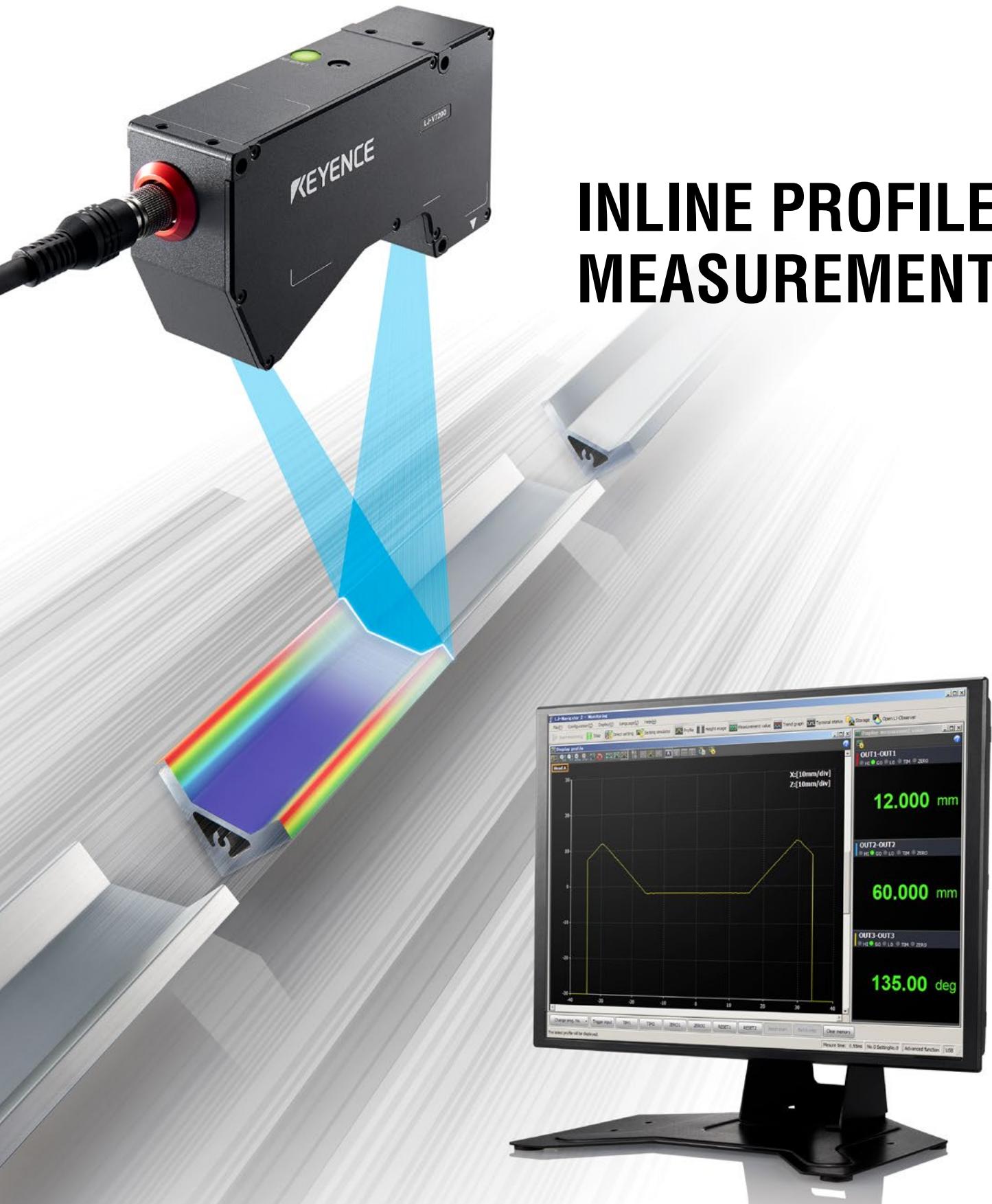


KEYENCE

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

CE



LJ-V7000 Series

CONTACT-TYPE MEASURING SENSORS

Contact-type sensors can lead to part damage such as **scratches** or inaccurate readings of **soft, compressible objects**. The manual tools are also prone to **variation between operators**.



OFFERING A SOLUTION TO ANY PROBLEM

2D/3D Laser Profiler

LJ-V Series

NON-CONTACT MEASUREMENT

Direct measurement using a laser

No damage to workpieces

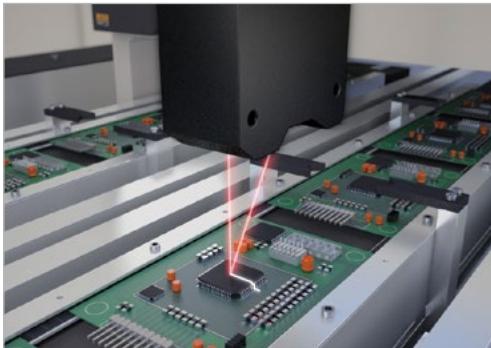
Removes operator error

No need to stop the line



1D LASER DISPLACEMENT SENSORS

Measurements such as height difference or warpage require **installing multiple sensors** or scanning the target. This can be difficult if **space is limited** or takt time is critical.



Multiple units required

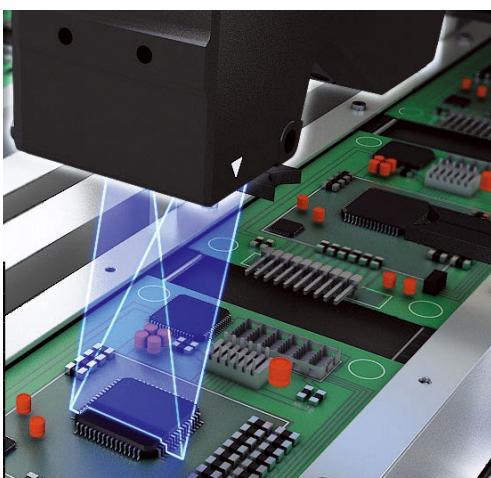
ONE DEVICE FOR MULTIPLE SOLUTIONS

Measure once with a 2D laser

Multiple measurement modes

Compact, space-saving design

No need to move the sensor



CAMERA INSPECTION MACHINES

Area cameras can be used to inspect width or position, but inspecting **height and height difference** requires a second device. **Installing lighting** can also be troublesome.



2D measurements only

X, Y, AND Z PLANES WITH A SINGLE DEVICE

Inspect using 3D image data

No lighting necessary

Height measurement is possible

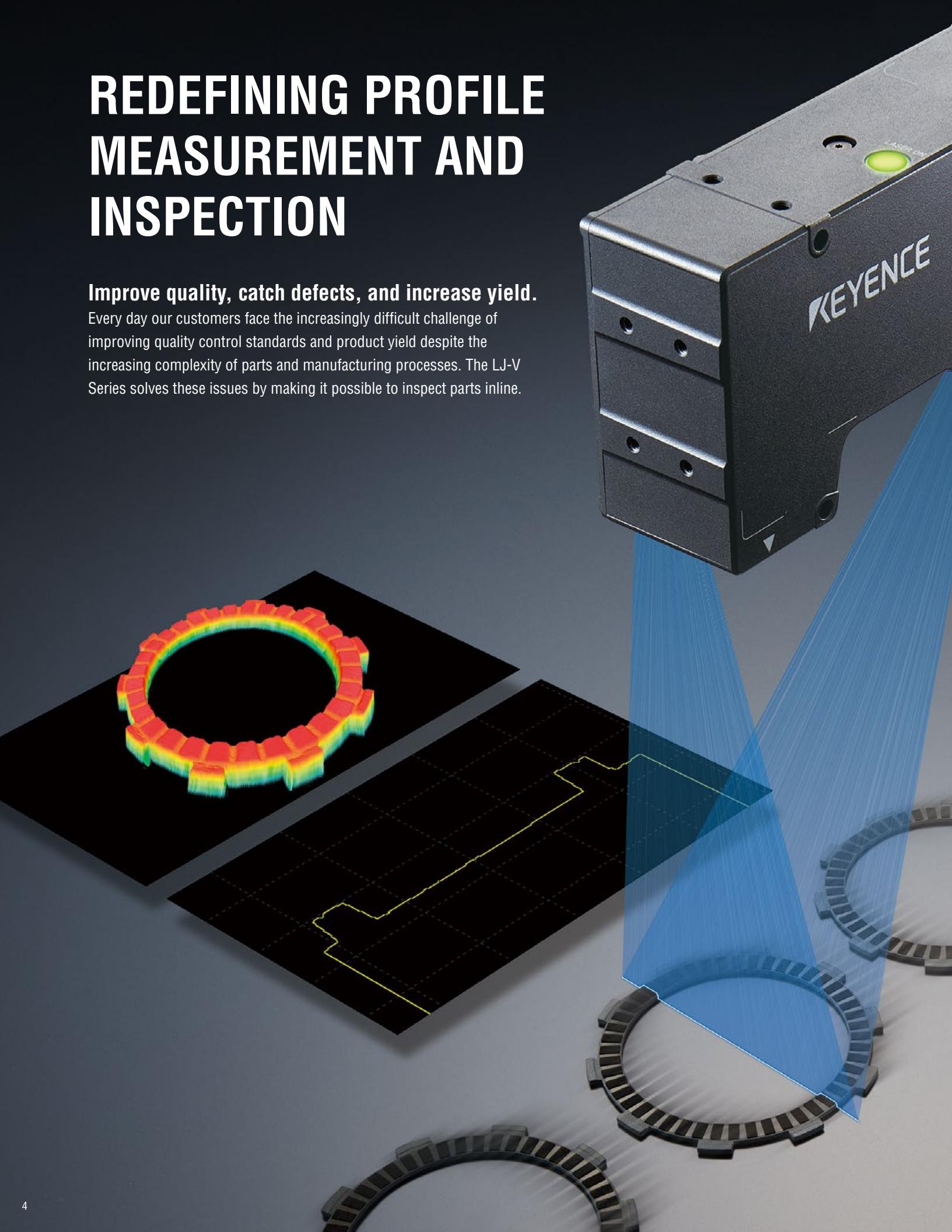
Accurate regardless of color or contrast



REDEFINING PROFILE MEASUREMENT AND INSPECTION

Improve quality, catch defects, and increase yield.

Every day our customers face the increasingly difficult challenge of improving quality control standards and product yield despite the increasing complexity of parts and manufacturing processes. The LJ-V Series solves these issues by making it possible to inspect parts inline.





FAST

01

HIGH-SPEED SAMPLING

The LJ-V Series achieves sampling speeds up to 64,000 Hz. This makes it possible to measure parts moving at extremely high speeds, in high definition, without missing a detail.

VERSATILE

02

STABLE INSPECTION OF ANY SURFACE

The wide dynamic range of the HSE3-CMOS allows accurate profiles to be captured, even in areas with varied reflectivity due to target color, material, or shape. The improved profile stability of the LJ-V series offers high accuracy measurement of any surface.

INDUSTRY FIRST

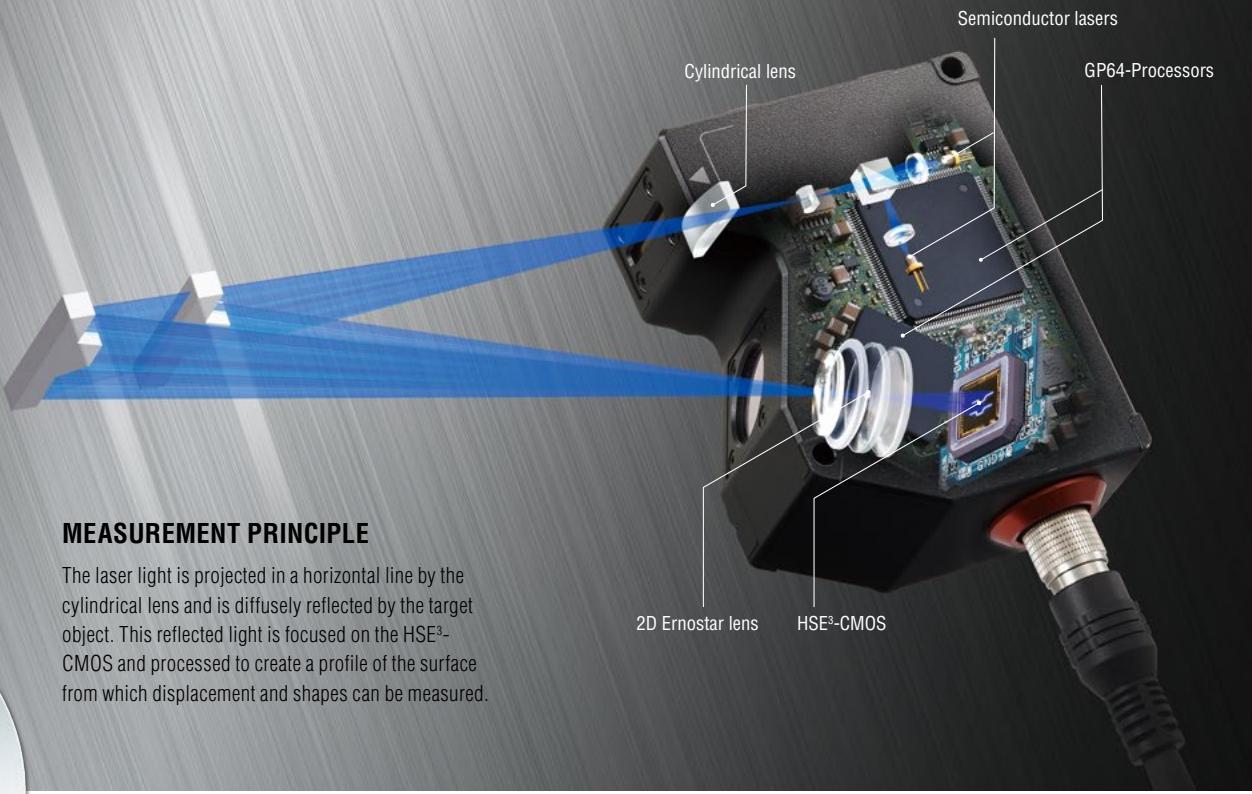
03

MORE MEASUREMENT CAPABILITY FROM A SINGLE DEVICE

The LJ-V Series is able to perform any measurement thanks to a variety of sensor heads and measurement modes, as well as 3D inspection when connected to an image processing system. In addition, the automatic setting optimization function makes operation easy for any user.



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



MEASUREMENT PRINCIPLE

The laser light is projected in a horizontal line by the cylindrical lens and is diffusely reflected by the target object. This reflected light is focused on the HSE³-CMOS and processed to create a profile of the surface from which displacement and shapes can be measured.

01

HIGH-SPEED SAMPLING

STABLE MEASUREMENT OF MOVING TARGETS IS POSSIBLE

▷ HSE³-CMOS * HS = High Speed, E³ = Enhanced Eye Emulation

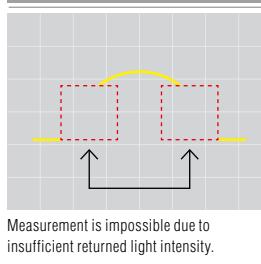
The LJ-V7000 Series is equipped with the newly developed HSE³-CMOS. In addition to improved speed, the dynamic range has been further improved over the established and conventional E³-CMOS. Even with the extremely short exposure time of 15.5 µs (64 kHz), it is sensitive enough to reliably measure surfaces with varied reflectivity, from black rubber to shiny metal, in a single capture thanks to its wide dynamic range.



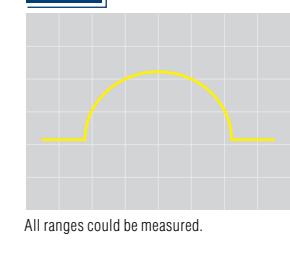
STOPPED TARGET



Conventional model



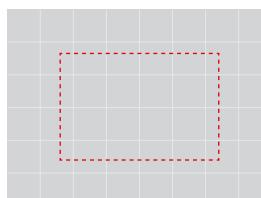
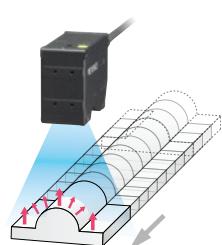
LJ-V | HSE³-CMOS



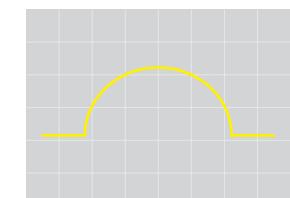
MOVING TARGET

DYNAMIC RANGE

2400x



Because there is even less light intensity, the measurement could not be performed at all.

