Optical Sensors

Leading technology in sensing

Miniature sensor E3T  Fiber optic amplifier E3X-DA-N
Compact sensor E3Z  Fiber optic solutions
Long range sensor E3NT  ZX Laser sensor
Optical sensors - Leading technology in sensing

Omrone offers a complete range of optical sensors for industrial automation tasks, whether it’s for basic object detection, positioning, color analysis or high-resolution sensing. And all of our sensors are designed with operating and installation convenience in mind.

Each of our processor-controlled sensors has an interface for communicating with other systems, such as a PC or machine control unit. Thanks to the use of calibrated lenses with minimized squint error, our photoelectric sensors do not require additional optical calibration, which saves installation time. And because the sensitivity of our sensors is reproducible, adjustment is required only once.

Traditionally when setting up a sensor, users had to adjust a single or multi-turn potentiometer to achieve the optimum setting. While potentiometers are quite simple to use, the user had no indication of the best position for setting the potentiometer; it was a matter of setting the potentiometer to various positions until optimum results were achieved.

With optical sensors becoming more sophisticated, Omron has developed a ‘touch to teach’ set-up system to ensure that users benefit from an easier way to set up a sensor. Omron’s sensors are tough. Models are available mounted in plastic, zinc die-cast or stainless steel housings with cable or plug connections, and
are adapted to suit individual requirements. Omron’s sensors are also user-friendly. Each includes a stability display to indicate the safe on and off operating positions and to show the reliable function.

Whatever your sensor requirement - for presence checking, positioning, inspection, measurement or color and contrast analysis - Omron has a model that offers top performance and maximum operating convenience.

4. **Miniature sensor E3T**
   Sub-miniature through-beam with integrated analysis

6. **Compact sensor E3Z**
   Compact sensor suitable for long distances

8. **Long range sensor E3NT-L**
   Sensor with background suppression and digital display

10. **Fiber optic amplifier E3X-DA-N**
    Process-controlled sensor with digital display

12. **Fiber optic solutions**
    E32 fiber-optics range for E3X-DA-N/E3X-NA

14. **ZX Laser sensor**
    Unique plug & play concept for precise measurement

16. **Typical Applications**
    E32 fiber-optics range for E3X-DA-N/E3X-NA

18. **Smart & Seamless Technology**
    Omron platform for seamless communication and smart devices

19. **Overview of sensors**
The E3T is a very compact photoelectric sensor series and is available as a through-beam, retro-reflective and scanning type with background suppression. It features integrated optics and electronics, and is ideal for detecting tiny components such as ICs.

The E3T series offers the same electrical reliability as larger sensors. Polarity protection and a short-circuit-proof switch output are integrated, just like the function display and stability display. Its small dimensions make the E3T ideal for applications where space is limited and ambient requirements are demanding.
Omron’s unique pin-point LED produces a high-output narrow-visibility beam of 0.8-mm spot diameter (E3TSL1). A red spot can be seen clearly and optical axis alignment and detection position checks are easy. Furthermore, the LED is not affected by the color of the item or the background, and can detect even small items with great accuracy.

High output pin-point light source LED (wave length: 670 nm).

Suitable for use in envelope filling machines.
The photoelectric sensor family E3Z consists of compact through-beam, scanning and energetic reflective sensors, as well as sensors with background and foreground suppression. Special models are also available for precision detection and transparent materials detection.

Built in small plastic housing with a thickness of just 10 mm, the E3Z series is ideal for installation in narrow spaces. Despite their small size, these sensors outperform any equivalent sensor on the market, and thanks to their high power reserves, they can easily replace larger sensors.

The integrated optical ICs, specially developed by Omron for the E3Z, greatly exceed the IEC requirements for EMC. No special measures are needed to prevent electrical interference such as from frequency converters or mobile phones.
- PNP or NPN output
- Through-beam: 15 m sensing distance
- Retro-reflective sensor: 5 m sensing distance
- Energetic sensor: 1 m sensing range
- Distance-setting sensor: 0.2 m
- Application-specific sensor versions
- Light-On or Dark-On
- Cable and plug models
- Class IP67 protection

No mutual influence occurs, even when several sensors are operating in close proximity to each other.

One switching point for different colored objects.

Omron’s highly integrated optical IC technology offers excellent EMC.

