High-speed Sub-micron Displacement Sensor with 40,000 Samples/sec.

High Accuracy Inductive Gaunting Technology
High-speed, high-accuracy detection allows for 24-hour monitoring of facilities and products, preventing defective products from being produced.

The high-speed, 40,000 samples/second sampling, does not overlook any instantaneous changes. Even high-speed production lines or moving objects can be measured accurately and efficiently.

The EX-V Series significantly improves the reliability of facility monitoring system by adding more accurate measurement to the rugged design, which is virtually unaffected by harsh environments.

**Bottom-dead-center measurement**
High-accuracy and high-speed sampling enables the detection of minute changes in end of stroke.

**Vibration measurement**
The high-speed sampling of 40,000 times/second allows for reliable detection of abnormal vibrations in facilities.

**Gap measurement**
The rugged, compact sensor head allows for accurate measurement of the position or gap between devices.
Best-in-its class accuracy and high-speed sampling

The EX-V series combines high-speed sampling with a newly developed linearity correction circuit which results in dramatic performance improvement over conventional eddy current systems.

High-speed sampling: 40,000 samples/second

Instantaneous changes can be detected reliably.

The high-speed digital processing circuit allows for accurate detection of real peak (bottom) values that cannot be detected at conventional sampling speeds.

High resolution: 0.02% of F.S.; Linearity: ±0.3% of F.S.

FLL circuit for high accuracy

The FLL (Flat Level Linearize) circuit applies the optimal linearization correction for each individual sensor head. You can achieve the measurement with best-in-its class accuracy with simple setting.

Significant reductions in cost/labor-hours at the touch of a button

The optimal program for the application is automatically set by just selecting the measurement mode. There is no need for complicated settings of a trigger input, timer setting or arithmetic operation using external devices.

Small and highly resistant sensor head

Considering the use in factories, the sensor head is designed to be resistant against harsh environments, to save space and to allow for easy maintenance.

Resistant against harsh environments: IP-67 rated

All models are rated as IP-67, offering resistance against both water and oil. They offer reliable operation even in harsh environments.

Space saving: Compact or low-profile type available

You can select the optimal sensor head according to the application and available mounting space.

Easy maintenance

Compatible sensor head

The FLL circuit allows for compatibility among sensor heads of the same model.

Alarm output

The alarm output indicates accidental breakage or disconnection of the sensor head.

Easy maintenance and useful functions ensure reliable operation in factories.
Just select the optimal setting for your application.

**Basic modes for quick operation**

Optimal settings for common applications are preprogrammed. Simply selecting the appropriate mode completes the setting. There is no need for time-consuming initial setting or adjustment.

**Bottom-dead-center mode**

Automatically detects the bottom dead center of stroke.

Detecting bottom dead center of an ultrasonic welder

The EX-V series measures the bottom dead center of the horn of the ultrasonic welder to detect defective welding.

Just selecting the bottom-dead-center mode automatically activates trigger inputs. The position of the bottom dead center within the sampling period is detected and then judged whether it is within the tolerance range or not.

**Eccentricity/vibration mode**

Accurately measures amplitude without being affected by changes over time.

Measuring the eccentricity of a shaft

The eccentricity of a rapidly turning shaft is measured for abnormality detection.

Measurement automatically starts when the amplitude exceeds the specified value. If the amplitude exceeds the tolerance range, an output is produced to indicate abnormal vibration.
Just selecting the "Average" measurement type automatically activates trigger inputs to measure the average value within the specified section.

**Thickness/gap mode**

Measures the average thickness of the desired section with a simple setting.

**Select the program best suited for your application.**

**Various measurement modes**

You can select the measurement mode best suited for your application, such as the limited bottom-dead-center mode or difference between peaks (bottoms) mode.

**Limited bottom-dead-center mode**

Detecting swarf generation in a press
The swarf may not be detected at the bottom dead center of the die because it is crushed there. Detecting the bottom dead center of the stripper allows for stable detection.

**Automatic trigger**

When a target approaches the sensor, a trigger signal is automatically turned ON to start measurement. There is no need for an external trigger input or timer setting.