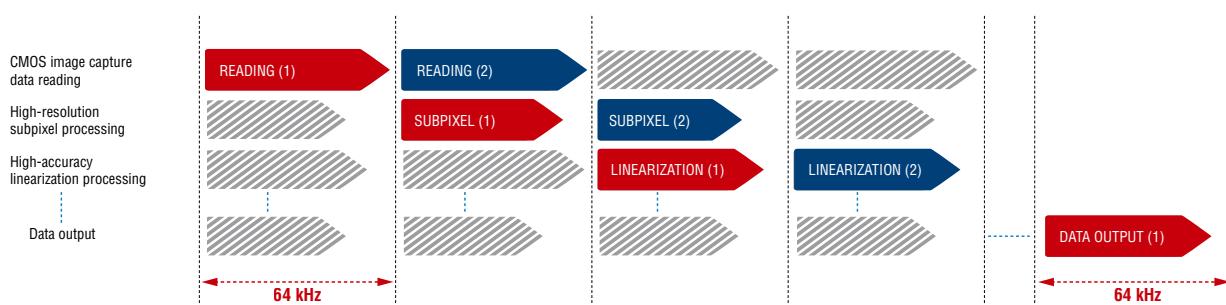
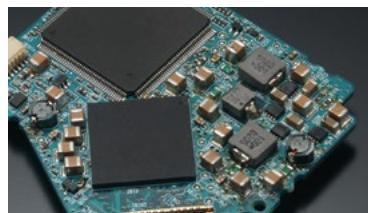


ACHIEVING ULTRA HIGH-SPEED MEASUREMENTS AT 64 kHz

► GP64-Processor*

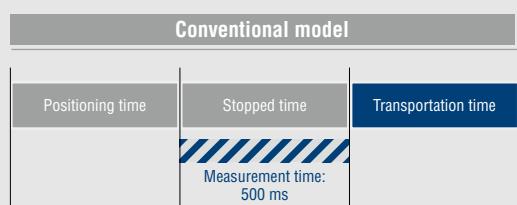
* G = Generating, P = Profiles

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

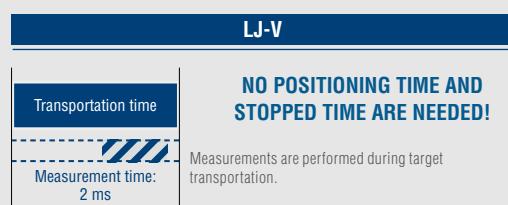


ADVANTAGES OF ULTRA HIGH-SPEED SAMPLING

REDUCED INSPECTION CYCLE TIME

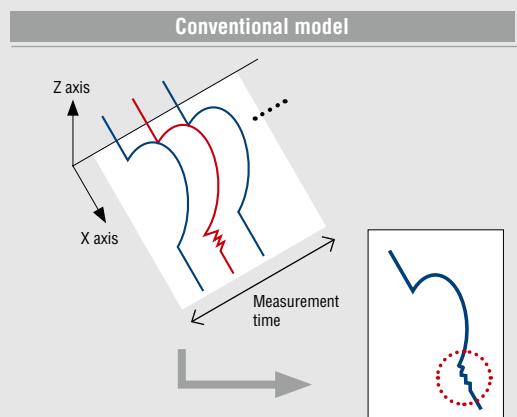


With the conventional method, it takes time to position a product, hold it in place for measurement, and transport or eject it in order to perform an accurate inspection.



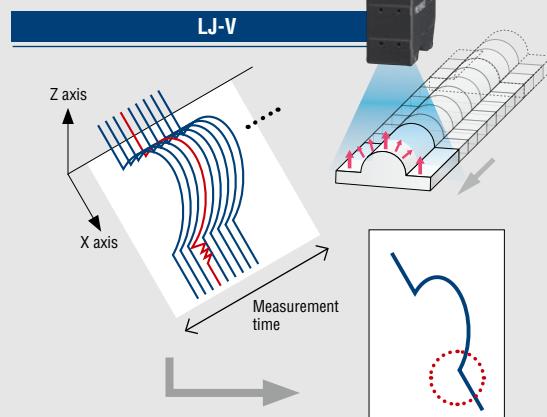
With the LJ-V Series, it's possible to inspect products while they are being transported, significantly reducing measurement time. This leads to improved cycle times.

STABILIZED MEASURED VALUES



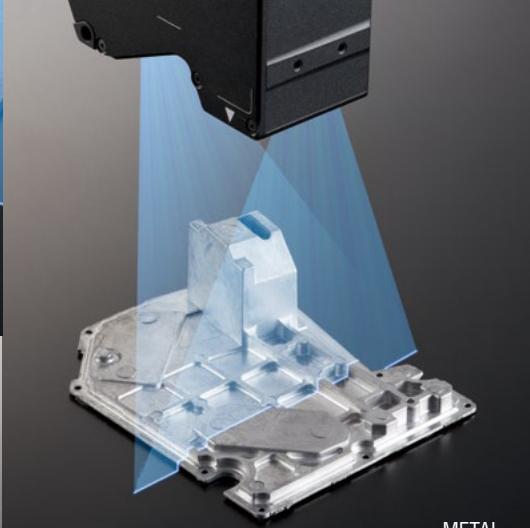
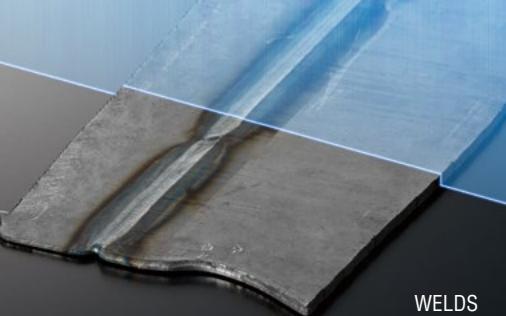
RESULT OF AVERAGING 3 PROFILES

With conventional models, measurement stability was limited due to insufficient sampling speeds necessary to hit the required cycle times. Without enough samples available, noise cannot be effectively removed.



RESULT OF AVERAGING 720 PROFILES

The LJ-V Series provides significantly higher profile stability by utilizing oversampling (240x faster than conventional models) to allow for profile averaging as well as abnormal value elimination using median filters.



RESIN

BLACK RUBBER

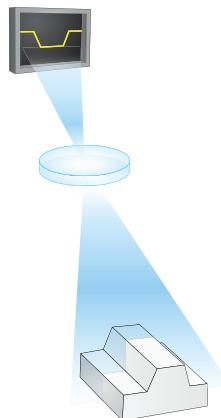
TRANSPARENT OBJECTS

STABLE INSPECTION OF ANY SURFACE

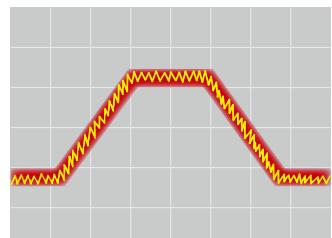
FORMS ACCURATE AND STABLE PROFILE IMAGES

▷ 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 stable, precise profile of the target. Additionally the received light density for the laser has been increased to amplify the received light intensity. By producing a high quality profile, the LJ-V series offers high accuracy measurement of any target, including those that are difficult to detect.

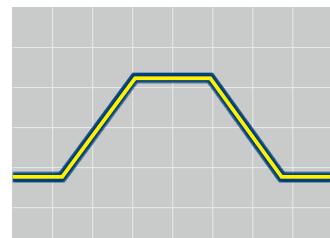


RED LASER (CONVENTIONAL)



With a conventional red laser.

BLUE LASER (LJ-V)

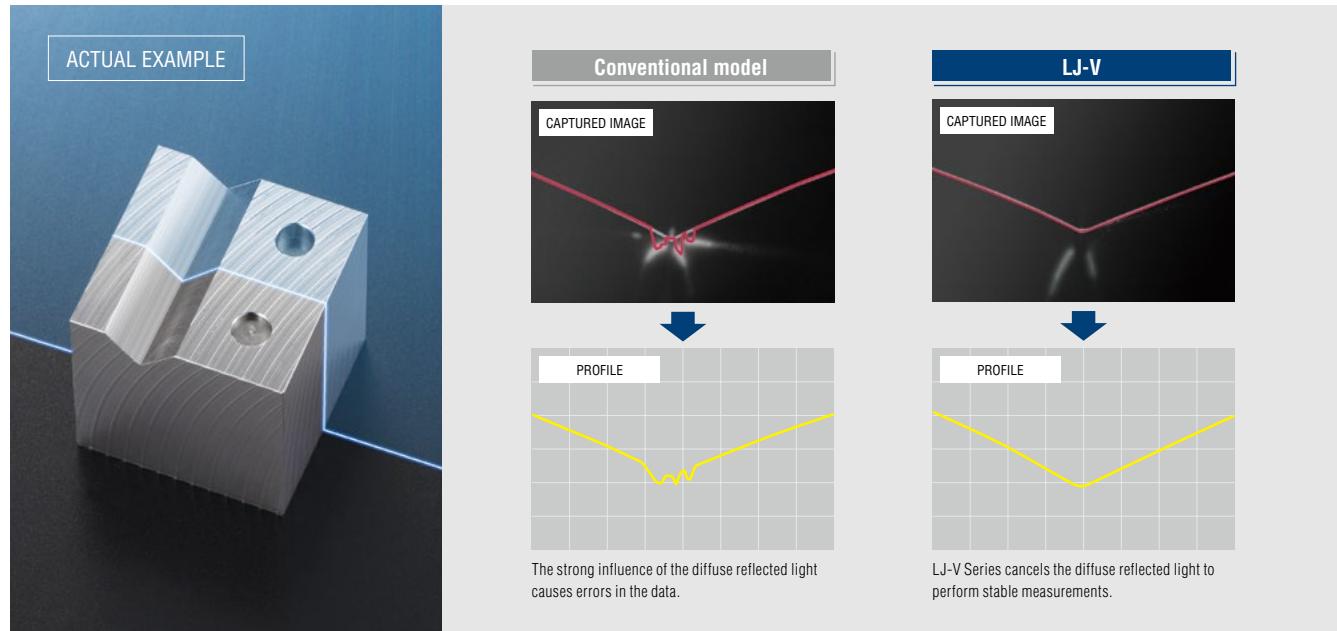
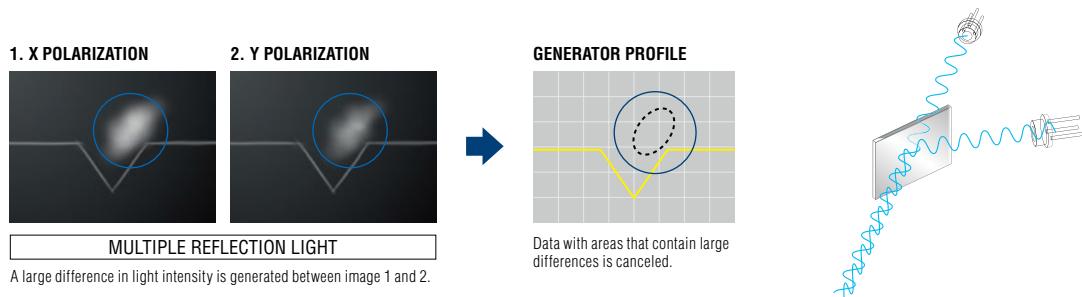


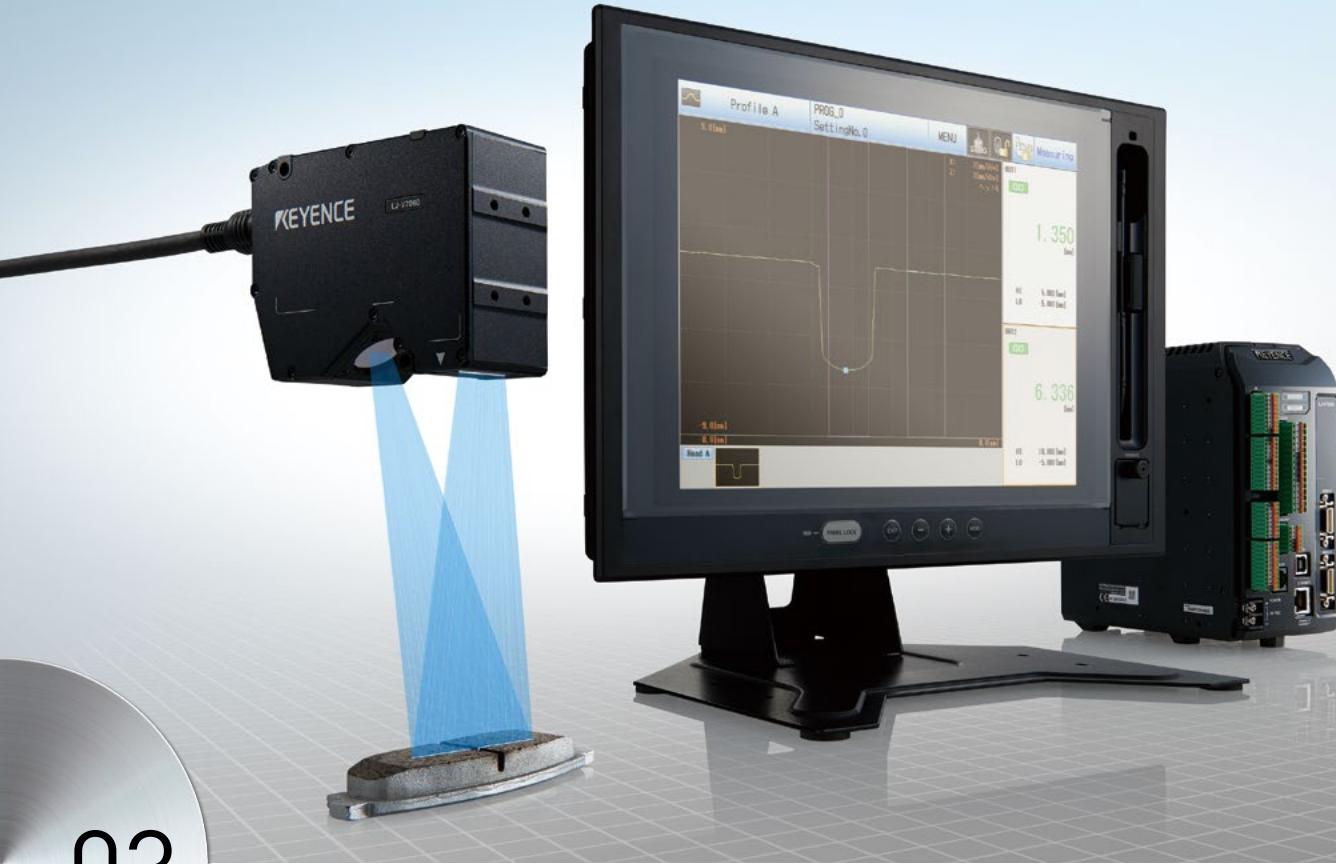
With a blue laser, the received light is sharply focused to enable the measurement of shapes with excellent accuracy.

IDENTIFIES AND IGNORES STRAY LIGHT REFLECTIONS

▷ Double polarization function

The double polarization function distinguishes and cancels multiple reflection light that acts as an obstacle to measurement. Light is shined at the target using two components, X- and Y-polarized light, and their reflections on the CMOS can be analyzed separately. Multiple reflection light will have slight differences in the amount of received light for X-polarization and Y-polarization, and this characteristic is used to identify and cancel data for areas where multiple reflections would have impacted the profile. This function is especially beneficial when measuring metaltargets with complex shapes.





03

MORE MEASUREMENT CAPABILITY FROM A SINGLE DEVICE

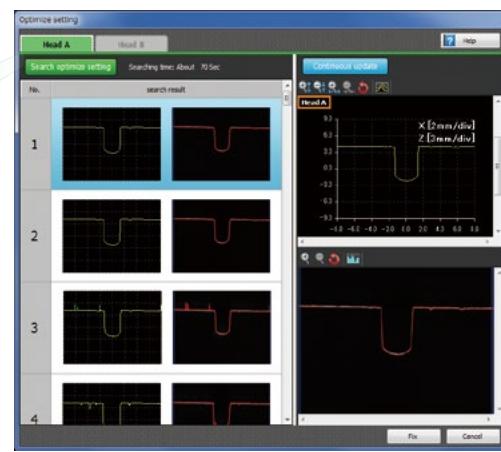
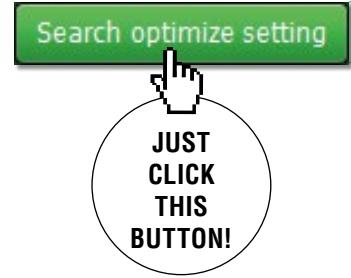


STEP 1

IMAGING CAPTURE SETTINGS — One-click optimization makes setup simple —

▷ Automatic setting optimization function

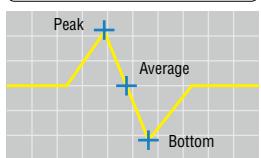
In order to obtain a stable and clean waveform, adjusting parameters like laser power, light sensitivity, and exposure time is necessary. By incorporating an automatic setting optimization function, conventional adjustment operations can be done with just one click.



