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

INLINE PROFILE MEASUREMENT
THE WORLD’S FASTEST AT 64000 PROFILES/SEC.
OFFERING A SOLUTION TO ANY PROBLEM

2D/3D Laser Scanner

LJ-V Series

CONTACT-TYPE MEASURING SENSORS

With contact-type sensors, scratches are an inevitable concern. In addition, soft objects can sometimes be troublesome and unmeasurable. User-caused variations in the inspection results also prove difficult to improve.

Workpiece contact and human errors

NON-CONTACT MEASUREMENT

Direct measurement using a laser

- No damage to workpieces
- No variation in results from person to person
- No need to stop the line
1D LASER DISPLACEMENT SENSORS

For measurements such as height difference and warpage, installing multiple sensors or moving the sensor is necessary. Securing sufficient space is also difficult, and measurements are time-consuming.

Multiple units required

ONE DEVICE FOR MULTIPLE SOLUTIONS

Measure once with a 2D laser

Various measurement modes
Compact, space-saving design
No need to move the sensor

CAMERA INSPECTION MACHINES

Installing lighting can be troublesome, in although area cameras and line cameras can be used to inspect aspects such as width or position; inspecting height and height difference is not possible.

X and Y planes only

X, Y, AND Z PLANES WITH A SINGLE DEVICE

3D imaging with additional image processing

No lights necessary
Height measurement
No color errors caused by color irregularity
REDEFINING PROFILE MEASUREMENT AND INSPECTION

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. With conventional contact sensors and 1D laser displacement sensors, inline profile measurements and inspections are difficult. The LJ-V Series solves this issue by implementing appropriate quality control.
WORLD’S FASTEST!

ULTRA-HIGH-SPEED SAMPLING

The LJ-V Series is the fastest 2D laser measuring instrument in the world.* This makes it possible to measure parts moving at extremely high speeds, in high definition, without missing a single one.

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

INDUSTRY’S VARIETY!

OVERWHELMING WORKPIECE RESPONSE CAPABILITIES 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.

Our newly developed HSE3-CMOS wide dynamic range has provided the LJ-V Series with improvements in both speed and detection stability.

INDUSTRY FIRST

ALL TYPES OF MEASUREMENTS ARE POSSIBLE WITH THIS SINGLE DEVICE

The LJ-V Series is able to perform any measurement thanks to a variety of head variations 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.
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 STABLE MEASUREMENTS OF ANY TARGET POSSIBLE 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) due to it’s wide dynamic range.

STOPPED TARGET
Measurement is impossible due to insufficient light intensity.

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

Conventional model
All ranges could be measured.

LJ-V HSE³-CMOS
Even though the exposure time is short, all ranges could be measured without issue.

DYNAMIC RANGE 2400×
NEWLY DEVELOPED

ACHIEVING ULTRA HIGH-SPEED MEASUREMENTS AT 64 kHz

GP64-Processor

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

Positioning time | Stopped time | Transportation time

Measurement time: 500 ms

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.

LI-V

NO POSITIONING TIME AND STOPPED TIME ARE NEEDED!

Transportation time

Measurement time: 2 ms

Measurements are performed during target transportation.

With the LI-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.

LI-V

RESULT OF AVERAGING 720 PROFILES

The LI-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 WORKPIECE RESPONSE CAPABILITIES AND DETECTION STABILITY

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.

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

With a blue laser, the image forming beam becomes sharp to enable the measurement of shapes with excellent accuracy.
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.
ALL TYPES OF MEASUREMENTS ARE POSSIBLE WITH THIS SINGLE DEVICE

STEP 1
IMAGING CAPTURE SETTINGS — One-click optimization for easy use by anyone —

▷ 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.
**MEASUREMENT SETTINGS** — 74 different measurement modes for a wide variety of inspections —

**HEIGHT**
Measures the height within the specified range.

**WIDTH AND POSITION**
Measures the width and positions under the specified conditions.

**ANGLE AND INTERSECTION**
Measures the angle between and the intersection point of a pair of detected straight lines.

**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)**

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

**STEP 3**
**OUTPUT SETTINGS** — Output modes available for a variety of uses —

**OUTPUT METHOD**

- Measurement value
  - Ethernet
  - USB
  - RS-232C
  - Analog voltage
  - EtherNet/IP™
  - PROFINET

- Profile data
  - Ethernet
  - USB
  - EtherNet/IP™
  - PROFINET

- OK/NG judgment
  - Ethernet
  - USB
  - RS-232C
  - I/O
  - EtherNet/IP™
  - PROFINET

For Ethernet and USB, you can also use DLLs.
AN EMPHASIS ON INLINE MEASUREMENT

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 LCD color monitor.

