"	51mm 2.01"	110 mm 4.33"
	X-axis (width) Reference distance	7 mm 0.28"	7 mm 0.28"	14 mm 0.55"	15 mm 0.59"	32 mm 1.26"	62 mm 2.44"	180 mm 7.09"
	X-axis (width) Far side	7.5 mm 0.30"	7.5 mm 0.30"	8 mm 0.31"	15 mm 0.59"	39 mm 1.54"	73 mm 2.87"	240 mm 9.45"
Light source		Blue semiconductor laser						
	Wavelength	405 nm (visible beam)						
	Laser class IEC60825-1 FDA(CDRH) Part 1040.10*1	Class 2M Laser Product*12		Class 2 Laser Product	Class 2M Laser Product*12	Class 2 Laser Product		
	Output	10 mW		4.8 mW	10 mW	4.8 mW		
Spot size (reference distance)		Approx. 14 mm x 35 µm 0.55" x 1.38 Mil		Approx. 21 mm x 45 µm 0.83" x 1.77 Mil		Approx. 48 mm x 48 µm 1.89" x 1.89 Mil	Approx. 90 mm x 85 µm 3.54" x 3.35 Mil	Approx. 240 mm x 610 µm 9.45" x 24.02 Mil
Repeatability*2	Z-axis (height)*3	0.2 µm 0.01 Mil		0.4 µm 0.02 Mil		0.5 µm 0.02 Mil	1 µm 0.04 Mil	5 µm 0.20 Mil
	X-axis (width)*4	2.5 µm 0.10 Mil		5 µm 0.20 Mil		10 µm 0.39 Mil	20 µm 0.79 Mil	60 µm 2.36 Mil
Linearity	Z-axis (height)*5	±0.1% of F.S.						±0.05 to ±0.15% of F.S.*6
Profile Data interval	X-axis (width)	10 µm 0.39 Mil		20 µm 0.79 Mil		50 µm 1.97 Mil	100 µm 3.94 Mil	300 µm 11.81 Mil
Sampling cycle (trigger interval)*7		Top speed: 16 µs (high-speed mode) Top speed: 32 µs (advanced function mode)						
Temperature characteristics		0.01% of F.S./°C						
Environmental resistance	Enclosure rating*8	IP67 (IEC60529)						
	Ambient operating illuminance*9	Incandescent lamp: 10000 lux max.						
	Ambient temperature*10	0 to +45°C 32 to 113°F						
	Operating Ambient humidity	20 to 85% RH (No condensation)						
	Vibration resistance	10 to 57 Hz, 1.5 mm 0.06" double amplitude in X, Y, and Z directions, 3 hours respectively						
	Impact resistance	15G/6 msec						
Material		Aluminum						
Weight		Approx. 410 g		Approx. 450 g		Approx. 400 g	Approx. 550 g	Approx. 1000 g

*1 The laser classification for FDA(CDRH) is implemented based on IEC60825-1 in accordance with the requirements of Laser Notice No. 50.
*2 This value is from a case in which measurement has been performed with a reference distance with 4096 times of averaging.
*3 The measurement targets are KEYENCE standard targets. This value is from a case in which the average height of the default setting area has been measured in height mode. All other settings are default.
*4 The measurement target is a pin gauge. This value is from a case in which the position of the intersection between the rounded surface of the pin gauge and the edge level has been measured in position mode. All other settings are default.
*5 The measurement targets are KEYENCE standard targets. The profile data is from a case in which measurement has been performed with 64 times of smoothing and 8 times of averaging. All other settings are default.
*6 The linearity will differ depending on the measurement area. (See the diagram on the right.)
*7 For high-speed mode, when the measurement area is at its minimum, binning is ON, image capture mode is set to standard, and parallel image capture is ON. All other settings are default. For advanced function mode, when the measurement area is at its minimum, binning is ON and image capture mode is set to standard. All other settings are default.
8 This value is from a case in which the sensor head cable (CB-B) or extension cable (CB-B*E) has been connected.
*9 This is the illuminance for the light-receiving surface of the sensor head during white paper measurement when light has been shined onto the white paper.
*10 The sensor head must be mounted on a metal plate for use.
*11 The double polarization function cannot be used.
*12 Do not look into the beam directly using any optical instruments (such as eye loupes, magnifiers, microscopes, telescopes, or binoculars). Viewing the laser output with an optical instrument may pose an eye hazard.