**Timer function**

The flicker function using the internal timer allows for measurement of the average value or vibration within a specified period. Moreover, the timer enables adjustment of the start or end point of measurement from the instant the automatic trigger is turned ON.

**Previous value comparison**

The latest measured value can be compared with the average value of the previous measurements. This allows for the detection of only abrupt changes without being affected by changes over time.
Various Functions for Every Need

Measurement period output
The measurement period for bottom-dead-center or eccentricity detection can be specified by strobe outputs. By connecting the EX-V Series to an oscilloscope or other device, you can adjust the device while monitoring a waveform.

Tolerance limit memory function
Up to four upper/lower tolerance limit settings can be stored in memory. You can switch these settings also by external signals. This makes changeover quick and easy.

Comparator output disable input
The comparator output can be stopped with external signals. While continuing comparator operation, you can stop the output until the device operation stabilizes.

Applications by Facility/Product

Electric machinery/electronics
- Detecting improper crimping
  Improper crimping can be detected by checking the bottom dead center of the machine.
- Checking the origin of the X-Y stage
  The resolution of 0.4 µm enables accurate measurement of the position of the origin.
- Measuring the surface runout of a disk
  The eccentricity mode detects the surface runout of a disk.
- Measuring subtle vibration of a precision motor
  Detecting abnormal vibration prevents defective products from being sent to the next process.

Metal/automobile
- Measuring the eccentricity of ATC tools
  Eccentricity due to trapped swarf can be detected.
- Measuring the elongation of a tie bar
  The elongation of the tie bar of a die-cast machine can be measured by using a magnet jig.
- Detecting the eccentricity of a gear
  Setting the eccentricity mode to the difference between peaks measurement type detects the eccentricity in gear teeth tops.
- Measuring the gap between rollers
  The gap between the molding rollers can be accurately measured

Plastic/paper
- Measuring the distortion of a die for an injection molding machine
  The amount of distortion can be measured by comparing the measured values before and after the load is applied.
- Detecting the surface runout of a slitter blade
  The eccentricity mode automatically detects the surface runout exceeding the reference value.
- Measuring double-fed paper bags
  Detecting the movement of a jig allows for differentiation between one and two paper bags.
**Selection Chart**

Controller Sensor head

<table>
<thead>
<tr>
<th>Shape</th>
<th>Measuring range</th>
<th>Resolution</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>ø5.4 x 18 mm</td>
<td>1 mm</td>
<td>0.4 µm</td>
<td>EX-305V</td>
</tr>
<tr>
<td>M10 x 18 mm</td>
<td>2 mm</td>
<td>0.4 µm</td>
<td>EX-110V</td>
</tr>
<tr>
<td>M16 x 20 mm</td>
<td>5 mm</td>
<td>1 µm</td>
<td>EX-416V</td>
</tr>
<tr>
<td>ø22 x 35 mm</td>
<td>10 mm</td>
<td>2 µm</td>
<td>EX-422V</td>
</tr>
<tr>
<td>14 x 30 x 4.8 mm</td>
<td>4 mm</td>
<td>1 µm</td>
<td>EX-614V</td>
</tr>
</tbody>
</table>

**Specifications**

Model | Cylindrical ø5.4 x 18 mm | Threaded M10 x 18 mm | Cylindrical + threaded M16 x 20 mm | Thin profile ø22 x 35 mm | Thin profile 14 x 30 x 4.8 mm

| Shape     | Sensor head | Controller | Sensor head | Controller | Sensor head | Controller | Sensor head | Controller | Sensor head | Controller |
|-----------|-------------|------------|-------------|------------|-------------|------------|-------------|------------|-------------|------------|------------|
| Cylindrical ø5.4 x 18 mm | EX-305V | NPN | EX-01P | NPN | EX-01P | NPN | EX-01P | NPN | EX-01P | NPN |
| Threaded M10 x 18 mm | EX-110V | NPN | EX-02P | NPN | EX-02P | NPN | EX-02P | NPN | EX-02P | NPN |
| Cylindrical + threaded M16 x 20 mm | EX-416V | NPN | EX-05P | NPN | EX-05P | NPN | EX-05P | NPN | EX-05P | NPN |
| Thin profile ø22 x 35 mm | EX-422V | NPN | EX-10P | NPN | EX-10P | NPN | EX-10P | NPN | EX-10P | NPN |
| Thin profile 14 x 30 x 4.8 mm | EX-614V | NPN | EX-64P | NPN | EX-64P | NPN | EX-64P | NPN | EX-64P | NPN |