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

θ→X adjustment (angle then x position)

If the position of the workpiece becomes misaligned...

Conventional model

LJ-V

Measurement area

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

**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.

**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.
**SIMPLE PROGRAMING — LJ-Navigator2 —**

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

**EASY SETTINGS**

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

**EASY NAVIGATION 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 real-time. There is no need to return to the measurement screen for confirmation, making it possible to greatly reduce the time and effort spent on set up.

**SIMULATION FUNCTION**

Saved measurement data or data obtained in real time can be used to change 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
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.

PROFILE STORAGE FUNCTION
It is possible to store approx. 160,000 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.

OFFLINE PROFILE OBSERVATION — LJ-Observer —
This tool uses saved measurement data to provide a 3D view and allows for simple profile measurement.

SIMPLE PROFILE MEASUREMENT FUNCTION
Extracting a desired cross-section for 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 XG-X controller, it is possible to apply image processing to the created 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 with unprecedented simplicity to best suit the imaging conditions (Support for 64 to 150000 pulses).
Unlike with conventional products, there’s no need to select encoders based on aspects such as the rotation speed of the shaft, the roller diameter, or the field of view.

Support for up to 150000 pulses allow for high-resolution output at a minimum of 0.0024° (6.64 seconds). High-speed output is also possible at a maximum output frequency of 16 MHz.

Added consideration for environmental resistance has resulted in a design that is even more resistant to 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.
Combining the advanced profiling capabilities of the LJ-V Series with the Image Processing System. Image processing can be performed on 3D measurement data to open new doors in the realm of quality inspection.

**Measured Value Acquisition**

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

**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.

**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.

AS FAST AS 2 MS PER INSPECTION!
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. This always ensures stable measurement even if workpieces change their orientation. You can also specify a different reference plane for each measurement point. In addition, setting a free-form plane for zero plane specification is also possible. This allows for calculation of such properties as height and depth on a curved surface.

Area and Volume Measurement

Measures volumes in the range enclosed by the inspection region and the “zero plane”.

16-bit Pre-Processing Dedicated for Height Images

Pre-processing dedicated for height images is provided.

Five types of pre-processing are available: Median, Average, Gaussian, Smoothing, and Invalid Pixel Interpolation. This creates stable measurement for each workpiece.

Using pre-processing for grooves, which have largely varying luster, makes it possible to perform stable measurements.

TAKE FULL ADVANTAGE OF ALL THE FUNCTIONALITY FOUND IN CONVENTIONAL IMAGING EQUIPMENT

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 continuously use all conventional, established XG/CV-X functions. Targets hard to detect with conventional image processing can now be detected by combining, for example, free-form plane extraction and OCR.

Also supports difficult-to-detect workpieces by extracting concavities and convexities from free-form plane shapes

Area cameras cannot detect dents because images are shaded due to the influence of complex curves and surface irregularities. Inspection becomes possible by extracting height change of points based on the information of a free-form plane.
NEW FUNCTIONS FOR MORE STABLE 3D INSPECTION

Projection Noise Removal

The LJ-V Series includes algorithms designed to exclude suddenly generated noise. 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 common bottlenecks 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.
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.

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.

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.
### COMPONENTS SELECTION GUIDE

**SENSOR HEAD**

<table>
<thead>
<tr>
<th>Ultra high-accuracy</th>
<th>Ultra high-accuracy specular reflection</th>
<th>High-accuracy</th>
<th>High-accuracy specular reflection</th>
</tr>
</thead>
<tbody>
<tr>
<td>LJ-V7020</td>
<td>LJ-V7020K</td>
<td>LJ-V7060</td>
<td>LJ-V7060K</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(mm) (inch)</th>
<th>(mm) (inch)</th>
<th>(mm) (inch)</th>
<th>(mm) (inch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>17.4 mm 0.69&quot;</td>
<td>20.6 mm 0.81&quot;</td>
<td>22.6 mm 0.89&quot;</td>
<td>24.2 mm 0.95&quot;</td>
</tr>
<tr>
<td>Width: 6.5 mm</td>
<td>Width: 7.0 mm</td>
<td>Width: 7.5 mm</td>
<td>Width: 8.0 mm</td>
</tr>
<tr>
<td>0.26&quot;</td>
<td>0.26&quot;</td>
<td>0.26&quot;</td>
<td>0.26&quot;</td>
</tr>
<tr>
<td>0.59&quot;</td>
<td>0.59&quot;</td>
<td>0.59&quot;</td>
<td>0.59&quot;</td>
</tr>
</tbody>
</table>