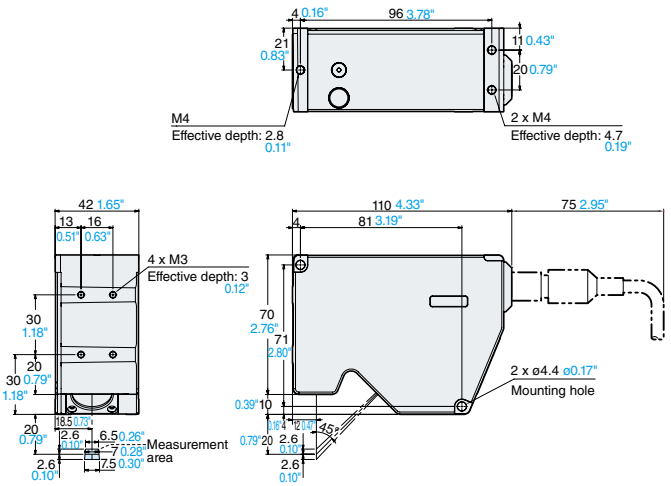


Sensor head

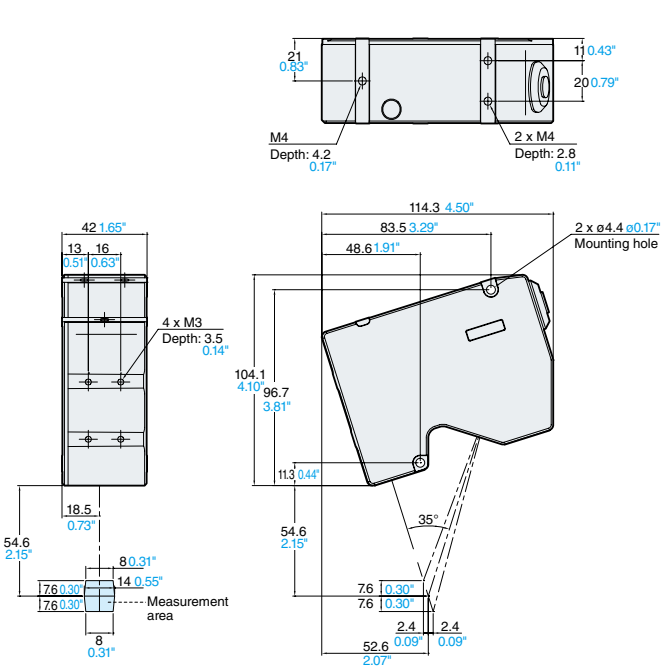
Ultra high-accuracy specular reflection model
LJ-V7020K



