This new generation of high-performance laser measurement sensors delivers three major advances

- Space-efficient modular sensor/amplifier design
- Easy-to-program amplifier
- Advanced PC control for setup, monitoring and data acquisition

Why choose a measurement sensor?

To maintain a competitive edge, you now need to collect more useful information and make high-speed decisions right in-line with your manufacturing process without stopping the operations.

Measurement sensors fill the void between conventional photoelectric and proximity sensors, even those with analog outputs, and low-cost vision sensors. They provide multiple discrimination limits allowing several qualitative decisions instead of just accept or reject. Using conventional sensing techniques combined with advanced analytical tools preprogrammed into the amplifier, Omron’s measurement sensors solve a wide range of application problems.

Major advances in Omron’s ZX Series of measurement sensors include:
- ZX amplifier supports distance and width measurement applications
- Five analog output options including 4-20 mA and four DC voltage outputs, plus three discrimination outputs
- One-button teaching function or PC setup and monitoring software simplify start-up
- Operation monitoring and direct data logging capabilities
- Waveform monitoring eliminates oscilloscope use
- Resolution indicator displaying maximum application resolution

Small, versatile and safe sensing heads

Space-saving size

In addition to the small size, the ZX Series offers the world’s lightest laser measurement sensors (as of October 2001). Approximately the same size as a photoelectric sensor, the compact ZX sensors meet space-saving requirements for production equipment. Response speed is also equivalent to that of a photoelectric sensor: high-speed sampling of 0.15 ms; response speed of 0.3 ms.

Safe laser types

The interchangeable sensing heads use FDA Class I or Class II visible red laser light sources. Neither requires special or supplemental laser safety equipment for safe operation. Normal blinking or human response to bright light prevents overexposure.
Wide range of modular sensor heads and one powerful amplifier

For distance or width measurement, ZX Sensor heads use FDA Class 2 or Class 1 visible light lasers. Select the sensor head according to the required measurement distance and application. Measurement distances range from 28 to 500 mm. Use spot beams to measure minute objects or a line beam to measure larger areas for measurement averaging.

**Diffuse reflection types**

For Detection of All Target Types

**Three sensing distances:**

- 300 mm ±200 mm with 300 µm resolution
- 100 mm ±40 mm with 16 µm resolution
- 40 mm ±10 mm with 2 µm resolution

**Two beam shapes available:**

- Spot beam and 2 mm wide x 75 µm line beam
- 50 µm (40 mm range)
- Line beam
- 2 mm
- 75 µm

**Specular reflection types**

For Highly Reflective Targets or Precise, Sub-micron Resolution

**One sensing distance:**

- 30 mm ±2 mm with 0.25 µm resolution

**Two beam shapes available:**

- 75 µm dia. spot and 1.8 mm wide x 100 µm line beam

**Through-beam types**

For Area Detection

Using FDA Class 1 visible light lasers, ZX through-beam sensor heads have a 1 mm diameter beam for precise position, or a 5 mm or 10 mm wide beam for area detection. Measures width and distance range with 4 mm resolution.

**Three measuring widths and distance ranges with 4 µm resolution**

- 1 mm dia. spot
  - 1 mm dia.
  - 0 to 500 mm
  - 500 to 2,000 mm
  - Sensing distance
- 5 mm wide beam
  - 5 mm
  - 0 to 500 mm
  - Sensing distance
- 10 mm wide beam
  - 10 mm
  - 0 to 500 mm
  - Sensing distance

**ZX application examples**

**Electronic Assembly**

- IC Orientation
  - IC Pin Inspection

**Food and Beverage**

- Liquid Level Detection
  - Cap Detection

**Metal Fabrication**

- Part Tolerance
  - Web Width
- Thickness Detection
Advanced functions and capabilities to respond to your evolving needs

**Advanced functionality; easy to operate**

**Top Priority Placed on Easy Operation**
The ZX Series amplifier combines advanced functions and high performance with easy operation. Simple one-touch control allows for easy programming of three discrimination outputs, display of measurement values, analog output value and operating parameters.

**Comprehensive teaching functions**

**Position/2-point/Automatic**
Three teaching functions increase application flexibility and simplify setup of high, pass and low set-point values.

- **Position teaching**
  For high-precision positioning applications.

- **2-point teaching**
  For detecting ultra-small level differences between two points.

- **Automatic teaching**
  For teaching without stopping the workpiece.