STEP 2

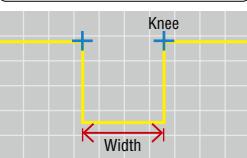
MEASUREMENT SETTINGS — 74 different measurement modes support a wide variety of inspections —

HEIGHT



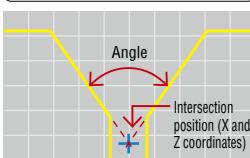
Measures the height within the specified range.

WIDTH AND POSITION



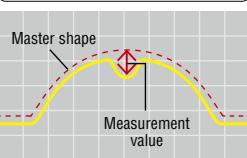
Measures the width and position under the specified conditions.

ANGLE AND INTERSECTION



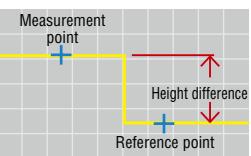
Measures the angle between and the intersection point of a pair of best fit lines.

MASTER PROFILE COMPARISON



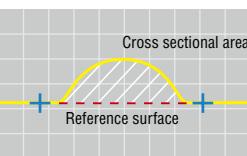
Makes a comparison with the registered master shape and measures the largest difference in height.

HEIGHT DIFFERENCE



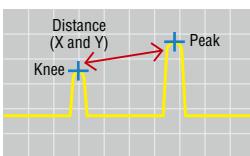
Measures the height difference from a reference point to a measurement point.

CROSS SECTIONAL AREA



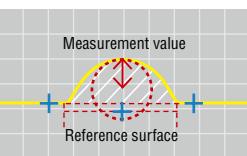
Measures the cross sectional area from a reference surface.

DISTANCE (POINT - POINT)



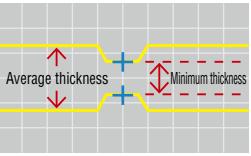
Measures the distance between two points.

RADIUS AND MIDPOINT



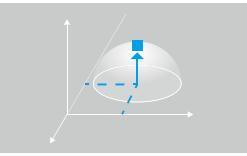
Measures the radius of a curved profile and the coordinates of the center position of a specified point.

THICKNESS

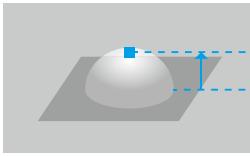


Measures the thickness within the specified range.

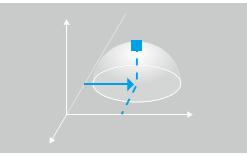
SIMPLE 3D SETTING (HEIGHT)



SIMPLE 3D SETTING (HEIGHT DIFFERENCE)



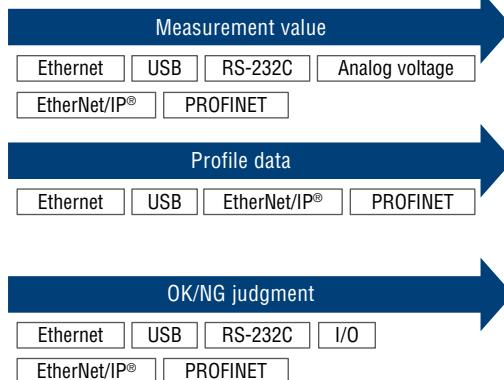
SIMPLE 3D SETTING (POSITION)



STEP 3

OUTPUT SETTINGS — Communication options for every application —

▷ OUTPUT METHOD



PC



PLC, etc.

Ethernet and USB can also be used with DLLs.

OUR AIM IS ON-SITE EASE OF USE

FLEXIBLE USER INTERFACE OPTIONS

Choose from 3 available user interface methods to setup programs and display measurement results:

- Touch panel
- PC software
- LCD monitor



Touch panel HMI
CA-MP120T

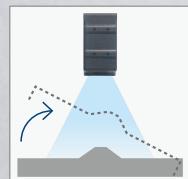
AN EMPHASIS ON INLINE MEASUREMENT

INLINE POSITION ADJUSTMENT FUNCTION (X, Y, AND Z)

Corrects positional misalignment of the target, eliminating errors in the measurement results due to target tilt.

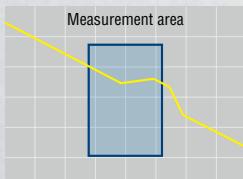
Accurate measurements are possible even in cases where the target is moving at random or when it is difficult to perform positioning.

$\theta \rightarrow X$ adjustment
(angle then x position)



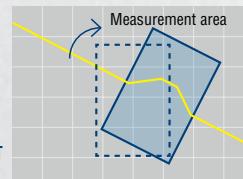
If the position of the workpiece becomes misaligned...

Conventional model

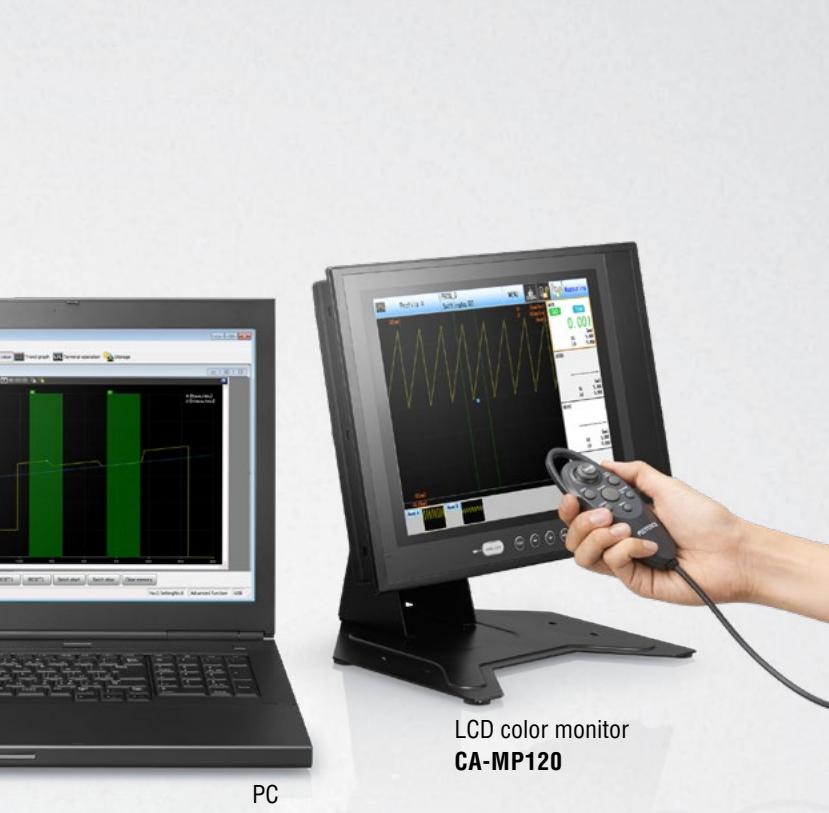


ADJUSTMENT

LJ-V



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



SPECIFICATIONS TO ACCOMMODATE ALL ON-SITE NEEDS

DIRECT ENCODER INPUT

Can perform encoder synchronized measurement up to a top speed of 64 kHz. Measure shapes in the direction of movement with accurate pitch.

HIGH-FLEX CABLE

A high flex cable comes standard with the unit. Can be installed on robots and other movable parts without concern.

IP67 RATED SENSOR HEAD AND CONNECTION CABLE

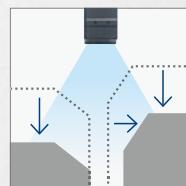
In addition to the sensor head, the connection cable also supports an IP67 enclosure rating. Safe to install even in dirty or dusty manufacturing environments.

PASSES IMPACT RESISTANCE TEST IEC 60068-2-27

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

DOUBLE XZ θ ADJUSTMENT FUNCTION

The LJ-V7000 Series is equipped with a new function that makes it possible to individually set corrections on two separate features. This is effective when measuring gaps, angles, or height differences of two targets that move independently.



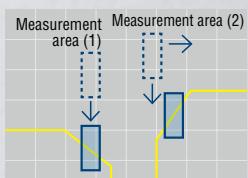
If the position of individual workpieces becomes misaligned...

Conventional model



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

LJ-V

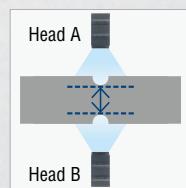


Because original adjustment is applied individually to measurement areas (1) and (2), measurement can be properly performed.

DUAL-HEAD ADJUSTMENT FUNCTION

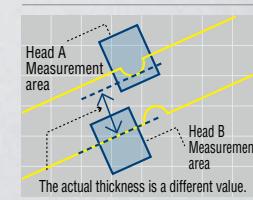
By understanding the positional relationship of both heads, it is possible to match the θ adjustment for both heads. Even when measuring targets with variation or incline changes, it is possible to measure the correct points.

Ex. Minimum thickness measurement



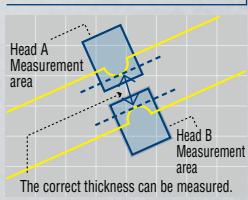
If the workpiece tilts...

Conventional model



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

LJ-V

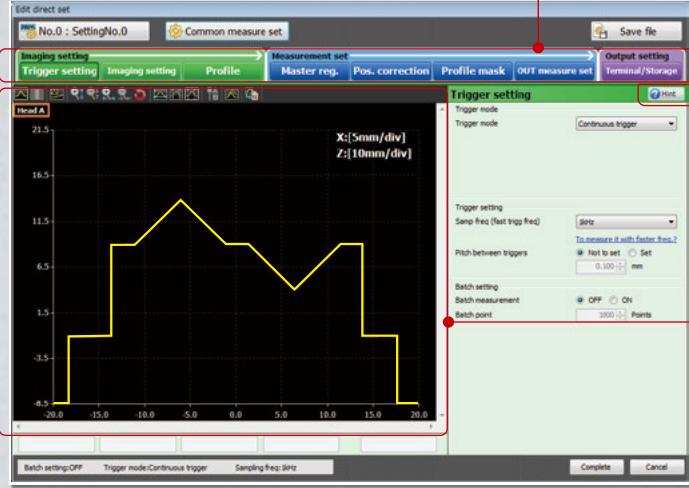


The θ adjustment center of rotation for both heads match, so the measurement area is not misaligned.

SIMPLE PROGRAMMING — LJ-Navigator2 —

View measurement results, configure settings, and transfer data all from one easy to use software package.

EASY SETTINGS



EASY NAVIGATION SETTINGS

Anyone can program settings intuitively by following the navigation bar from left to right, starting with image capture settings, followed by measurement settings, and ending with output settings.

HINT FUNCTIONS THAT DON'T REQUIRE THE MANUAL

"Hint" icons have been prepared for each screen.



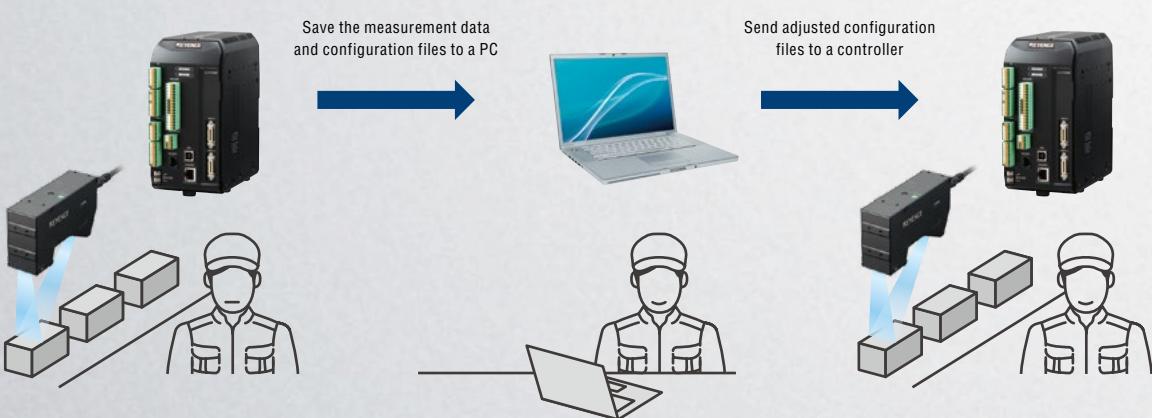
SETTINGS APPLIED IN REAL-TIME

The measurement conditions are applied to the settings screen profile in realtime. There is no need to return to the measurement screen for confirmation, reducing the time and effort spent on setup.

SIMULATION FUNCTION

Saved measurement data or data obtained in real time can be used to optimize measurement settings and position adjustments before re-measuring. This feature helps solve problems in as little time as possible, such as when settings must be changed or when optimization is necessary due to the addition of a new target object.

USEFUL APPLICATIONS



Time for a new target object. First, save the measurement data.

Use the simulation function on the PC software to optimize the configuration.

Now all that needs to be done is to load the adjusted configuration file. The settings can be configured immediately without even stopping the line

MULTI-SCREEN FUNCTION

Simultaneously view 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.



PROFILE STORAGE FUNCTION

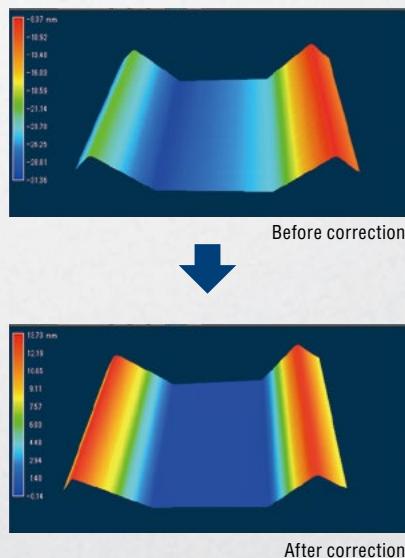
Store up to approx 160,000 profiles, as well as the measurement values for 16 outputs at the same time. The LJ-V7000 Series is equipped with various analysis functions, which are useful for the verification of defects and for research and development.



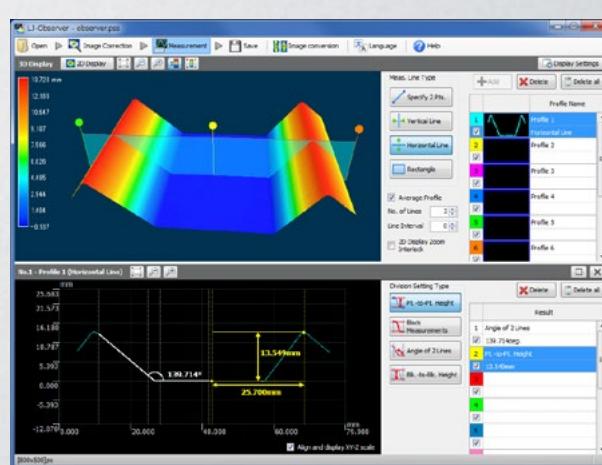
OFFLINE PROFILE OBSERVATION — LJ-Observer —

This tool uses saved measurement data to provide a 3D image for simple profile measurement.

3D VIEWER AND SURFACE SLANT ADJUSTMENT



SIMPLE PROFILE MEASUREMENT FUNCTION



Extracting a desired cross-section from 3D data allows for measurement of height, horizontal distance, and angle.

INLINE 3D MEASUREMENT

TWO TYPES OF SELECTABLE 3D MEASUREMENT SYSTEMS

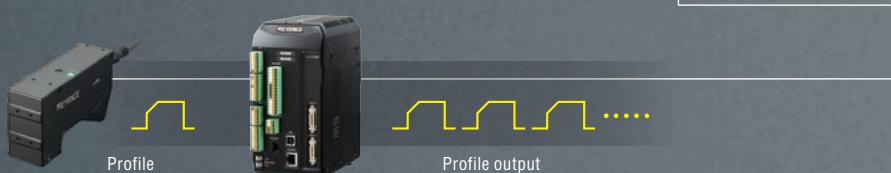
LJ-V Series + Image Processing System

By loading 2D profiles acquired by the LJ-V Series into the CV-X controller and stitching them together, it is possible to apply image processing to a 3D image.



LJ-V Series + PC

Measured profiles can be output from the LJ-V into a user developed PC program or application.



Usable with encoders

The number of pulses can be set arbitrarily, making it possible to install an encoder to best suit the imaging conditions (Support for 64 to 150000 pulses).