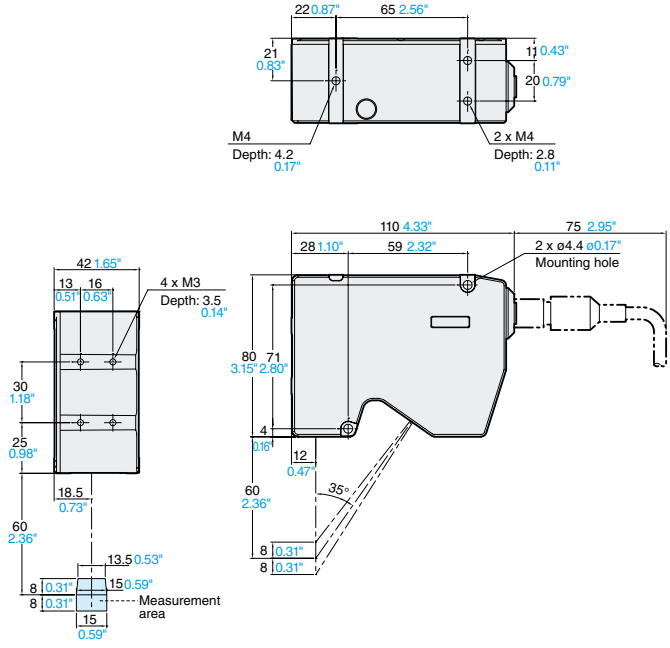
Ultra high-accuracy model
LJ-V7020



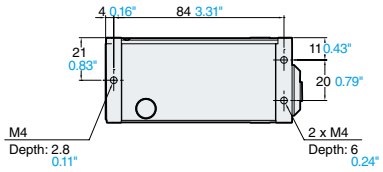
High-accuracy specular reflection model
LJ-V7060K