**Equipped with a laser lifetime monitor**

**Self-Detection and Display of Laser Diode Lifetime**
A self-detection circuit, for laser diode deterioration, continuously monitors laser diode lifetime. When significant deterioration is detected, a warning appears on the amplifier’s sub-digital display. Early detection enables timely, trouble-free replacement of the sensor head before failure.

**Resolution indicator**
The achieved resolution of the application is calculated and displayed in millimeters on the amplifier allowing for smart determination of acceptable High and Low measurement limits.

**Other easy-to-use functions**

- Automatic or manual scaling of measurement display values
- Hold functions include peak hold, bottom hold, sample hold, peak to peak hold, self peak hold and self bottom hold
- Discrimination output timing functions include on-delay, off-delay and one-shot operation

Displays an error code of “lddyn” (laser diode dying) in advance of complete failure.
**A full complement of practical functions**

**Operation Setting with No Need for a Digital Panel Meter**

By simply fitting the optional Calculating Unit (ZX-CAL) between two amplifiers, the processing results of two sensors can be displayed on one amplifier for thickness measurement applications. Setting parameters only need to be input on one amplifier. This eliminates extra hardware and saves space formerly required to handle simple thickness comparisons.

**Light intensity mode's alternate functions**

**Diffuse Reflection**

Light intensity can be detected by the ultra-small spot of the laser beam. By operating as a high-precision laser photoelectric sensor, rather than a displacement meter, this enables detection of small items with backgrounds, as well as color detection. Ideal function settings are possible by using both the displacement mode and the light-intensity mode to meet multiple application needs.

**Through-Beam**

The light intensity/% mode can provide measurement width displays.

**Software setup tool saves time**

The SmartMonitor ZX Series Sensor Setup Tool enables connection with a PC. An advanced new approach for digital measurement sensing, this software simplifies start-up by stepping the user through teaching functions, limit settings and other parameters to fine-tune operation. The optional Communication Unit plugs into the amplifier to provide serial connection to the PC.
New SmartMonitor software for efficient 
ZX Series sensor setup

Tap into full sensor performance with a PC
Using a PC greatly enhances the amplifier display. Unlike conventional systems, the detection results from applications such as waveform monitoring and data logging can also be easily processed.

Simplifies setup
Complicated settings can be easily made while referring to PC software function menus. Settings can also be imported and exported as text data.

Flexible quality control
Data Logging
The ability of log measurement data to manage the system history enables efficient and effective quality control, and aids in determining necessary corrective action.

Waveform monitoring
Easy waveform monitoring replaces the conventional oscilloscope. Drag and drop threshold setting and other easy-to-use functions further enhance operation.

PC software specifications
Monitoring/Setting Digital Values
- Setting direct threshold and operational values
- Teach setting of threshold values; auto or manual
Waveform Monitoring
- Waveform collection, observation and editing
- Waveform saving and loading
Data Logging
- Compilation settings
- Microsoft® Excel compatible
Configurator Functions
- Setting amplifier functions (actual measurement scaling, input scaling, etc.)
- Saving and loading amplifier setting conditions
ZX reliable measurements solve the toughest application problems

Detect tiny parts in embossed tape

Problem:
In chip packaging and insertion applications, how can you tell if there’s a chip in every cell of embossed tape? Conventional narrow-beam sensors with 1 mm spot diameter can barely detect the chip as shown in the sensor’s output signal.

1 mm dia. sensor beam

Resulting output wave shape

Embossed tape with 0603 chip part (minute object)

ZX Solution: 50 Micron Spot Beam
The ultra-narrow visible laser beam clearly detects the chip’s leading and trailing edges within the embossed tape, as shown by the ZX amplifier’s output. This increases reliability for outbound and incoming inspection of small parts.

Detect PCB height for positioning

Problem:
Printed circuit boards are raised or lowered within a processing station before work begins. It is hard to detect the right height zone for PCBs using a spot beam sensor due to uneven surface, color differences and surface conditions caused by traces. Even using high-speed averaging calculations on the sensor output makes it tough to find the zone.

Spot beam

Uneven surface, various color and condition

ZONE

Resulting output wave shape

ZX Solution: Line Beam Sensing Head
The line beam provides a wider view that allows the amplifier to average out differences and provide the smooth, linear distance measurement to clearly identify the proper work zone height.