**Measurement range**

- **LJ-V7020**: 20±2.6 mm (0.79"±0.1")
- **LJ-V7020K**: 24.2±2.3 mm (0.95"±0.09")
- **LJ-V7060**: 60±8 mm (2.36"±0.31")
- **LJ-V7060K**: 54.6±7.6 mm (2.15"±0.30")

**Repeatability**

- Z-axis: 0.2 µm
- X-axis: 2.5 µm

**Units/Options**

- **EtherNet/IP™ unit**: CB-EP100
- **PROFINET unit**: CB-PN100
- **Display output unit**: LJ-VM100
- **Monitor stand**: OP-87262
- **Ethernet cable**: OP-87736 (2 m 6.6")
- **Image stitching unit**: CA-E100LJ
- **D-sub 9 pin connector**: OP-26401
- **RS-232C cable**: OP-66844

**Required**

- **Head-to-controller cable**
  - CB-B3 (3 m 9.8")
  - CB-B10 (10 m 32.8")
- **Extension cable**
  - CB-B5E (5 m 16.4")
  - CB-B10E (10 m 32.8")
  - CB-B20E (20 m 65.6")

**Controller variations**

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

**Controller**

- **LJ-V7000(P)**

**Settings monitor software**

- **LJ-H3**

**USB cable**

- (LJ-H3 accessory) OP-66844

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

**LJ-V7080**

- **Measurement range:** 80±23 mm (3.15±.91")
- **Width:** 25 mm
- **Z-axis:** 0.9 mm
- **X-axis:** 1.5 mm

**Repeatability**

- **Z-axis:** 0.5 μm
- **X-axis:** 10 μm

- **Repeatability range:** 10.3 mm

**Long range**

**LJ-V7200**

- **Measurement range:** 200±48 mm (7.87±1.89")
- **Width:** 32 mm
- **Z-axis:** 5.9 mm
- **X-axis:** 2.4 mm

**Repeatability**

- **Z-axis:** 1 μm
- **X-axis:** 20 μm

- **Repeatability range:** 60 mm

**Ultra-long range**

**LJ-V7300**

- **Measurement range:** 300±145 mm (11.81±5.71")
- **Width:** 62 mm
- **Z-axis:** 6.1 mm
- **X-axis:** 2.6 mm

**Repeatability**

- **Z-axis:** 5 μm
- **X-axis:** 60 μm

- **Repeatability range:** 110 mm

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**Connect to PC**

Connect using the USB cable included with the PC software or an Ethernet cable.

- **USB cable** (LJ-H3 accessory)
  - **OP-66844**

**Connect to color monitor**

- **Display output unit**
  - **LJ-VM100**
  - Display monitor connection cable
    - **OP-66842** (3 m 9.8’)
    - **OP-87055** (10 m 32.8’)
  - **Console**
    - **OP-87504**

**Connect to touch panel**

- **Display output unit**
  - **LJ-VM100**
  - Display monitor connection cable
    - **OP-66842** (3 m 9.8’)
    - **OP-87055** (10 m 32.8’)
  - **Touch panel HMI extension cable**
    - **OP-87258** (3 m 9.8’)
    - **OP-87259** (10 m 32.8’)

- **Touch panel HMI**
  - **CA-MP120**
  - **CA-MP120T**
  - **LCD color monitor**
  - **PC** (not included)
### Controller