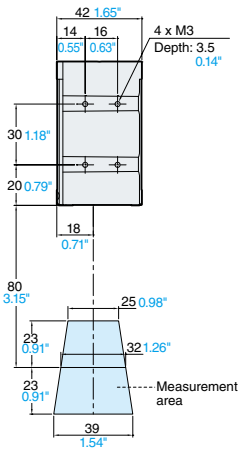


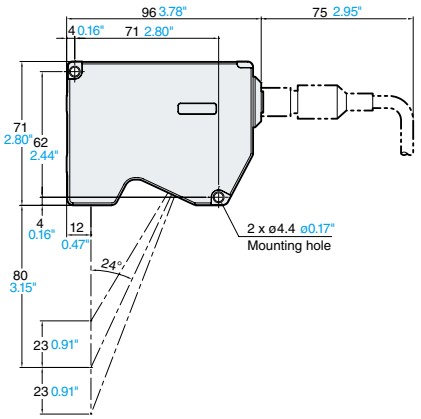
High-accuracy model
LJ-V7060



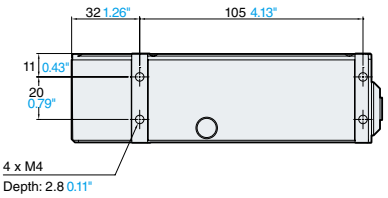
Middle-range model
LJ-V7080

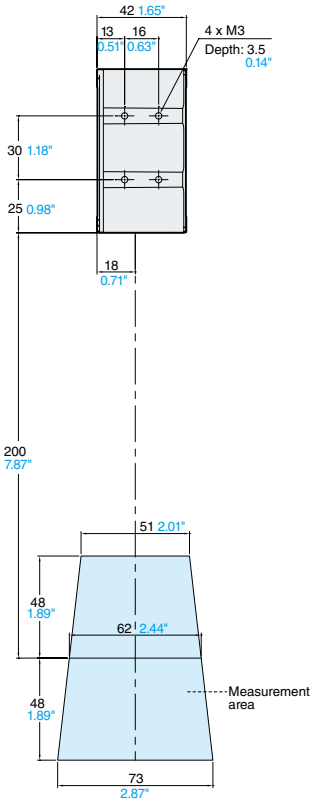


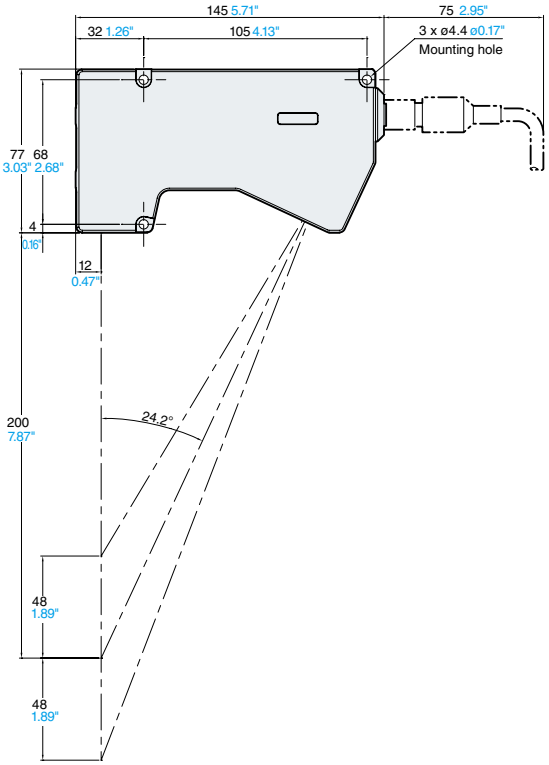




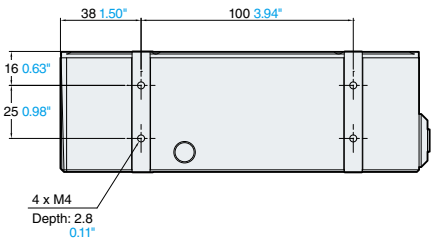