Unlike with conventional products, there's no need to select an encoder based on features such as the rotation speed of the shaft, the roller diameter, or the field of view.



**High-resolution
and
high-speed output**

With up to 150,000 pulses per revolution, it has a high-resolution output at a minimum of 0.0024° (8.64 seconds). High-speed output is also possible at a maximum output frequency of 16 MHz.

Its environmentally resistant design provides greater protection from water and dust, making devices even easier to use in the worksite (This does not include the head or shaft areas).

* If there is a chance that the shaft through-hole area will be exposed to oil droplets, use a cover or take other necessary precautions.

LJ-V SERIES + IMAGE PROCESSING SYSTEM

Combining the advanced profiling capabilities of the LJ-V Series with the Image Processing System opens new doors for quality inspection.

**LJ-V7000
Series**



Image Processing System



3D Image Acquisition

The continuous profile data captured with the LJ-V Series is loaded into the Image Processing System.

3D DATA

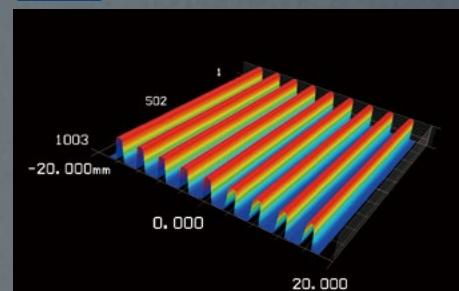
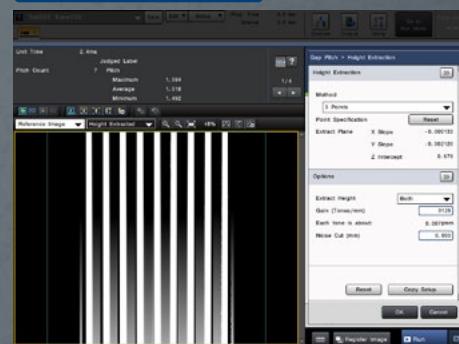


Image Processing

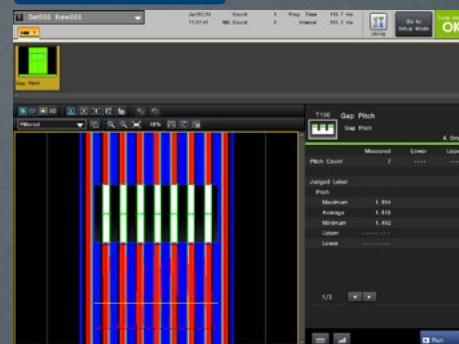
Within the Image Processing System, the height data is converted to a gray-scale image with 256 gradations. The Image Processing System utilizes 21 built-in pre-processing filters, such as real-time gray-scale adjustment and a blob filter to obtain the optimum image for the inspection.

HEIGHT GRAY-SCALE PROCESSING



AS FAST AS
2 MS PER
INSPECTION!

IMAGE PROCESSING RESULT



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, you can also detect defects such as scratches and chips on any surface.

MEASURING HEIGHT, AREA, AND VOLUME FROM 3D DATA

Zero Plane Specification

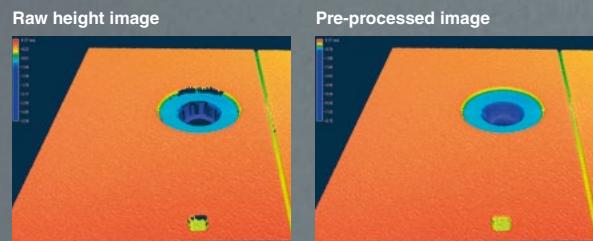
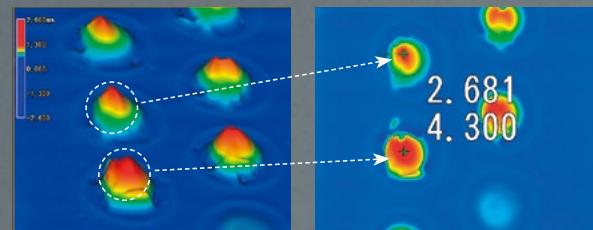
As the reference plane for height measurement, a “zero plane” can be specified separately for each workpiece and individual measurement tool. This ensures stable measurement even if workpieces change their orientation. In addition, setting a free-form plane for zero plane specification is also possible. This allows for calculation of properties such as height and depth on a curved surface.

Area and Volume Measurement

Measures the volume of the area(s) enclosed by the inspection region and the “zero plane”.



Even if a workpiece is inclined, the zero plane is automatically set according to the workpiece to obtain an accurate shape.



Pre-processed images reduce image noise or dropouts, making it possible to perform stable measurements.

16-bit Pre-Processing Dedicated for Height Images

Pre-processing height images creates consistent image quality for each workpiece and stabilizes measurements. Five types of pre-processing are available so you can select the method that best suits the target: Median, Average, Gaussian, Smoothing, and Invalid Pixel Interpolation.

HARNESS THE POWER OF A VISION SYSTEM APPLIED TO 3D DATA

Height extraction

Based on 3D data, a grayscale image is automatically generated with emphasis on the height you want to check. This allows you to use all conventional, established XG/CV-X functions. Targets which are hard to detect with conventional image processing can now be detected by combining multiple tools, such as free-form plane extraction and OCR.

Detect flaws in difficult areas using free-form plane

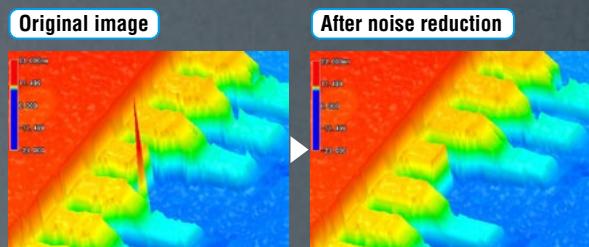
Area cameras cannot detect dents because images are shaded due to the influence of complex curves and surface irregularities. By applying a free-form plane and looking for relative height change, it's possible to inspect targets with complex shapes.



NEW FUNCTIONS FOR MORE STABLE 3D INSPECTION

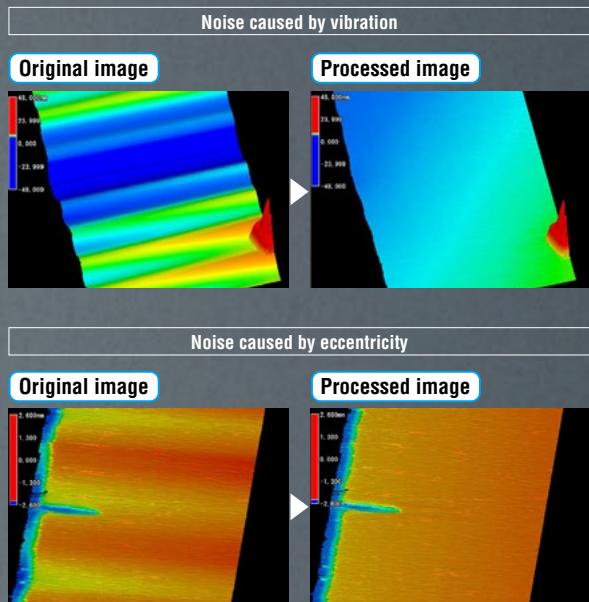
Projection Noise Removal

The LJ-V Series includes algorithms designed to exclude noise spikes in the 3D data. Noise removal sizes can be individually specified for the X and Y directions, enabling support for a wide range of workpieces.



Vibration Compensation Filter

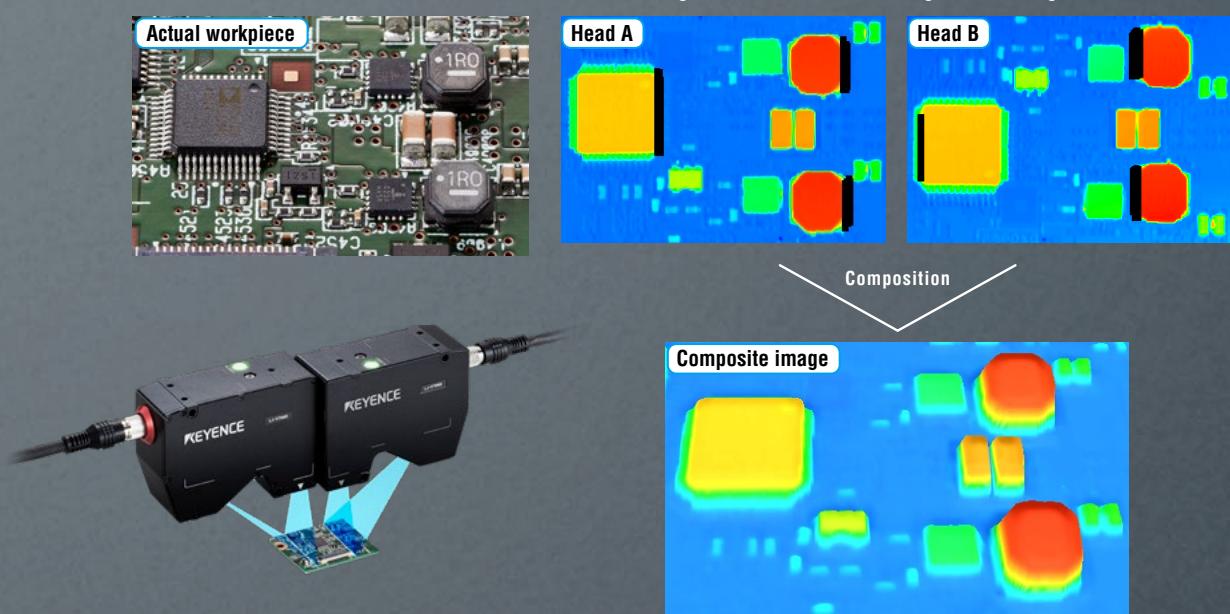
Stable detection is possible by suppressing noise caused by vibrations and eccentricity during conveyance. This allows for reduced fluctuations in data - eliminating a common bottleneck with inline inspection.



Dual Head Dead Angle Removal Function

Profile data from two directions is combined in order to provide dead angle information that could not otherwise have been measured.

Data is missing because there is a dead angle in both images.



It is possible to create an image without any missing data by using the "Dual head dead angle removal function".

EQUIPPED WITH MEASUREMENT TOOLS FOR CAPTURING TRUE APPEARANCE

Profile Measurement/Continuous Profile Measurement

Challenge of 2D profile measurement

Because the angle that cross-sectional profiles can be taken from is fixed, precise target positioning is required.

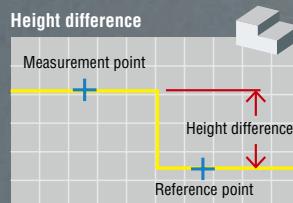
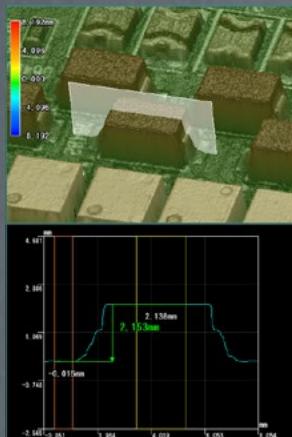
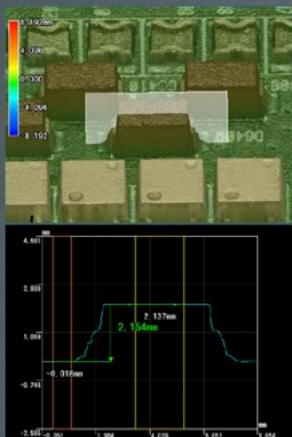
A cross-sectional profile could only be acquired in one direction.

With 3D profile measurement

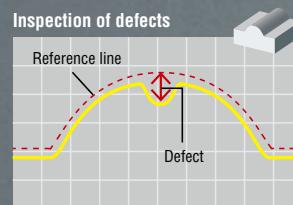
Correction that tracks the target position is possible, so even if the target position is misaligned, accurate measurement of the desired location is performed.

Acquiring a cross-sectional profile of a feature is possible from any angle or position.

Even if the target is misaligned on the conveyor, position adjustment enables accurate measurement at the desired location.



Measures the height difference between the measurement point and a reference point.



This uses profiled circles, straight lines, and free-form curves as a reference and identifies any areas that differ in height from the reference profile as defects.

Supports the range of inspections expected in 3D dimension inspections, through using all 15 types of measurement tool

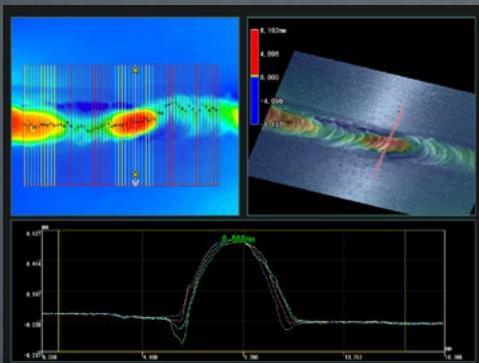


Analyze 16,000+ continuous cross-sections within an area to detect minute changes

Enables continuous profile measurement for acquired 3D shapes.

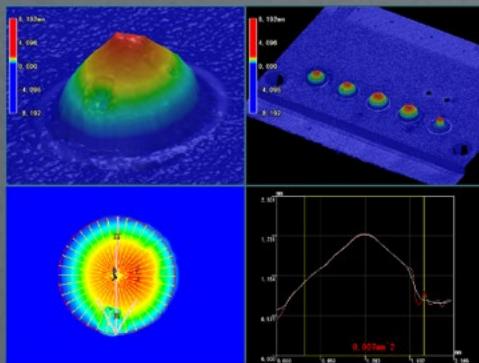
Output maximum, minimum, and NG (failure) profiles at a specified interval.

Welding appearance inspection



Continuously measure height and cross-sectional area.
Achieve stable inspections by measuring maximum and minimum values.

Solder appearance inspection

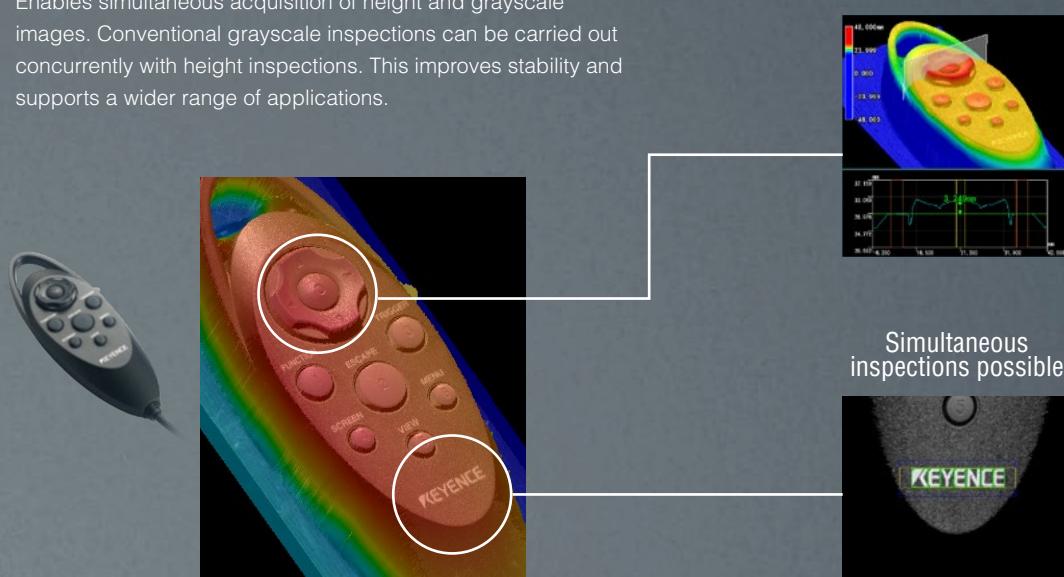


360° inspection of solder appearance enables the detection of minute changes on the surface.

GRAYSCALE INSPECTIONS AND 3D INSPECTIONS IN A SINGLE DEVICE

Simultaneous Grayscale Image Acquisition

Enables simultaneous acquisition of height and grayscale images. Conventional grayscale inspections can be carried out concurrently with height inspections. This improves stability and supports a wider range of applications.



Height images

Height difference inspections using height images

Simultaneous inspections possible

Grayscale images

Character inspections using grayscale images

Use X, Y, and Z Data to Detect Defects

Inspection using both grayscale information and height information provides stable detection.