<table>
<thead>
<tr>
<th>Model</th>
<th>LJ-V7601</th>
<th>LJ-V7601P</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of connectable sensors</td>
<td>Max. 2 units</td>
<td></td>
</tr>
<tr>
<td>Display</td>
<td>Minimum display unit</td>
<td>0.1 μm ±0.000004&quot;, ±0.00001 mm&quot;, ±0.01°</td>
</tr>
<tr>
<td></td>
<td>Maximum display range</td>
<td>±9999.9 mm 3047.0&quot;, ±99999 mm</td>
</tr>
<tr>
<td></td>
<td>Laser remote interlock input</td>
<td>Non-voltage input</td>
</tr>
<tr>
<td></td>
<td>Encoder input</td>
<td>NPN open-collector output, voltage output (5 V/12 V/24 V), and line-driver output all supported</td>
</tr>
<tr>
<td></td>
<td>Trigger inputs</td>
<td>Non-voltage input</td>
</tr>
<tr>
<td></td>
<td>Timing 1, 2 input</td>
<td>Voltage input</td>
</tr>
<tr>
<td></td>
<td>Auto-zero1, 2 input</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reset 1, 2 input</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Start measurement/stop input</td>
<td>Non-voltage input</td>
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<tr>
<td></td>
<td>Start storage/stop input</td>
<td>Voltage input</td>
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<tr>
<td></td>
<td>Clear memory input</td>
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<tr>
<td></td>
<td>Laser OFF input</td>
<td></td>
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<tr>
<td></td>
<td>Program switch input</td>
<td>Non-voltage input &lt;4 inputs</td>
</tr>
<tr>
<td></td>
<td>Analog voltage output</td>
<td>±10 V ±2 outputs, Output impedance: 100 Ω</td>
</tr>
<tr>
<td></td>
<td>NPN open collector output +12 outputs</td>
<td>(Can freely assign 16 OUTs × 3 stage judgment results)</td>
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<tr>
<td></td>
<td>Voltage input</td>
<td></td>
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<tr>
<td></td>
<td>Voltage input</td>
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<tr>
<td></td>
<td>PNP open collector output +12 outputs</td>
<td>(Can freely assign 16 OUTs × 3 stage judgment results)</td>
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<td></td>
<td>OUT comparator output</td>
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<td></td>
<td>NPN open collector output</td>
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<td></td>
<td>PNP open collector output</td>
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<tr>
<td></td>
<td>Strobe output</td>
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<td></td>
<td>NPN open collector output</td>
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<td></td>
<td>PNP open collector output</td>
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<td></td>
<td>Disable trigger output</td>
<td></td>
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<td></td>
<td>Memory FULL output</td>
<td></td>
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<tr>
<td></td>
<td>Ready output</td>
<td></td>
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<tr>
<td></td>
<td>Error output</td>
<td>NPN open collector output (N.C.)</td>
</tr>
<tr>
<td></td>
<td>PNP open collector output (N.C.)</td>
<td></td>
</tr>
<tr>
<td>Ethernet interface</td>
<td>100BASE-T/100BASE-TX</td>
<td></td>
</tr>
<tr>
<td>USB Interface</td>
<td>USB 2.0 high speed compliant (USB 1.1 Full-SPEED compatible)</td>
<td></td>
</tr>
<tr>
<td>RS-232C interface</td>
<td>Measurement data output and control I/O (Can select a baud rate of up to 115,200 bps)</td>
<td></td>
</tr>
<tr>
<td>Rating</td>
<td>Voltage</td>
<td>24 VDC, including ±10% ripple (P-P)</td>
</tr>
<tr>
<td></td>
<td>Maximum current consumption</td>
<td>1.3 A or less when connected to 1 head; 1.9 A or less when connected to 2 heads</td>
</tr>
<tr>
<td>Environmental resistance</td>
<td>Operating ambient temperature</td>
<td>0 to +50°C 32 to 122°F</td>
</tr>
<tr>
<td></td>
<td>Operating ambient humidity</td>
<td>20 to 85% RH (No condensation)</td>
</tr>
<tr>
<td></td>
<td>Weight</td>
<td>Approx. 1500 g</td>
</tr>
</tbody>
</table>

### Display output unit

<table>
<thead>
<tr>
<th>Model</th>
<th>LJ-VM100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitor output</td>
<td>Analog RGB XGA (1024 × 768)</td>
</tr>
<tr>
<td></td>
<td>Touch panel monitor (CA-MP120T), specialized connector included</td>
</tr>
<tr>
<td>Voltage</td>
<td>Supplied from the controller</td>
</tr>
<tr>
<td>Power consumption</td>
<td>2.5 W or less</td>
</tr>
<tr>
<td>Environmental resistance</td>
<td>Operating ambient temperature</td>
</tr>
<tr>
<td></td>
<td>Operating ambient humidity</td>
</tr>
<tr>
<td>Weight</td>
<td>Approx. 400 g</td>
</tr>
</tbody>
</table>

### LJ-H3 (LJ-Navigator 2) operation system environment

<table>
<thead>
<tr>
<th>Minimum system requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Item</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Supported OS*</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Supported languages</td>
</tr>
<tr>
<td>CPU</td>
</tr>
<tr>
<td>Memory capacity</td>
</tr>
<tr>
<td>2D cache memory</td>
</tr>
<tr>
<td>Free space on hard disk</td>
</tr>
<tr>
<td>Display resolution</td>
</tr>
<tr>
<td>Weight</td>
</tr>
</tbody>
</table>

*1 Connections through a USB hub are not covered under warranty.
*2 Windows is either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.
PROFINET unit

<table>
<thead>
<tr>
<th>Model</th>
<th>CB-PN100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compatible network</td>
<td>PROFINET IO communication</td>
</tr>
</tbody>
</table>