Long-range model
LJ-V7200

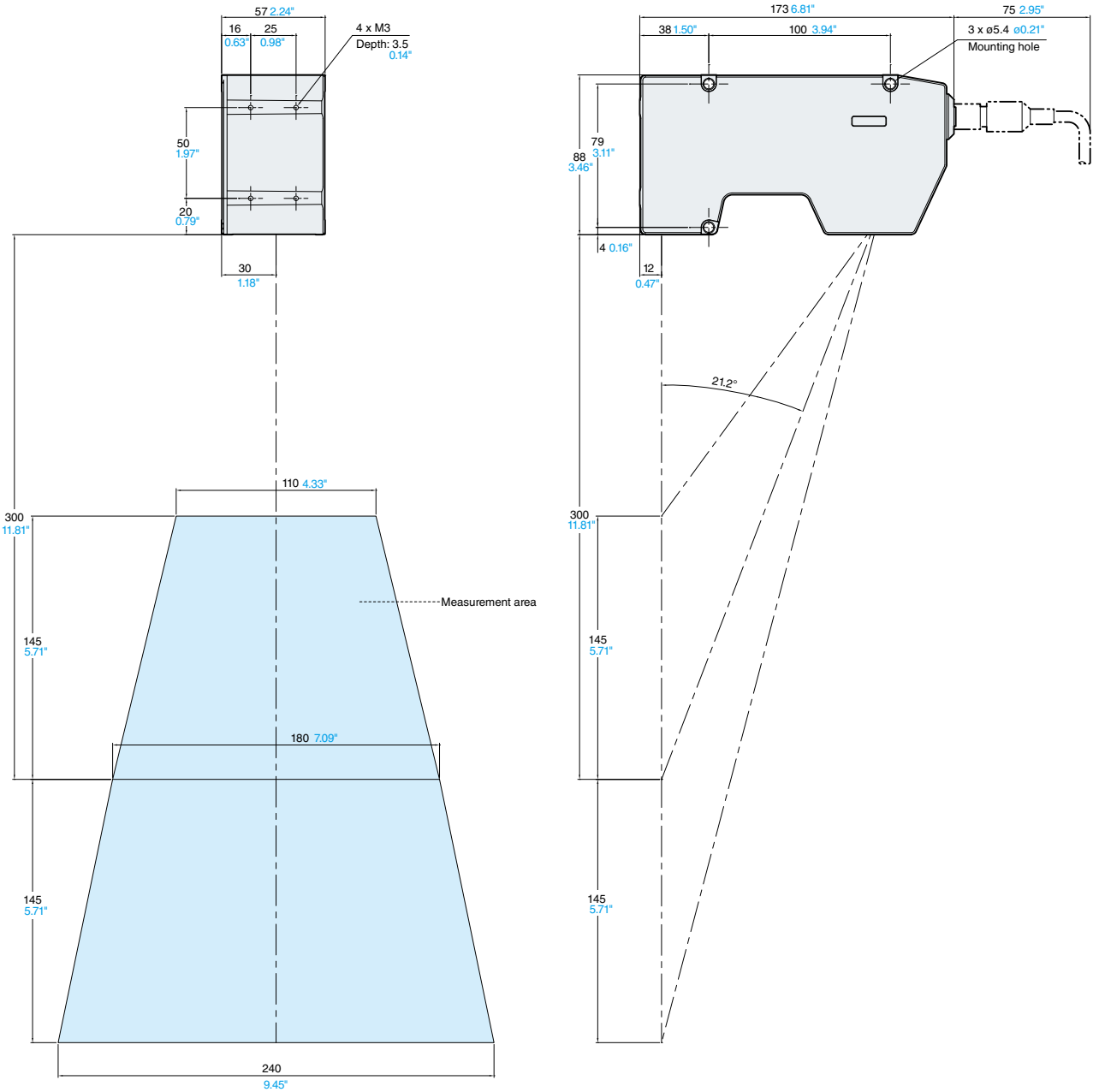




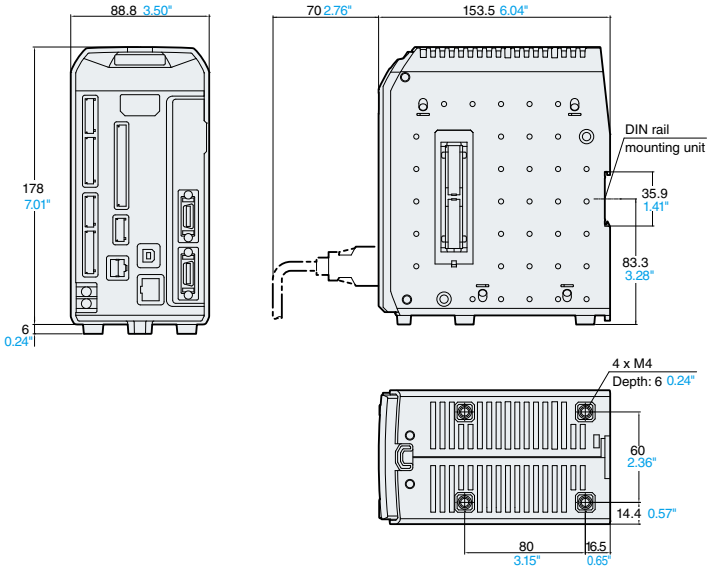


Ultra-long range model
LJ-V7300

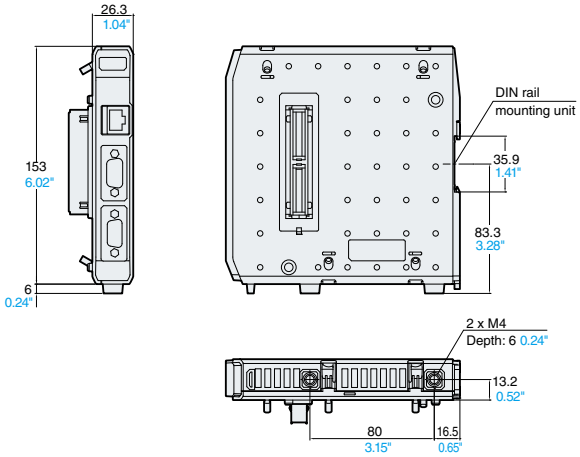




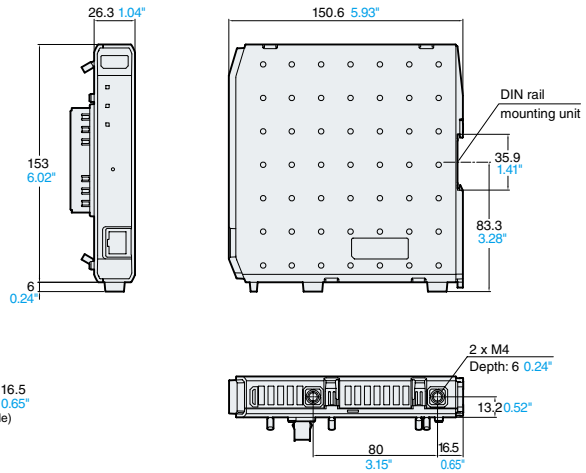
Multi-function controller
LJ-V7001(P)