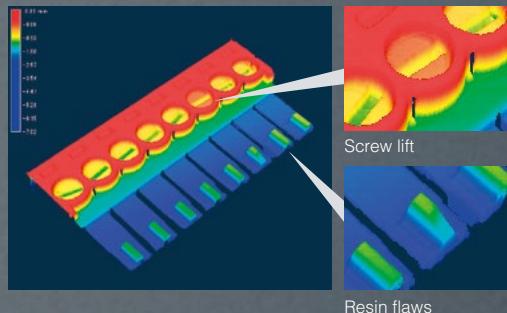
Conventional method: Area camera

Imaging using only a camera from above makes it difficult to detect defects and height differences.



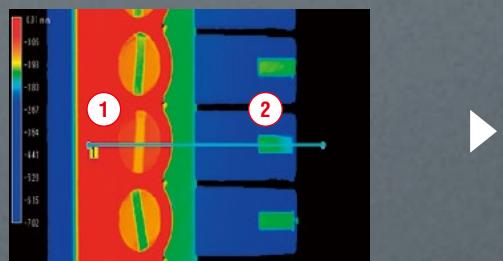
3D vision inspection

By using 3D shapes, it's possible to check for differences in uneven surfaces.

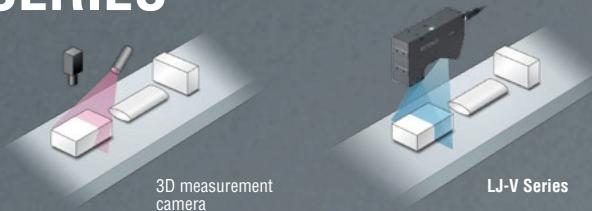


Quantification of Height Information

Enables quantification of height information. Numerically setting tolerances provides higher-accuracy inspections.

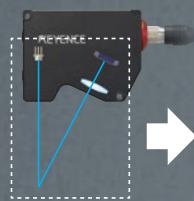


OPTICAL FOCUS AND DEPTH OF FIELD ADVANTAGES OF THE LJ-V SERIES

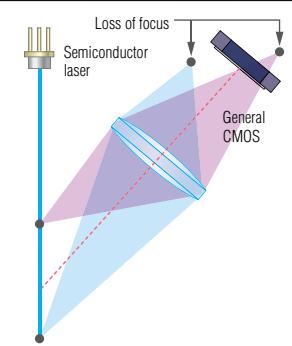


Better Optical Design

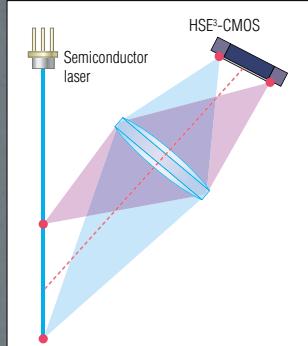
Cameras that are not equipped with auto focus or a similar technology have a set focus position which makes it impossible to obtain an accurate profile if the distance between the camera and target changes. The LJ-V Series uses a special optical system, which enables the LJ-V Series to always capture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



Typical 3D camera



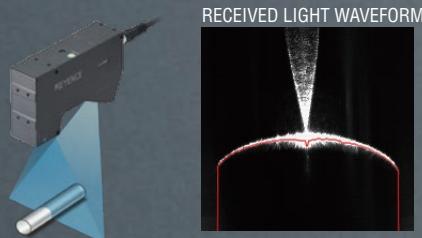
LJ-V Series



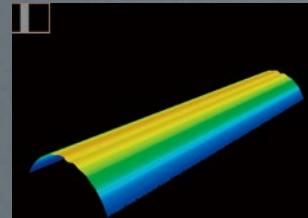
With the LJ-V Series, even if the target's position changes, the image will not go out of focus.

Better Dynamic Range

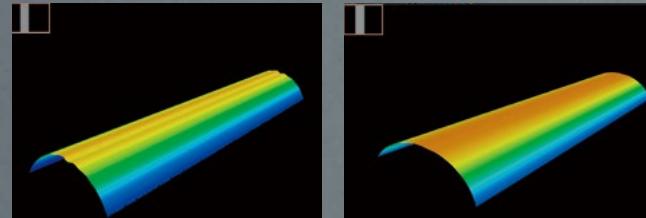
For general 3D cameras, the light receiving element has a narrow dynamic range leading to measurement errors caused by the amount of light reflected from the target. The LJ-V Series can perform stable measurements without light saturation even if the amount of reflected light is large.



Typical 3D camera



LJ-V Series



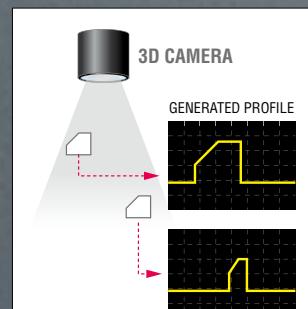
The area around the peak of the target object is saturated.

Stable measurements can be performed.

Better Usability

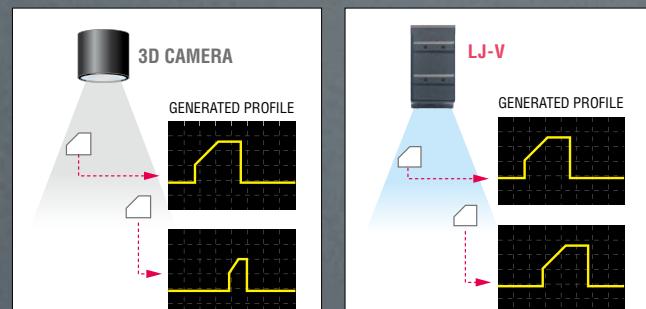
When using a 3D camera, the height and width data of individual pixels differs due to the positional relationship of the laser light source and the receiver, so a calibration must be performed for each pixel. With the LJ-V Series, there is no need for the user to perform additional calibration.

Typical 3D camera



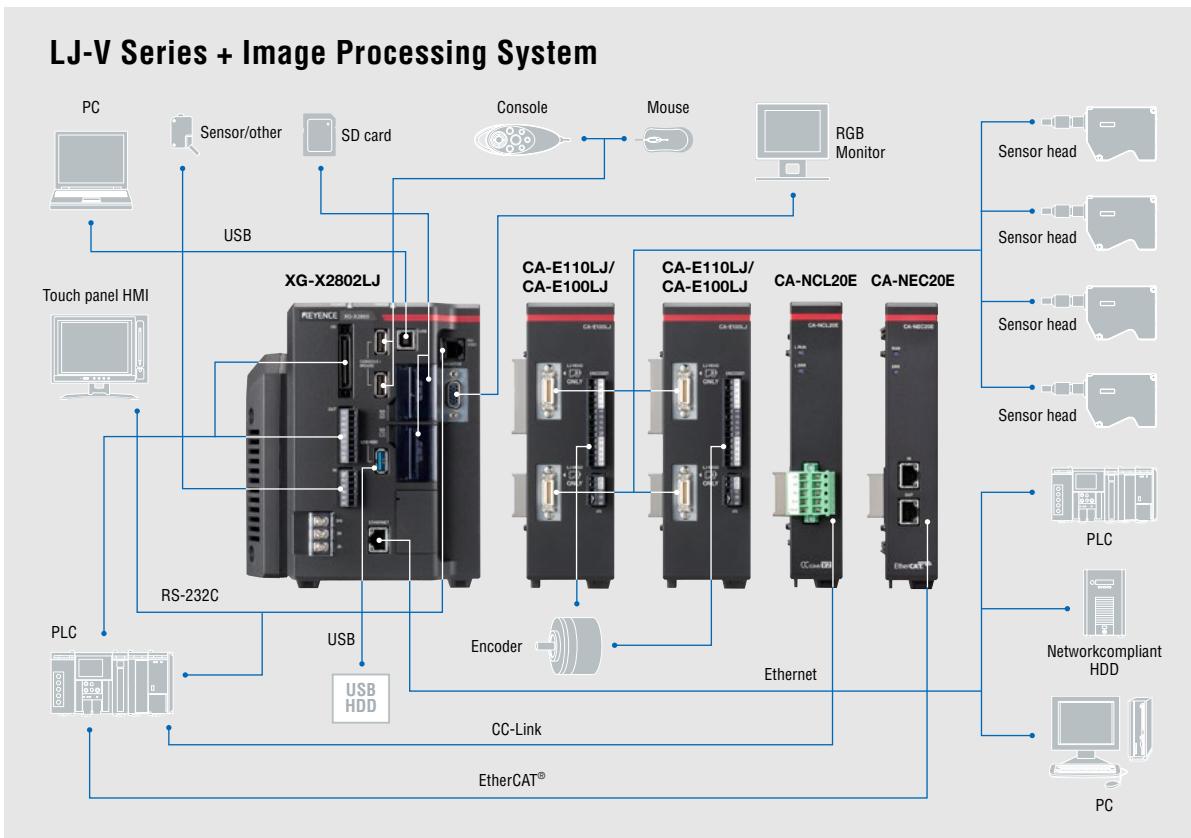
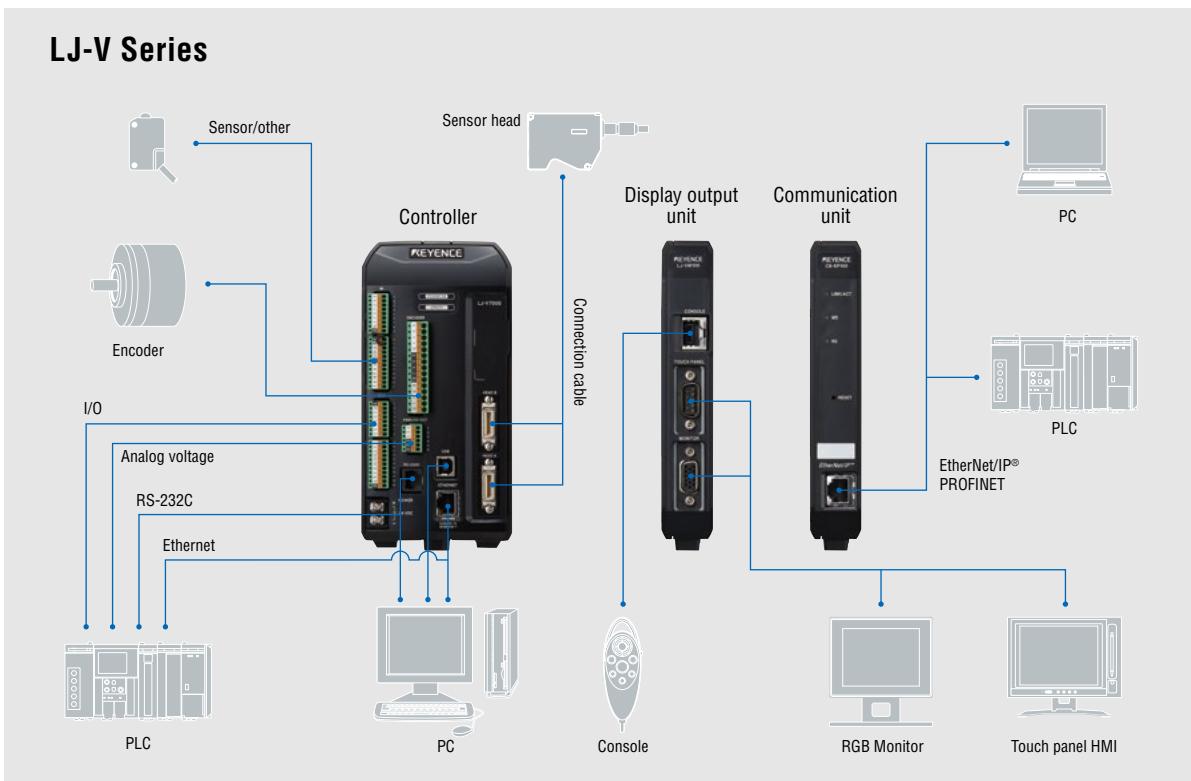
If the position of the workpiece changes, the profile that is obtained will differ.

LJ-V Series



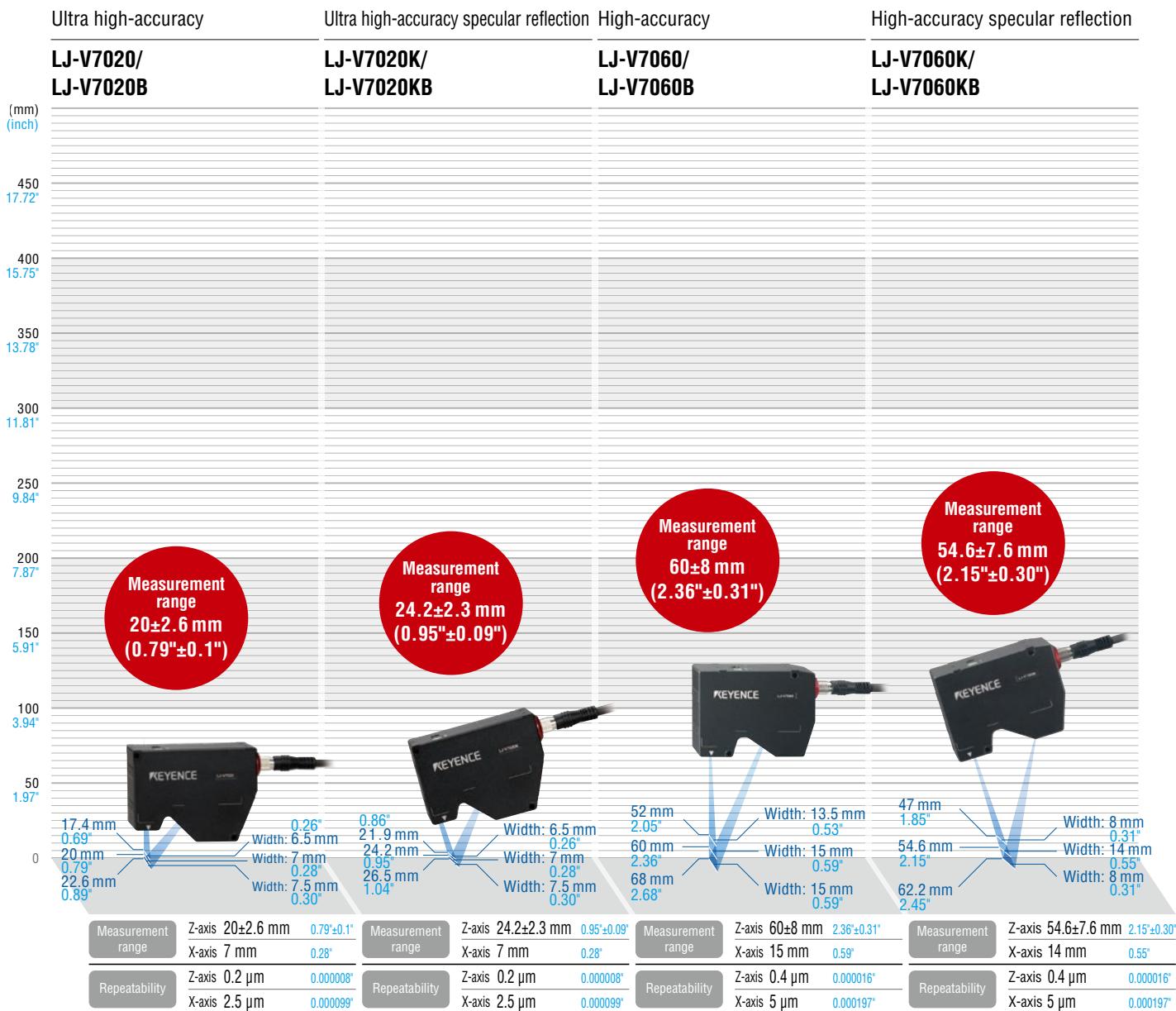
It is possible to obtain an accurate profile and measurements no matter where the target lies within the measurement area.

SYSTEM CONFIGURATION

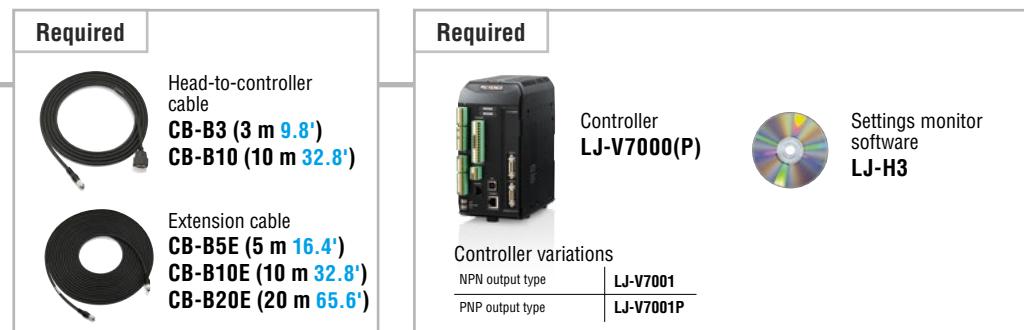


COMPONENTS SELECTION GUIDE

SENSOR HEAD



* Models with a "B" suffix are brightness output types. These cannot be connected to the LJ-V7000 or LJ-V700P. Additionally, the capture modes "Multi-light emitter (composition)" and "Multi-light emitter (light intensity optimized)" cannot be used.