Conveyor systems in the beverage industry.
The E3NT-L scanning sensor has a sensing distance of up to 2 meters, and features foreground and background suppression. The sensor's optics are specially arranged so that distance is evaluated using the 'double triangulation' principle. This prevents the possibility of false switching due to background motion, and enhances the reliability of the E3NT-L. The E3NT-L is a sealed unit, and configuration is quick and easy via the digital display. A locking function prevents accidental adjustment of the sensor's parameters. Its two programmable outputs can be adjusted to different set points, which means that the E3NT-L can in fact replace two sensors.

Thanks to its smooth, robust, die-cast aluminium design, the E3NT-L is ideal for operating in harsh environments. An anti-condensation option with heated glass window enables the sensor to operate reliably in low-temperature applications like refrigeration chambers.
• PNP/NPN or push-pull output
• Sensing range up to 2 m
• Digital display
• Menu-guided parameterization
• Freely programmable inputs and outputs
• Optional front-plate heating
• Optional PC interface
• Analogue output
• Die-cast aluminium housing
• Class IP67 protection

Two outputs can distinguish whether there is one, two or even more pallets in the storage location.

Machines in the food industry need to be cleaned frequently. With rapid temperature changes, and lots of water and steam, a completely sealed sensor with window heating is essential.

Thanks to the optic link, the sensor can be remotely set and checked while it is operating in an area where access is restricted.

This robust sensor is ideal for operation in the harshest of environments.
The E3X-DA-N family offers everything one would expect to find in a modern fiber-optic sensor. Various LED send lights, (blue, green, red, infrared) digital and monitor outputs, all time functions, and various electrical connections are just some of the features offered by this family. The E3X-DA-N also features a digital display that simplifies the menu-guided operation and shows how safe and reliable the fiber-optic amplifier is working. The sensors communicate with each other via the optical interface. This is located on the side of the sensor to prevent mutual interference. When connected to an interface unit this allows communication via bus modules such as DeviceNet, CompoBus/S or an RS-422 PC interface.

The E3X-NA family is a simpler variant of Omron’s very successful E3X-DA-N, and is suitable for basic applications such as fast detection of printing marks. It includes configuration options like the classic potentiometer and bar graph display.
Features E3X-DA-N

- Teach-in, easy to use
- Digital display
- APC function (Auto Power Control)
- No mutual interference by optical interface
- Menu-guided operation
- Remote setting by mobile console
- Analogue and monitor outputs
- Parameters easy to set up via bus module

Features E3X-NA

- Easy to operate
- Clear bar graph display
- Response time up to 20 µs
- No mutual interference from optical interface

E3X-NA for basic applications.

For services such as remote maintenance, it is important to parameterize and configure sensors via the control unit.

Omron’s original APC (Auto Power Control) function makes the E3X-DA-N ideal for applications where a high degree of sensitivity is required. The APC automatically resumes stable sensing for a long period. The APC also avoids re-adjustment of settings, which is necessary for conventional sensors.

Suitable for use in envelope filling machines.
The E32 fiber optics range offers hundreds of affordable solutions for various applications. These plastic and glass fiber optics not only provide small object detection and precise positioning, but can also be installed in high-temperature and chemical environments.

The plastic fiber can be cut to length for easier installation. The flexible fiber with multi-core can be bent to 1mm radius. Everything from head size, sensing distance, mounting, beam spot, and material can be chosen to best suit your application. Customized fibers can also be designed to your specifications.
Various tasks sometimes require different physical solutions.

- Long distance (up to 20 m)
- Thin fibers for precise detection
- Highly flexible fibers with more bending radius
- Customized fiber solutions available for area sensing and for heat and chemical resistance

Heat resistive heads up to 400 °C.

- Long distance (up to 20 m)
- Thin fibers for precise detection
- Highly flexible fibers with more bending radius
- Customized fiber solutions available for area sensing and for heat and chemical resistance

- Screen fiber for area detection, ideal for tiny object detection and precise positioning.
- Many fiber optics are available for specific applications.
- Unlike conventional fiber units, the E32-L25L Convergent Reflective Fiber Unit can detect upper and lower sets separately when inspecting two levels of connector pins.
- Flexible fiber contains multiple independent cores all surrounded by cladding. The fiber can be bent without breaking or reducing the light intensity. Conventional fiber uses just one core and one cladding section. Bending the fiber may break it or reduce the light intensity.
Omron’s innovative ZX sensor is a very compact, very versatile measuring sensor. Modular in design, the ZX consists of one amplifier and numerous measuring sensor heads (currently 11) which are interchangeable to suit almost any measurement-sensing requirement. The ZX measures not only the displacement very precisely, but also measures thickness and positioning.