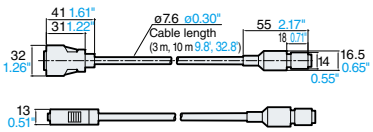
Display output unit
LJ-VM100



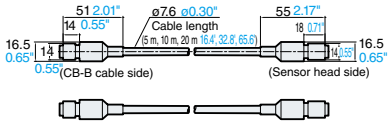
EtherNet/IP unit **CB-EP100**
PROFINET unit **CB-PN100**



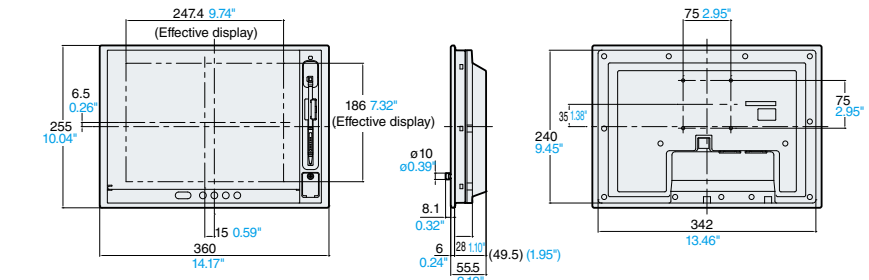
Head connection cable
CB-B3/CB-B10



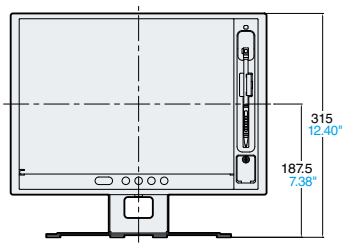
Head connection extension cable
CB-B5E/CB-B10E/CB-B20E