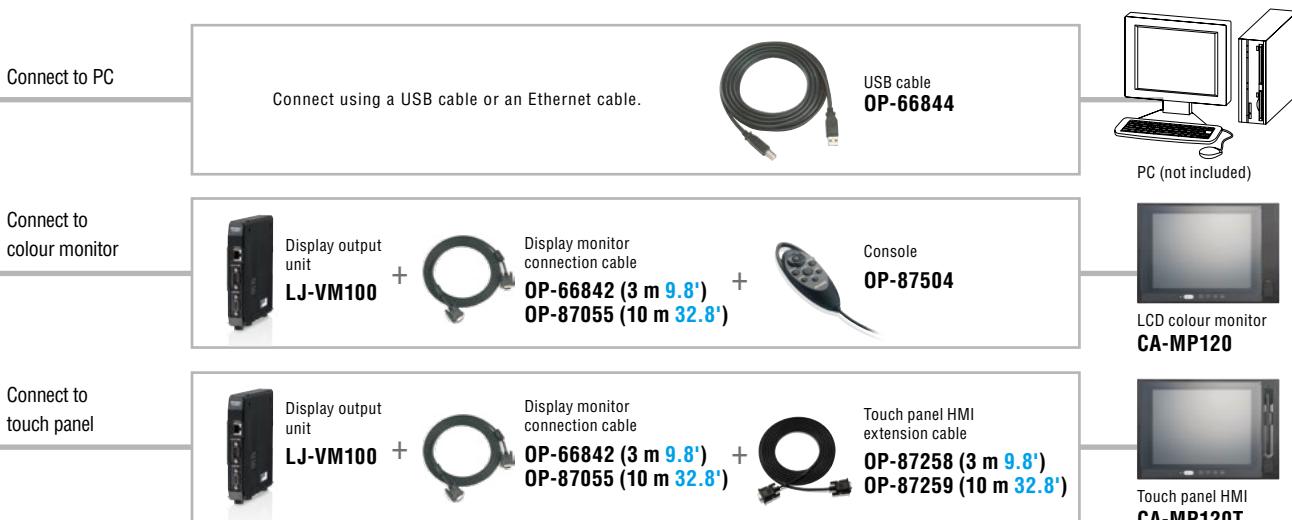
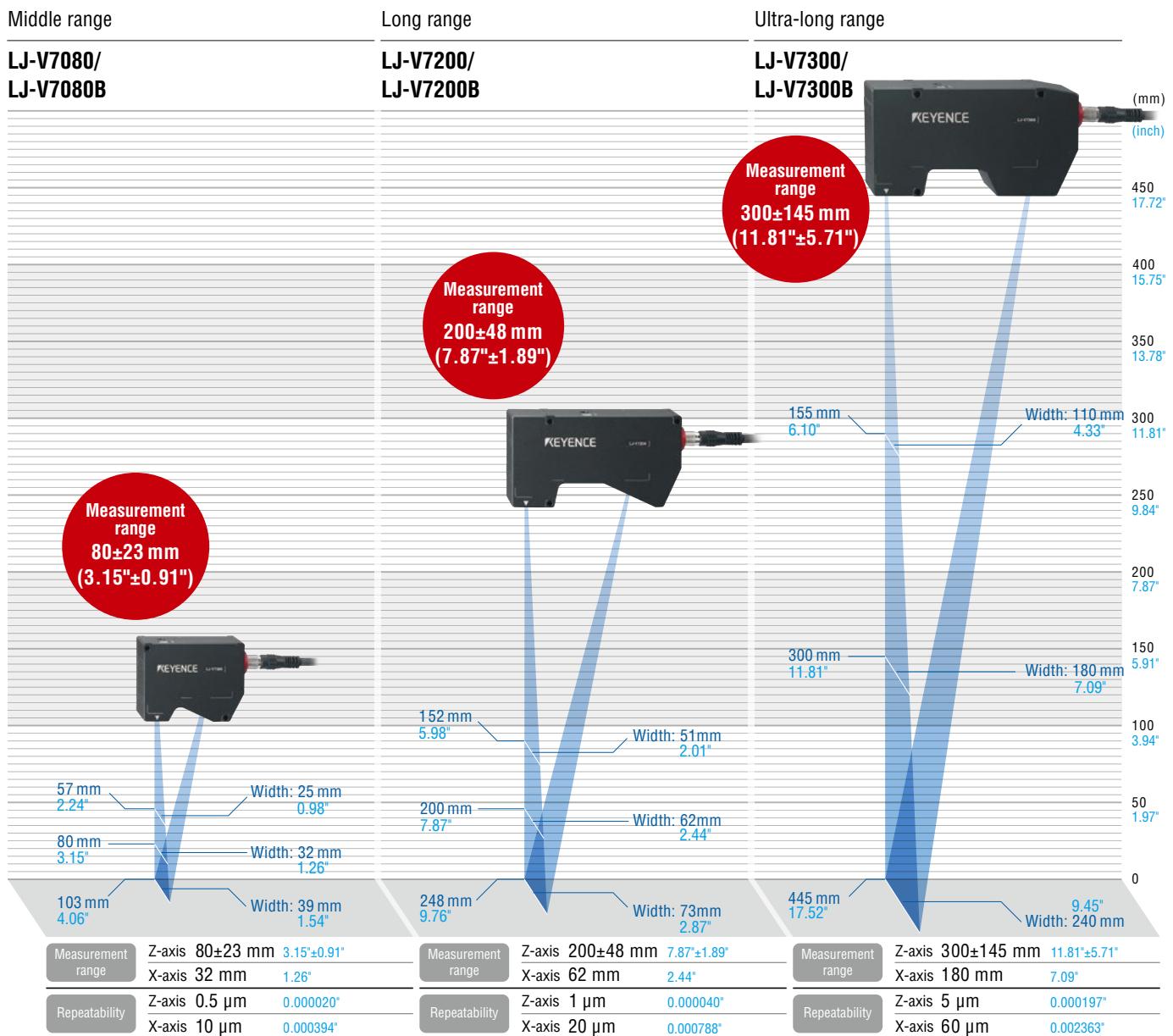
* For total lengths of 30 m 98.4', up to 2 extension cables may be added. Select products as required.

I Units/Options



**Image stitching unit
CA-E100LJ/CA-E110LJ**
**Encoder unit
CA-EN100U**
**Encoder head
CA-EN100H**
**Encoder head cable
CA-EN5 (5 m 16.4')/CA-EN10 (10 m 32.8')**

**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**



SPECIFICATIONS



Controller (LJ-V7000/V7000P)

| Model | LJ-V7001 | LJ-V7001P |
|----------------------------|--|--|
| No. of connectable sensors | Max. 2 units | |
| Sampling cycle | Top speed 16 µs (high-speed mode) / Top speed 32 µs (advanced function mode) | |
| Display | Minimum display unit | 0.1 µm 0.000004 ⁴ , 0.00001 mm ² , 0.01° |
| | Maximum display range | ±9999.99 mm, ±9999.99 mm ² |
| | Laser remote interlock input | Non-voltage input |
| | Encoder input | NPN open-collector output, voltage output (5 V/12 V/24 V), and line-driver output all supported |
| | Trigger inputs | |
| | Timing 1, 2 input | |
| | Auto-zero1, 2 input | |
| | Reset 1, 2 input | Non-voltage input |
| | Start measurement/stop input | |
| | Start storage/stop input | Voltage input |
| Input terminal block | Clear memory input | |
| | Laser OFF input | |
| | Program switch input | Non-voltage input × 4 inputs |
| | | Voltage input × 4 inputs |
| | Analog voltage output | ±10 V × 2 outputs, Output impedance: 100 Ω |
| | OUT comparator output | NPN open collector output × 12 outputs (Can freely assign 16 OUTs × 3 stage judgment results) |
| | Strobe output | PNP open collector output × 12 outputs (Can freely assign 16 OUTs × 3 stage judgment results) |
| | Disable trigger output | |
| | Memory FULL output | PNP open collector output |
| | Ready output | |
| Output terminal block | Error output | NPN open collector output (N.C.) |
| | Ethernet interface ^{*1} | 1000BASE-T/100BASE-TX |
| | USB Interface ^{*1} | 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 115,200 bps) |
| | Rating | Voltage |
| | | 24 VDC, including ±10% ripple (P-P) |
| | Environmental resistance | Maximum current consumption |
| | | 1.3 A or less when connected to 1 head/ 1.9 A or less when connected to 2 heads |
| | Operating ambient temperature | 0 to +50°C 32 to 122°F |
| | | 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

*1 Sample DLL and LabVIEW programs are available. Contact your local sales office for details.



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-H3 (LJ-Navigator 2) operation system environment

| Item | Minimum system requirements | |
|-------------------------|---|--|
| PC interface | Ethernet | 1000BASE-T/100BASE-TX |
| | USB ^{*5} | USB 2.0 high speed compliant (USB 1.1 Full-SPEED compatible) |
| Supported OS | Windows 11 Pro Windows 10 ^{*1} Windows 7 (SP1 or later) ^{*2} Windows Vista (SP2 or later) ^{*3} Windows XP (SP3 or later) ^{*4} | |
| Supported languages | English, Japanese, German, French, Simplified Chinese, Traditional Chinese | |
| CPU | Core i3 2.3 GHz or higher | |
| Memory capacity | 2 GB or more | |
| 2D cache memory | 2 MB or more | |
| Free space on hard disk | 10 GB or more | |
| Display resolution | XGA (1024 × 768) or higher | |
| Weight | Approx. 400 g | |

*1 Home, Pro, and Enterprise editions are supported.

*2 Home Premium, Professional, and Ultimate editions are supported.

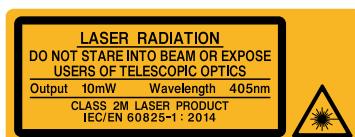
*3 Ultimate, Business, Home Premium, and Home Basic editions are supported.

*4 Professional and Home editions are supported.

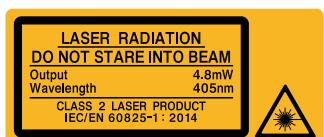
*5 Connection through a USB hub is not included in the guarantee.

LASER WARNING/EXPLANATORY LABEL

LJ-V7020/LJ-V7020B, LJ-V7020K/LJ-V7020KB,
LJ-V7060/LJ-V7060B



LJ-V7060K/LJ-V7060KB, LJ-V7080/LJ-V7080B
LJ-V7200/LJ-V7200B, LJ-V7300/LJ-V7300B



Controller (XG-X2802LJ)

| Model | | XG-X2802LJ |
|--|--------------------------------|---|
| Camera input ^{*1} | | When connected to a CA-E100LJ/CA-E110LJ camera input unit, 2 LJ-V Series heads can be connected to a single input unit, so with the maximum of 2 input units up to 4 heads can be connected. |
| Sampling cycle | | Top speed 16 µs (125 µs for brightness output types with the model suffix "B") |
| Supported cameras / pixel count | LJ-V sensor head ^{*2} | • LJ-V7020/V7020K/V7060/V7060K/V7080/V7200/V7300 512 (H) × 16,384 (L), approx. 8.39 megapixels, 1024 (H) × 8192 (L), approx. 8.39 megapixels, 2048 (H) × 4096 (L), approx. 8.39 megapixels |
| Main image processor | | DSP (high-speed type) |
| Number of registered inspection settings | | Up to 1000 settings each for SD card 1 and SD card 2 (depending on SD card capacity and setting contents). External switching is possible. |
| Screen capacity | | Each setting supports up to 1000 per camera (depending on SD card capacity), compress and save functions and image registration/partial image registration using position adjusted images. External switching is possible through references to variables. |
| Memory card | | • SD card slot × 2 • Compatible with OP-87133 (512 MB), CA-SD1G (1 GB; Equipped as standard in SD1 slot), CA-SD4G (4 GB), CA-SD16G (16 GB) |
| Saved image archive | | When LJ-V connected • Maximum 153 (2048 × 4096 combined continuous import, single sheet import) • Maximum 153 (1024 × 8192 combined continuous import, single sheet import) • Maximum 153 (512 × 16,384 combined continuous import, single sheet import) |
| Interface | Assignable input | • 20 points (includes 4 high-speed input terminals which can be assigned to trigger input) • Input rating: 26.4 V max., 2 mA min. (High-speed input terminals: 3 mA min.) |
| | Assignable output | • 28 points (includes 4 high-speed output terminals which can be assigned to FLASH output linked to external trigger) • Photo MOSFET ^{*3} 50 mA max. (30 V max.) |
| | Programmable encoder input | • When connected to a CA-E100LJ/E110LJ, 1 system per unit, with up to 2 systems and 2 units • RS-422 line-driver output (with 5 V output: max 150 mA), also used for open collector output |
| | Monitor output | Analog RGB Output, XGA (1024 × 768, 24-bit color) |
| | Unit indicators | Power supply / ERROR LED display |
| | RS-232C | • Value output and control I/O can be switched to a CA Series touch panel interface (when this is in use, PLC Link using the RS-232C port cannot be used) • Supports baud rates up to 230,400 bps |
| | PLC Link | • Can output numerical values and perform control I/O using the Ethernet or RS-232C ports (CC-Link, EtherNet/IP®, PROFINET, and EtherCAT® cannot be used in conjunction with PLC-Link) • The following PLCs are supported via link unit ^{*4} KEYENCE: KV-7000 Series, KV-5000/3000 Series, KV-1000/700 Series, and KV Nano Series Mitsubishi Electric: MELSEC iQ-R/L/Q Series, MELSEC A Series (RS-232C only), MELSEC iQ-F Series, MELSEC FX Series (RS-232C only) OMRON: SYSMAC CJ2/CJ1/CS1 Series, SYSMAC C Series (RS-232C only), SYSMAC CP1 Series YASKAWA Electric Corporation: MP2000 Series, MP900 Series (RS-232C only) |
| | Ethernet | • Can output numerical values and perform control I/O • Connecting to KEYENCE PC application software enables upload and download of inspection settings, various simulations, data transmission/reception of different data types including image data and remote connection in addition to the functions listed above • Supports FTP client, FTP server, and SFTP client functions, VNC server functions (for non-PC clients, only displaying the monitor screen is supported) and BOOTP functions • 1000BASE-T/100BASE-TX/10BASE-T |
| | USB | • Connecting to KEYENCE PC application software enables upload and download of inspection settings, various simulations, data transmission/reception of different data types including image data and remote connection in addition to value output and control I/O • Dedicated USB 2.0 |
| | CC-Link | • Connecting the optional CC-Link unit CA-NCL20E enables value output and control I/O (Cannot be used together with PLC Link, EtherNet/IP®, PROFINET, or EtherCAT®) • Supports Ver. 1.10 and Ver. 2.00 remote device stations |
| | EtherCAT® | • Connecting the optional EtherCAT® unit CA-NEC20E enables value output and control I/O (Cannot be used together with PLC Link, CC-Link, EtherNet/IP®, or PROFINET) • Supports cyclic communication (process data object communications) (input: max. 536 bytes/output: max 532 bytes) • Supports non-cyclic communication (mailbox communications) • Supports Col • Explicit device identification • Conforms to Version 2.1.0.2 conformance test |
| | EtherNet/IP® | • Value I/O and control I/O using Ethernet port (Cannot be used together with PLC Link, CC-Link, PROFINET, or EtherCAT®) • Supports cyclic communication (max. 1436 bytes) and message communication • Maximum number of connections: 32 • Conforms to Version.CT15 conformance test |
| | PROFINET | • Value input and control I/O using Ethernet port (Cannot be used together with PLC Link, CC-Link, EtherNet/IP®, or EtherCAT®) • Supports cyclic communication (max. 1408 bytes) • Supports non-cyclic communication (record data) • Conforms to Conformance Class A |
| | SNTP | Automatic correction of device date and time possible through connection to an SNTP server |
| | USB console | • The optional USB console (OP-87983) allows control of various menus • Supports assignment of settings controls to console buttons |
| | Mouse | Various menus can be controlled via the optional dedicated mouse (OP-87506) |
| | Touch panel | • Settings can be controlled from the CA Series touch panel using the RS-232C port (when this is in use, no-protocol RS-232C communication and PLC Link using RS-232C cannot be used) • Supports a dedicated touch menu and control buttons |
| | USB HDD | • Connecting a HDD (max. 2 TB) to the dedicated USB port (compatible with USB 3.0, supports bus-powered devices, rated output: 900 mA) enables output of various data types, including image data |
| | VisionDataStorage | Connecting the optional VisionDataStorage via the Ethernet port or dedicated USB cable (OP-88263: optional) to the USB HDD port enables output of various data types, including image data |
| Language | | Switch between Japanese/English/Chinese (Simp.)/Chinese (Trad.)/German (decide on initial language at first start-up) |
| Cooling fan | | The CA-F100 fan unit is equipped as standard |
| Ratings | Power voltage | 24 V DC ±10% |
| | Current consumption | 5.3 A |
| Environmental resistance | Operating ambient temperature | 0 to 45°C 32 to 113°F (DIN rail mount) / 0 to 40°C 32 to 104°F (Base surface mount) |
| | Operating ambient humidity | 35 to 85% RH (no condensation) |
| Weight | Approx. 1750 g | |

*1 A minimum of 1 camera input unit (optional) is required since the main controller does not support camera input.