**Ethernet**
- Compliant standards: IEEE 802.3u
- Transmission speed: 100 Mbps, full duplex (100BASE-TX)
- Transmission media: STP or Category 5e or higher UTP
- Maximum cable length: 100 m (328 ft)
- Supported functions: PROFINET IO communication
- Supported functions: Data I/O 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

---

EtherNet/IP™ unit

<table>
<thead>
<tr>
<th>Model</th>
<th>CB-EP100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compatible network</td>
<td>EtherNet/IP™ and displacement sensor-specific protocols (socket communication)</td>
</tr>
</tbody>
</table>

**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 5 or higher UTP (10BASE-T), STP or Category 5 or higher UTP (100BASE-TX)
- Maximum cable length: 100 m (328 ft) (Distance between the unit and Ethernet switch)
- Maximum number of connectable hubs†: 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 (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

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Sensor head unit

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting conditions</td>
<td>Specular reflection</td>
<td>Diffuse reflection</td>
<td>Specular reflection</td>
<td>Diffuse reflection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference distance</td>
<td>24.2 mm ±0.95</td>
<td>20 mm ±1.19</td>
<td>54.6 mm ±2.07</td>
<td>60 mm ±2.16</td>
<td>60 mm ±2.16</td>
<td>200 mm ±8.27</td>
<td>360 mm ±11.81</td>
</tr>
<tr>
<td>Z-axis (height)</td>
<td>≤±2.3 mm ±0.09</td>
<td>≤±2.5 mm ±0.10</td>
<td>≤±15.6 mm ±0.60</td>
<td>≤±15.6 mm ±0.60</td>
<td>≤±23 mm ±0.91</td>
<td>≤±23 mm ±0.91</td>
<td>≤±46 mm ±1.81</td>
</tr>
<tr>
<td>X-axis (width)</td>
<td>Near side</td>
<td>6.5 mm ±0.20</td>
<td>6.5 mm ±0.20</td>
<td>8 mm ±0.31</td>
<td>13.5 mm ±0.53</td>
<td>25 mm ±0.98</td>
<td>51 mm ±2.01</td>
</tr>
<tr>
<td>Reference distance</td>
<td>7 mm ±0.24</td>
<td>7 mm ±0.28</td>
<td>14 mm ±0.55</td>
<td>15 mm ±0.59</td>
<td>32 mm ±1.26</td>
<td>62 mm ±2.44</td>
<td>180 mm ±7.09</td>
</tr>
<tr>
<td>Far side</td>
<td>7.5 mm ±0.30</td>
<td>7.5 mm ±0.30</td>
<td>8 mm ±0.31</td>
<td>15 mm ±0.59</td>
<td>39 mm ±1.54</td>
<td>73 mm ±2.67</td>
<td>240 mm ±9.40</td>
</tr>
</tbody>
</table>

**Light source**
- Wavelength: 405 nm (visible beam)

**Output**
- 10 mW
- 4.8 mW
- 4.8 mW

**Spot size (reference distance)**
- Approx. 14 mm × 25 μm
- 0.55 μm ±0.00378μm

**Repeatability**
- Z-axis (height)†††: ±0.1% of F.S.
- X-axis (width)††: ±0.2 μm (0.00008”)

**Linearity**
- Z-axis (height)†††: ±0.1% of F.S.
- ±0.05 to ±0.15% of F.S.†††

**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”

**Sampling cycle (trigger interval)†††**
- Top speed: 16 μs (high-speed mode)
- Top speed: 32 μs (advanced function mode)

**Environmental resistance**
- **Enclosure rating**†: IP67 (IEC60529)
- Incandescent lamp: 10000 lux max.
- Ambient temperature: 0 to +45°C (32 to 113°F)
- Operating Ambience: 20 to 85% RH (No condensation)
- Vibration resistance: 10 to 57 Hz, 1.5 mm 0.06” double amplitude in X, Y, and 2 directions, 3 hours respectively
- Impact resistance: 15 g/6 ms

**Material**
- Weight: Approx. 418 g

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*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 4.06 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 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.
*5 The linearity will differ depending on the measurement area. (See the diagram on the right.)
*6 For high-speed 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.
*7 The sensor head must be mounted on a metal plate for use.
*8 The double polarization function cannot be used.
*9 Do not look into the beam directly using any optical instruments (such as eye loupes, magnifiers, microscopes, telescopes, or binoculars).
*10 Viewing the laser output with an optical instrument may pose an eye hazard.
Middle-range model

**LJ-V7080**

![Diagram of LJ-V7080](image)

Long-range model

**LJ-V7200**

![Diagram of LJ-V7200](image)
DIMENSIONS

Sensor head

Ultra-long range model
LJ-V7300
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.

TAILORED BLANK WELDING APPEARANCE 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.