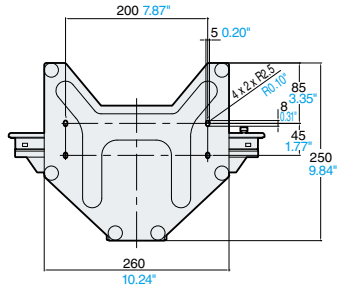


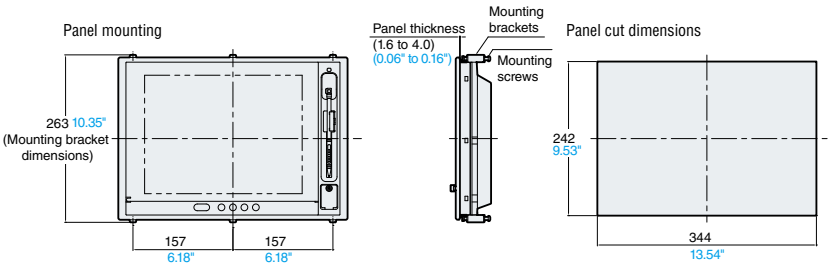
Touch panel HMI
CA-MP120T



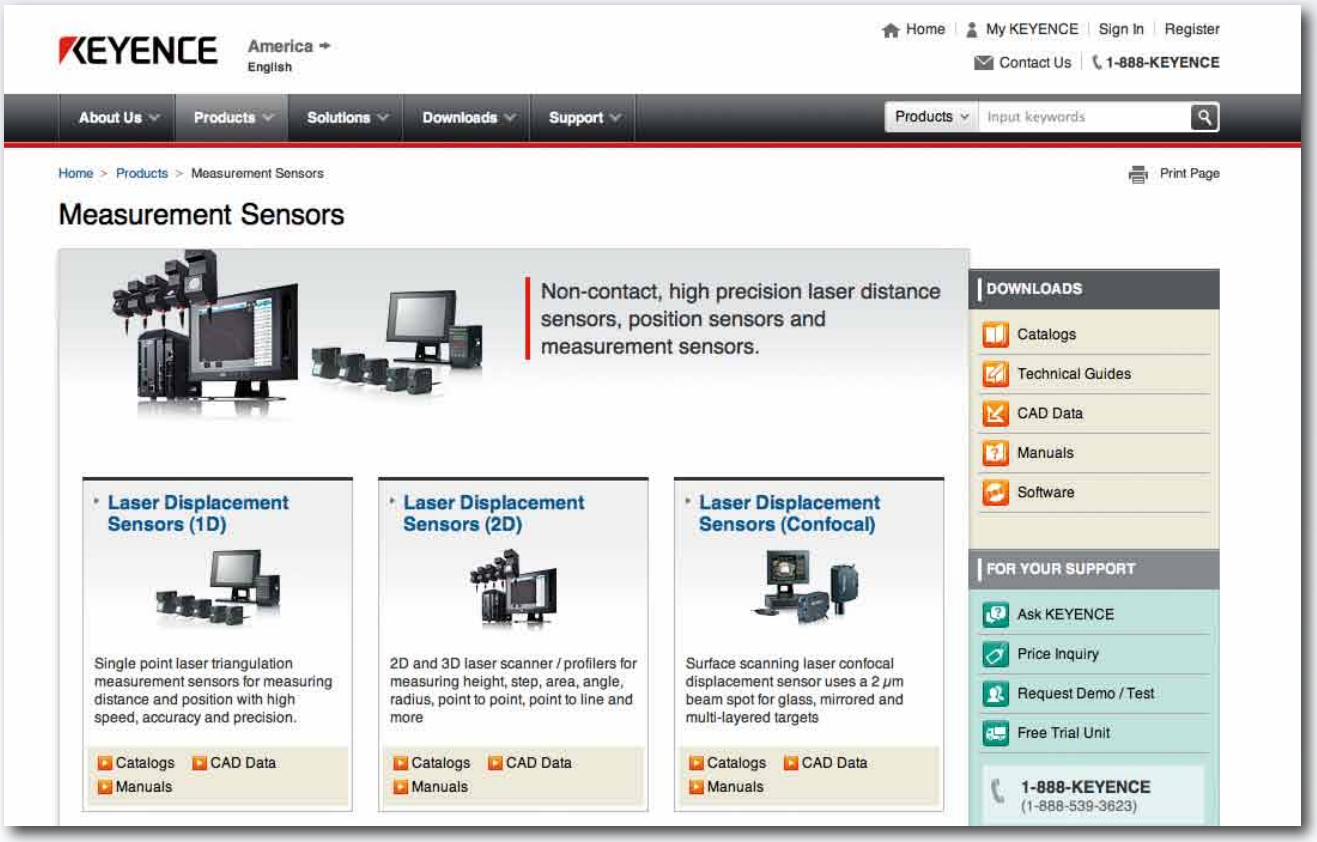
Specialized monitor stand
OP-87262







Visit our website for answers to all your measurement or gauging questions.



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KEYENCE CORPORATION OF AMERICA

Corporate Office 669 River Drive, Suite 302, Elmwood Park, NJ 07407 PHONE: 888-539-3623 FAX: 855-539-0123 E-mail: keyence@keyence.com

Sales & Marketing Head Office 1100 North Arlington Heights Road, Suite 210, Itasca, IL 60143 PHONE: 888-539-3623 FAX: 855-539-0123

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KEYENCE CANADA INC.

Head Office PHONE: 905-366-7655 FAX: 905-366-1122 E-mail: keyencecanada@keyence.com
Montreal PHONE: 514-694-4740 FAX: 514-694-3206 **Windsor** PHONE: 905-366-7655 FAX: 905-366-1122

KEYENCE MEXICO S.A. DE C.V.

PHONE: +52-81-8220-7900 FAX: +52-81-8220-9097
E-mail: keyencemexico@keyence.com

KA1-1124

LJVnew-KA-C3-US 1035-3 611848 Printed in Japan