*2 LJ-V Series heads with a suffix of B are brightness output types. Connecting a brightness output types requires a CA-E110LJ.

*3 The positive common connection compatible with NPN input devices and negative common connection compatible with PNP input devices can both be used.

*4 Models that are equipped with an Ethernet port on the CPU unit support direct connection with the Ethernet port.

LJ-V input unit (CA-E100LJ/E110LJ)

| Model | | CA-E100LJ | CA-E110LJ |
|------------------------------|-------------------------------|---|-----------|
| LJ-V Series head input | | 2 points ^{*1} | |
| Supported heads | | LJ-V7020/LJ-V7020K/LJ-V7060/LJ-V7060K LJ-V7080/LJ-V7200/LJ-V7300 | |
| Encoder input | | 1 system: RS-422 line-driver output (with 5 V output: max 150 mA) also used for open collector output (compatible with 5 V/12 V/24 V) | |
| Response frequency | RS-422 | Single phase/Z phase 1.6 MHz, 2 phase/single 1.6 MHz, 2 phase/double 3.2 MHz, 2 phase/quadruple 6.4 MHz | |
| | Open collector (OC) | Single phase/Z phase 100 kHz, 2 phase/single 100 kHz, 2 phase/double 200 kHz, 2 phase/quadruple 400 kHz | |
| Laser remote interlock input | | Non-voltage input (at factory settings, shorted with pin) | |
| Power supply | | Supplied from controller | |
| Environmental resistance | Operating ambient temperature | 0 to 45°C 32 to 113°F (DIN rail mount) / 0 to 40°C 32 to 104°F (base surface mount) | |
| | Operating ambient humidity | 35 to 85% RH (no condensation) | |
| Weight | Approx. 760 g | | |

*1 Connecting 2 units is only supported if they are both the same model of head.

*2 Models with a "B" suffix are brightness output types. Capture modes "Multi-light emitter (composition)" and "Multi-light emitter (light intensity optimized)" cannot be used.

SPECIFICATIONS



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) |
| EtherNet/IP® | Number of connectable hubs ¹ 4 hubs (10BASE-T), 2 hubs (100BASE-TX) |
| | 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-V7020KB ¹¹ | LJ-V7020 ¹¹ / LJ-V7020B ¹¹ | LJ-V7060K / LJ-V7060KB | LJ-V7060 / LJ-V7060B | LJ-V7080 / LJ-V7080B | LJ-V7200 / LJ-V7200B | LJ-V7300 / LJ-V7300B |
|-----------------------------|---|--|--------------------------------------|---|---|---|---|
| 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*) |
| | X-axis (width) | NEAR side 6.5 mm 0.26* | 6.5 mm 0.26* | 8 mm 0.31* | 13.5 mm 0.53* | 25 mm 0.98* | 51 mm 2.01* |
| | 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* |
| | 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* |
| Light source | Wavelength | Blue semiconductor laser | | | | | |
| | Laser class (IEC60825-1 FDA(CDRH) Part 1040.10 ¹² *) | Class 2M Laser Product ¹² | | Class 2 Laser Product | Class 2 Laser Product | | |
| | Output | 10 mW | | 4.8 mW | 10 mW | | |
| | Spot size (reference distance) | Approx. 14 mm × 35 µm 0.55° × 0.001378" | | Approx. 21 mm × 45 µm 0.83° × 0.001772" | Approx. 48 mm × 48 µm 1.89° × 0.001890" | Approx. 90 mm × 85 µm 3.54° × 0.003543" | Approx. 240 mm × 610 µm 9.45° × 0.024016" |
| Repeatability ¹³ | Z-axis (height)* ³ | 0.2 µm 0.000008" | | 0.4 µm 0.000016" | 0.5 µm 0.000020" | 1 µm 0.000040" | 5 µm 0.000197" |
| | X-axis (width)* ⁴ | 2.5 µm 0.000099" | | 5 µm 0.000197" | 10 µm 0.000394" | 20 µm 0.000788" | 60 µm 0.002363" |
| 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 0.0004" | | 20 µm 0.0008" | 50 µm 0.002" | 100 µm 0.004" | 300 µm 0.012" |
| Profile data count | | 800 items | | | | | |
| HDR (high dynamic range) | | Single shot HDR ⁷ | | | | | |
| 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 | | | | | |
| Material | Impact resistance | 15 G/6 msec | | | | | |
| | 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 4,096 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 Function that enables stable, high-accuracy measurement in a single capture (exposure) on surfaces ranging from black (low reflectance) through to glossy (high reflectance).

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.

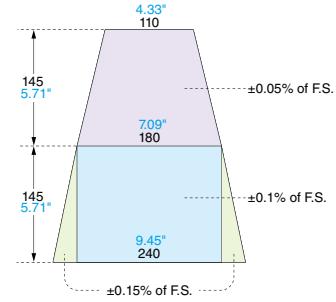
*11 The double polarization function cannot be used.

*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.

* Models with a "B" suffix are brightness output types. These cannot be connected to the LJ-V7000 or LJ-V7000B.

Capture modes "Multi-light emitter (co composition)" and "Multi-light emitter (light intensity optimized)" cannot be used.



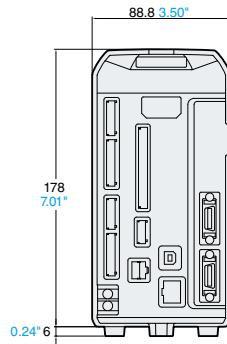
DIMENSIONS

Unit: mm inch

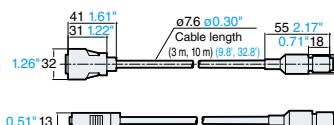
Controller/Cable/Monitor



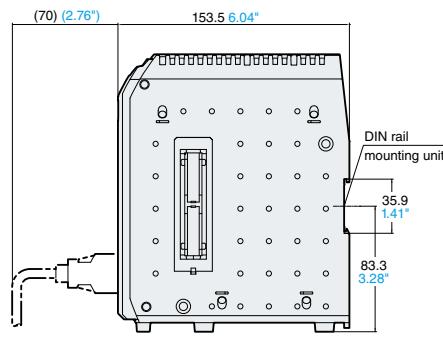
Multi-function controller
LJ-V7001(P)



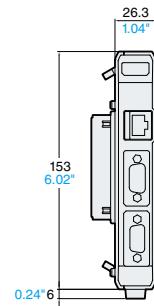
Head-to-controller cable
CB-B3/CB-B10



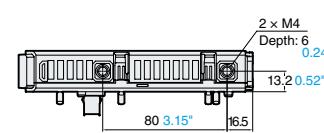
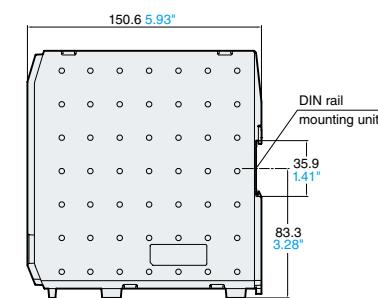
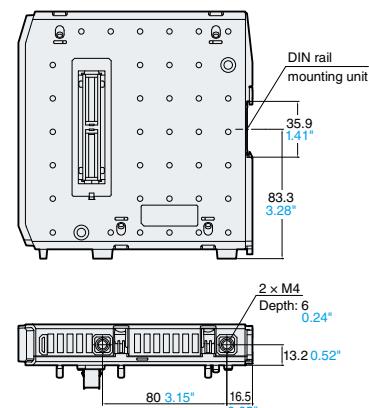
Extension cable
CB-B5E/CB-B10E/CB-B20E



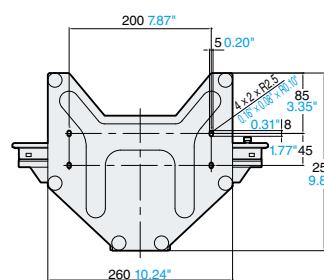
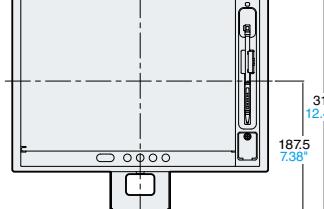
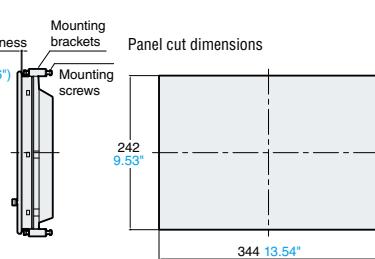
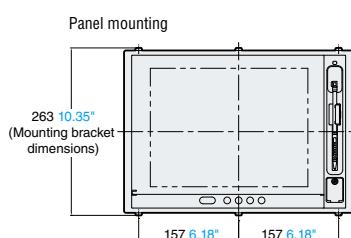
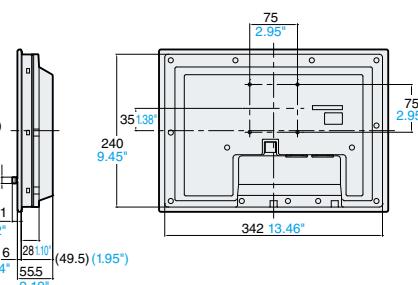
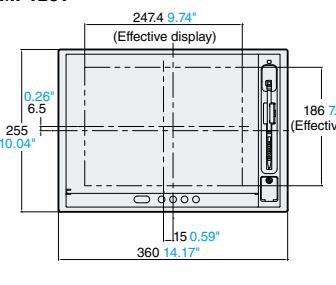
Display output unit
LJ-VM100



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



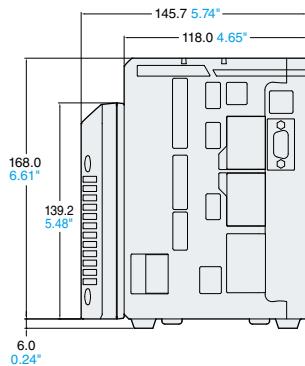
Specialized monitor stand
OP-87262



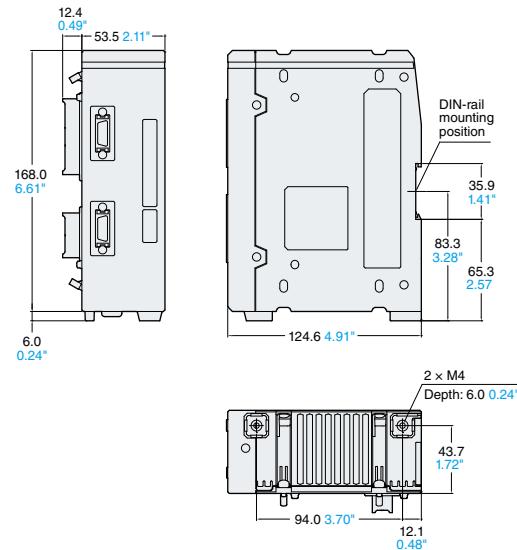
DIMENSIONS



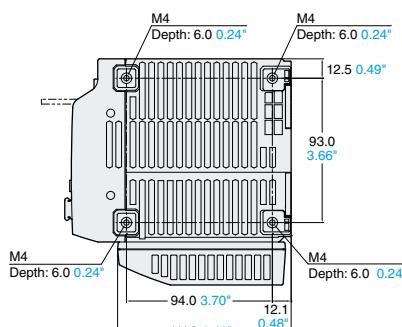
Controller
XG-X2802LJ



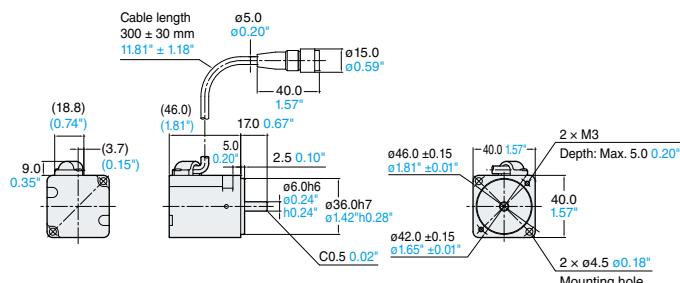
**Input unit
CA-E100LJ/E110LJ**



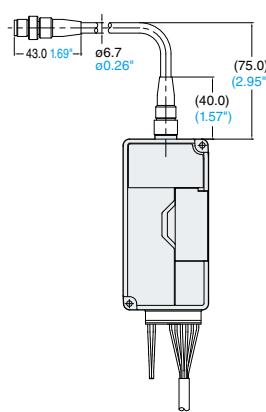
Encoder relay unit
CA-EN100U



Dedicated encoder
CA-EN100H

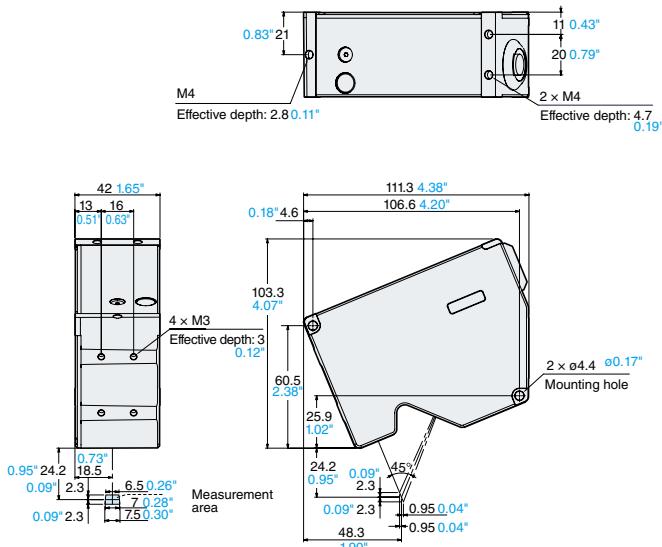


With **CA-EN** attached

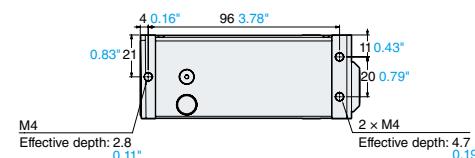


Sensor head

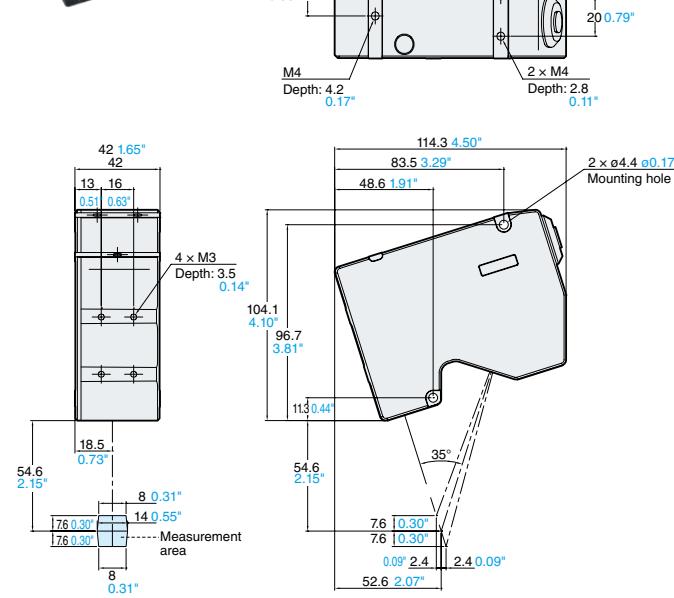
Ultra high-accuracy specular reflection model **LJ-V7020K/LJV-7020KB**