Even Greater Precision with Adjustable Hysteresis

Improve the precision of circuit board positioning by narrowing the acceptable range of hysteresis around the threshold level. The tighter tolerance in board positioning assures more accurate component placement.
## Ordering Information

### Amplifiers

<table>
<thead>
<tr>
<th>Description</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smart Sensor Amplifier, NPN output, 2 m cable</td>
<td>ZX-LDA11 2M</td>
</tr>
<tr>
<td>Smart Sensor Amplifier, PNP output, 2 m cable</td>
<td>ZX-LDA41 2M</td>
</tr>
<tr>
<td>Calculating unit; attaches between two amplifiers</td>
<td>ZX-CAL</td>
</tr>
<tr>
<td>Communications interface unit for sensor setup software</td>
<td>ZX-SF11</td>
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</table>

### Sensing Heads

<table>
<thead>
<tr>
<th>Description</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diffuse reflective, Spot beam, 40 +/-10 mm sensing distance</td>
<td>ZX-LD100</td>
</tr>
<tr>
<td>Diffuse reflective, Spot beam, 100 +/-40 mm sensing distance</td>
<td>ZX-LD100L</td>
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<tr>
<td>Diffuse reflective, Spot beam, 300 +/-200 mm sensing distance</td>
<td>ZX-LD300</td>
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<tr>
<td>Diffuse reflective, Line beam, 40 +/-10 mm sensing distance</td>
<td>ZX-LD40L</td>
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<tr>
<td>Diffuse reflective, Line beam, 100 +/-40 mm sensing distance</td>
<td>ZX-LD300L</td>
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<tr>
<td>Specular reflective, Spot beam, 30 +/-2 mm sensing distance</td>
<td>ZX-LD30V</td>
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<tr>
<td>Specular reflective, Line beam, 30 +/-2 mm sensing distance</td>
<td>ZX-LD30VL</td>
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<tr>
<td>Through-beam, 1 mm dia. measuring width, 0 to 2000 mm sensing distance</td>
<td>ZX-LT001</td>
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<tr>
<td>Through-beam, 5 mm dia. measuring width, 0 to 500 mm sensing distance</td>
<td>ZX-LT005</td>
</tr>
<tr>
<td>Through-beam, 10 mm dia. measuring width, 0 to 500 mm sensing distance</td>
<td>ZX-LT010</td>
</tr>
</tbody>
</table>

### Accessories

<table>
<thead>
<tr>
<th>Description</th>
<th>Part number</th>
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</thead>
<tbody>
<tr>
<td>Extension cable, 1 m cable length</td>
<td>ZX-XC1A 1M</td>
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<tr>
<td>Extension cable, 4 m cable length</td>
<td>ZX-XC4A 4M</td>
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<tr>
<td>Extension cable, 8 m cable length</td>
<td>ZX-XC8A 8M</td>
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<tr>
<td>Extension cable, 9 m cable length</td>
<td>ZX-XC9A 9M</td>
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<tr>
<td>Side-view attachment for ZX-LT001 and ZX-LT005</td>
<td>ZX-XF12</td>
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<tr>
<td>Side-view attachment for ZX-LT0101</td>
<td>ZX-XF22</td>
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<tr>
<td>Sensor Setup Software, English edition</td>
<td>ZX-SW11E</td>
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</tbody>
</table>

### Dimensions

<table>
<thead>
<tr>
<th>Millimeters (W x H x D)</th>
<th>Inches (W x H x D)</th>
<th>Type or part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 x 31.5 x 64.3</td>
<td>1.18 x 1.24 x 2.53</td>
<td>Diffuse reflective sensor heads</td>
</tr>
<tr>
<td>17 x 39 x 33</td>
<td>0.67 x 1.54 x 1.30</td>
<td>Specular reflective sensor heads</td>
</tr>
<tr>
<td>25 x 55 x 45</td>
<td>0.98 x 2.17 x 1.77</td>
<td>ZX-LT001, ZX-LT005 emitter</td>
</tr>
<tr>
<td>15 x 15 x 34</td>
<td>0.59 x 0.59 x 1.34</td>
<td>ZX-LT001, ZX-LT005 receiver</td>
</tr>
<tr>
<td>20 x 20 x 42</td>
<td>0.79 x 0.79 x 1.65</td>
<td>ZX-LT010 emitter</td>
</tr>
<tr>
<td>20 x 20 x 25</td>
<td>0.79 x 0.79 x 0.98</td>
<td>ZX-LT010, receiver</td>
</tr>
</tbody>
</table>