Measuring range: 0 to 1 mm 0.04" 0 to 2 mm 0.08" 0 to 5 mm 0.20" 0 to 10 mm 0.39" 0 to 4 mm 0.16"

Display range: -19999 to 19999

Resolution: 0.4 µm 0.4 µm 1 µm 2 µm

Sampling rate: 40000 samples max./sec.

Display rate: 20/sec.

Display character: 7-segment 2-color LED

Range-over alarm: ±FFFF is displayed. 1 µm

Control input:
- Timing input
- Reset input
- Auto-zero input
- Comparator output
- Disable input
- External setting input

Control output:
- Tolerance setting: Upper/lower 2-level setting x 4 sets (selectable)
- Signal: NPN open-collector (HIGH, GO and LOW): 100 mA max. (40 V max.)
- Response time: 0.075 ms (at maximum speed)
- Off-delay time: 60 ms
- Stroke output: NPN open-collector: 100 mA max. (40 V max.) (N.O.) PNP open-collector: 100 mA max. (30 V max.) (N.O.)
- Alarm output: NPN open-collector: 100 mA max. (40 V max.) (N.C.) PNP open-collector: 100 mA max. (30 V max.) (N.C.)

Analog voltage output:
- Output voltage: ±5 V
- Impedance: 100 Ω
- Response time: 0.075 ms (at maximum speed)
- Temperature fluctuation: 0.07% of F.S./°C

Power supply:
- 24 VDC ±10%, Ripple (P-P): 10% max.

Current consumption:
- 240 mA max.

Ambient temperature:
- Sensor head range: -10 to +60°C (14 to 140 °F), No freezing
- Controller range: 0 to +50°C (32 to 122 °F), No freezing

Relative humidity:
- 35 to 85%, No condensation

Vibration:
- 10 to 55 Hz, 1.5 mm double amplitude in X, Y and Z directions, 2 hours respectively

Weight:
- Sensor head (including 3-m cable): Approx. 45 g, Approx. 55 g, Approx. 75 g, Approx. 200 g, Approx. 60 g
- Controller: Approx. 235 g

Major functions:
- Auto-zero function
- Offset function
- Measurement modes (15 types)
- Tolerance limit value memory function (4 patterns)

1. When the digital filter function is used, the sampling rate is 2000 sampling/sec.
2. When the distance between the sensor head and the target is within 50% of the measuring range.
3. The above data was obtained using an iron target (S45C, SS41, t = 1 mm 0.04”). When measuring aluminum, copper, or stainless steel targets, refer to the linear characteristics for these materials.
**Dimensions**

<table>
<thead>
<tr>
<th>Panel thickness: 0.5 to 6.0 mm</th>
<th>2.95&quot; 75 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.89&quot; 46</td>
<td>2.91&quot; 74 mm</td>
</tr>
<tr>
<td>0.31&quot; 8</td>
<td>0.32&quot; 8</td>
</tr>
<tr>
<td>0.51&quot; 6</td>
<td>2.95&quot; 74 mm</td>
</tr>
</tbody>
</table>

**Sensor head**

EX-305V

- 0.71" 18
- 0.021" 0.5
- 0.613" 0.024"

EX-110V

- 0.71" 18
- 0.041" 0.5
- 0.13" 0.024"

EX-416V

- 0.565" 14
- 0.059" 0.5
- 0.13" 0.024"

EX-422V

- 0.565" 14
- 0.059" 0.5
- 0.13" 0.024"

**Mounting stand**

The stand has two 16-mm diameter mounting holes for attaching a push-button switch for reset input or comparator output disable input.

* The switch is not included. Contact KEYENCE for details.

**Options**

OP-35407

Mounting stand

To contact your local office >> call toll free: 1-888-KEYENCE

Specifications are subject to change without notice.