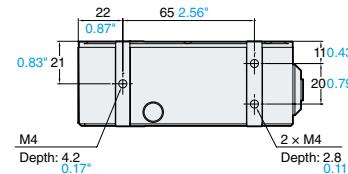
Ultra high-accuracy model **LJ-V7020/LJ-V7020B**



High-accuracy specular reflection model **LJ-V7060K/LJ-V7060KB**

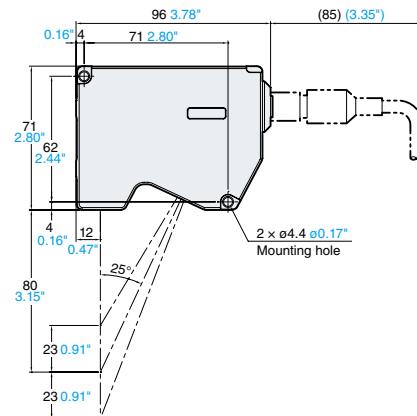
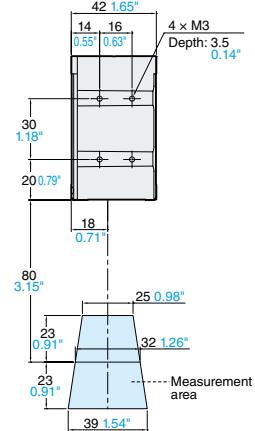
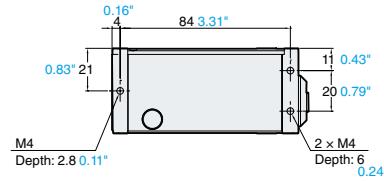


High-accuracy model
LJ-V7060/LJ-V7060B

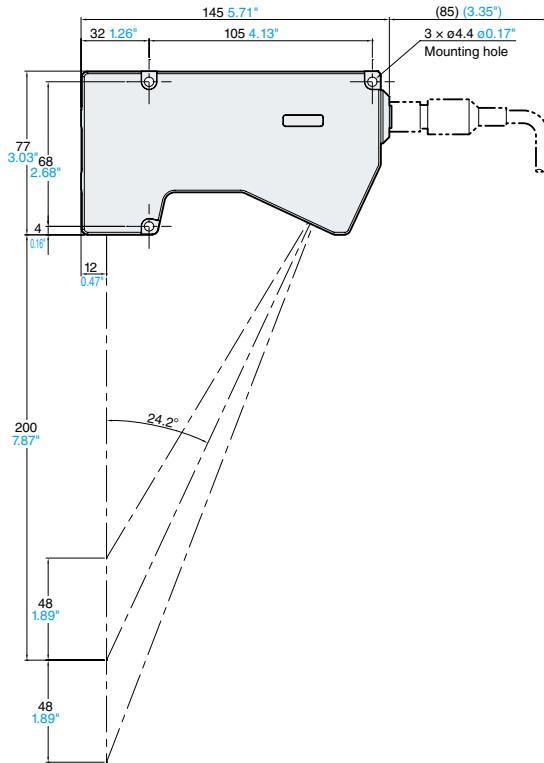
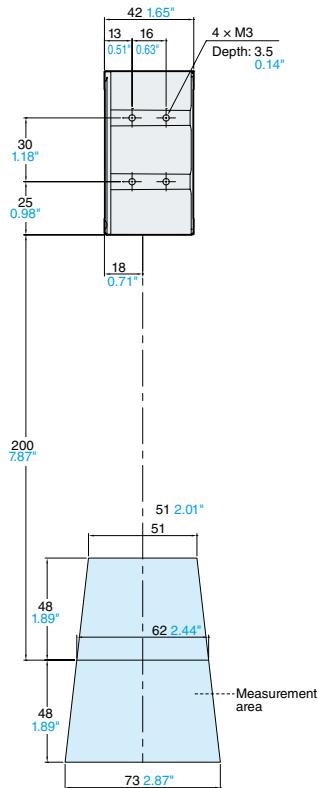
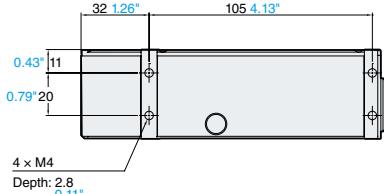


DIMENSIONS

Middle-range model
LJ-V7080/LJ-V7080B

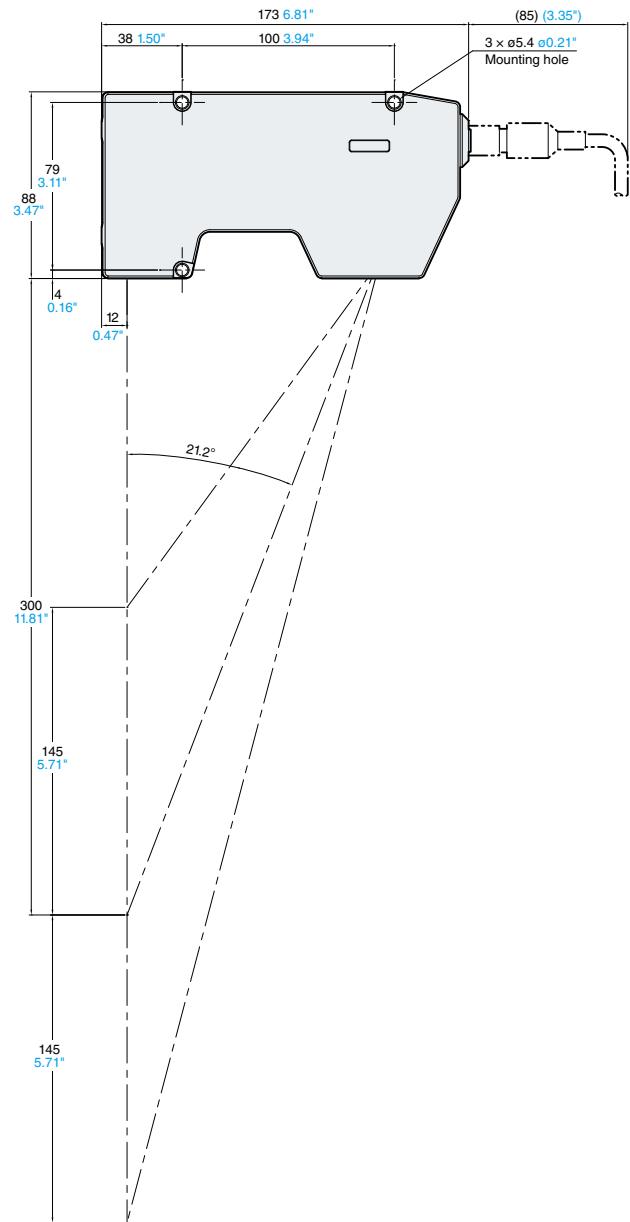
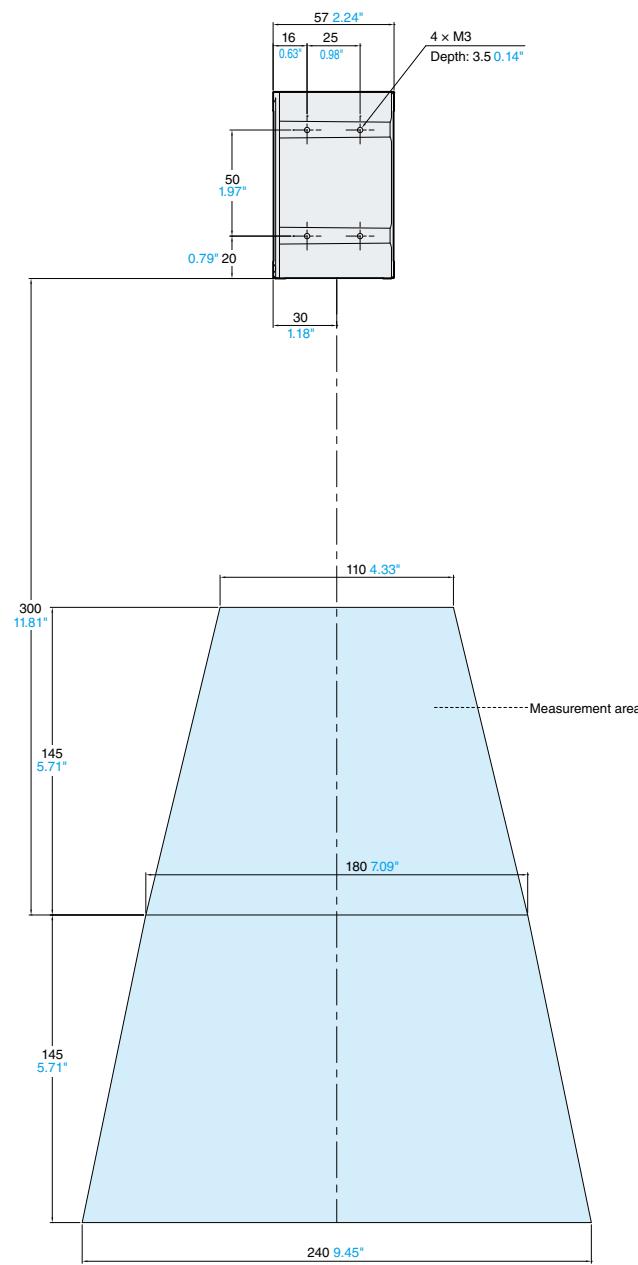
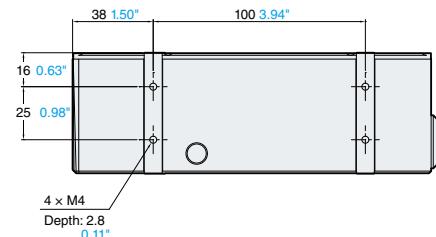


Long-range model
LJ-V7200/LJ-V7200B



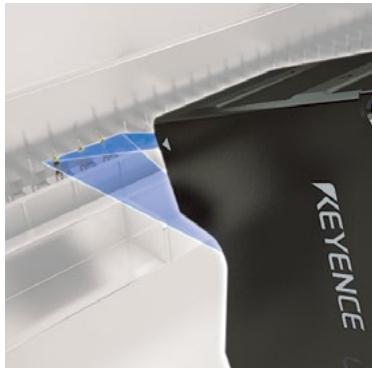
Sensor head

Ultra-long range model
LJ-V7300/LJ-V7300B



2D MEASUREMENT

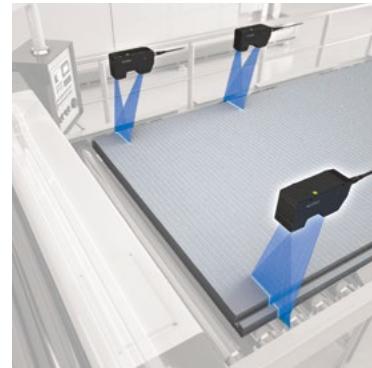
HEIGHT AND STEP DIFFERENCE



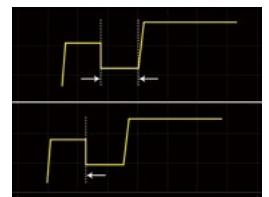
Pin height and step height measurement



WIDTH AND POSITION



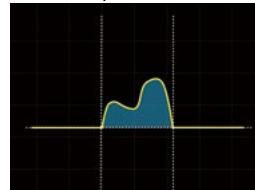
Building material board positioning



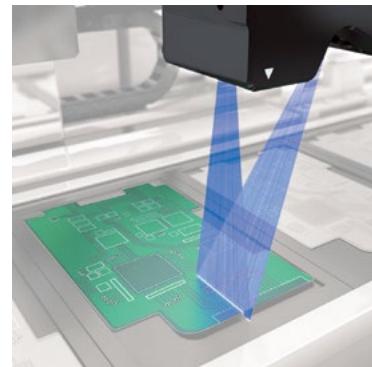
PROFILE AND CROSS SECTION



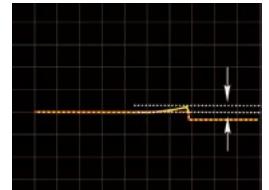
Sealant inspection



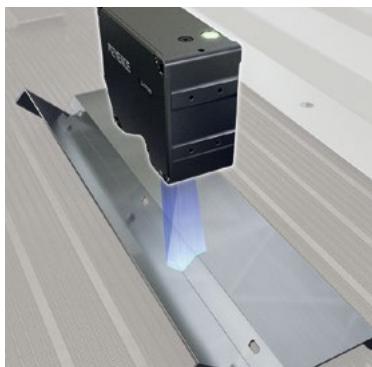
WARPAGE AND FLATNESS



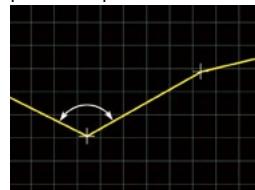
Warpage measurement of PCBs



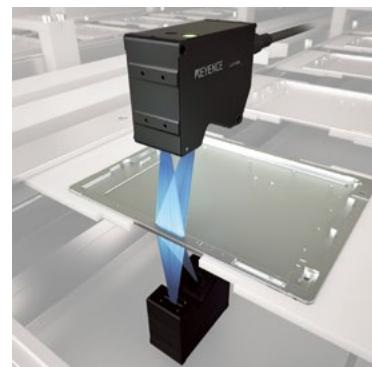
ANGLE AND RADIUS



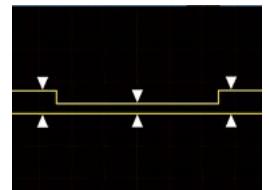
Angle measurement of processed products



THICKNESS MEASUREMENT



Case thickness measurement



3D MEASUREMENT (IMAGE PROCESSING)

SOLDERING BRIDGE AND VOLUME INSPECTION

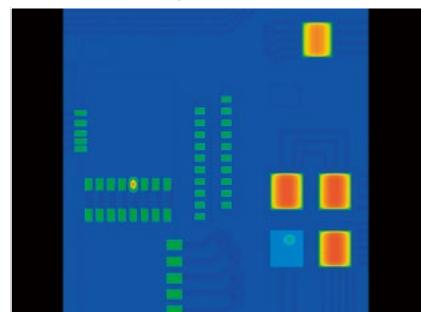
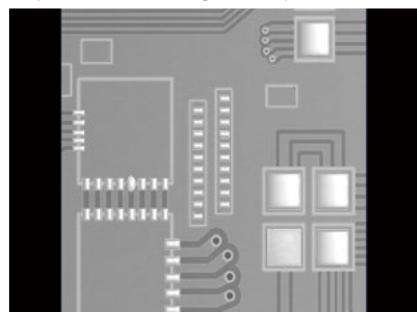


Traditional cameras

Inspection is difficult due to influence from PCB patterns and solder surface conditions.

LJ-V + Image processing

Inspections including solder presence, bridging, and volume can be performed.



WELD BEAD INSPECTION

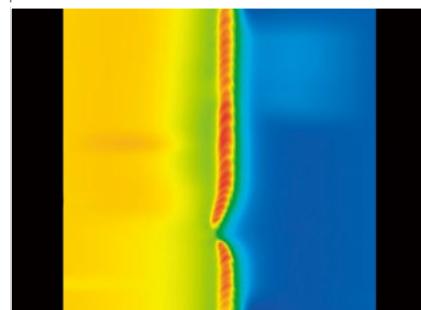
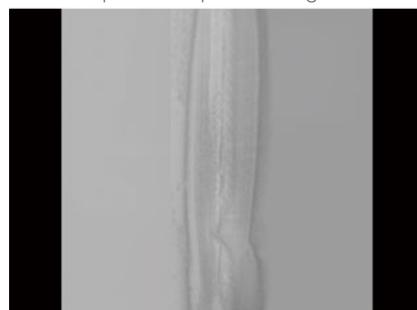


Traditional cameras

Inspection using the camera is difficult because the surface conditions of the workpiece are not stable.

LJ-V + Image processing

Stable inspection is possible regardless of the workpiece surface.



CARD NUMBER CHARACTER RECOGNITION (OCR)

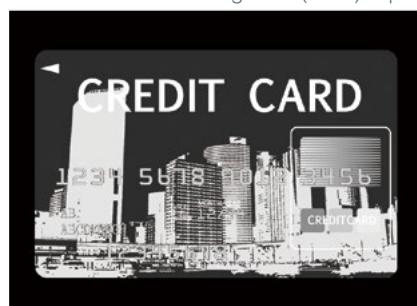


Traditional cameras

Detection is difficult due to influence from the background.

LJ-V + Image processing

Reliable character recognition (OCR) is possible no matter what kind of card is being used.



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CONTACT YOUR NEAREST OFFICE FOR RELEASE STATUS

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03KA-2032-2

LJV-KA-C7-US 2033-3 [611K92]