This very compact sensor is an attractive solution when location and installation space is limited. It offers the same kind of high-speed response as photoelectric sensors, and with a resolution of 0.2 micrometers the ZX is also very precise.

Thanks to a processor in the sensor head it is no longer necessary to calibrate the sensor head and amplifier; each sensor head is always configured by the amplifier. A calculation unit can be used to obtain thickness measurement without the need for a digital panel meter or specific controller.
Amplifier ZX-LDA

- 2 digital, five-digit displays
- Sensing frequency up to 0.15 ms, incrementally adjustable
- 3 digital outputs: HIGH, PASS, LOW
- 1 analogue output, incrementally adjustable between –5 V to 5 V, or 0 to 20 mA

Sensor head ZX-LD

- Measurement range of 40 ± 10 mm, 100 ± 40 mm, 300 ± 20 mm
- Sensing accuracy: up to 0.002 mm
- Focused spot beam or line beam
- Size of sensing head: 33 mm x 39 mm x 17 mm

Sensor head ZX-LD_V

- Measurement range: 30 ± 2 mm
- Sensing accuracy: up to 0.25 µm
- Measurement width: 1 to 2.5 mm, 5 mm, 10 mm
- Sensing distance up to 500 mm/2000 mm
- Resolution: 4 µm
- Size of sensing head: 45 mm x 55 mm x 21 mm

- Smart monitor software tool enables easy system set-up via PC or Notebook.

- Detects the smallest height differences, measures fluctuations.
- Measures thickness of vibrating systems for variations in surface.
- Detects tears in continuous paper roll, measures material thickness.
TYPICAL APPLICATIONS

- **Remote control** simplifies the set-up of fiber-optic sensors in restricted installation situations.

- For services such as remote maintenance, it is important to parameterize and configure sensors via the control unit.

- **Moving objects**
  Continuous measurement in the production line combined with self-trigger modes to detect moving objects.

- **Sheet counting**
  The ZX can detect a single sheet of paper for up or down sheet counting during the printing process.

- **In-line thickness control**
  Two ZX sensors combined with a calculation unit and the A-B modes detect the thickness of a product.

- **Rotating objects**
  Using the P-P Mode the ZX measures the eccentricity of rotating objects.

- **Through-line thickness control**
  Two ZX sensors combined with a calculation unit and the A+B modes detect the thickness of a product.

- **Through beam**
  The ZX through-beam type measures height, width or gaps in the production process.
The E3Z-L with an energetic narrow beam characteristic detects small gaps.

The E3Z-D, with a diffuse IR wide beam characteristic, is ideal for detecting structured surfaces. Notches or holes are eliminated by evaluating only the integral amount of reflected light.

Through-beam E3Z-TA sensors with visible red light are ideal for precise detection of position. A variety of slits are available, and mounting in a stack for height differentiation is possible with interference filters.

The well-tuned retro-reflective E3Z-B sensor is the best choice for detecting transparent PET bottles economically. Two models for single row or long-distance models for the jamming area are available.

The E3Z-G, with two optical axes, allows simple direction identification by evaluating whether one or two beams are interrupted.

Small packages only 4mm high can be detected on a conveyor belt with the E3Z-LS using background suppression. Shiny or glossy, uneven objects are detected by switching to the foreground suppression mode.

Two outputs can distinguish whether there is one, two or even more pallets in the storage location.

A version of the E3NT-L with analogue output is available, making it ideal for winding/unwinding applications.
The Smart & Seamless approach is to look at the system architecture as an information highway, where different field networks are feeding into each other seamlessly. Devices like sensors, vision, drives or motion controllers are plugged effortlessly into the automation architecture. They are recognised and information is automatically routed to and from them.

Smart & Seamless technology will allow engineers to develop their machinery faster, thanks to an integrated platform in terms of software and hardware. Ideally, users can develop their software regardless of the hardware being used. This will cut significantly the development and commissioning time. Smart & Seamless devices will allow field devices to issue maintenance messages, thus ensuring and enforcing preventive maintenance within plants.
# Overview of Sensors

## Photoelectric Sensors

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## Safety Sensors / Components

| Safety Relays | Safety Relay Unit G9SA, Safety Relay Unit G9SB, Safety Relay G7S, Safety Relay G7SA, Safety Relay Unit CQM1-SF200, CS1W-SF200 |

## Proximity Sensors

| Cylindrical | Standard E2A, Antispatter E2EQ, Chemical Resistance E2FQ |
| Rectangular | Subminiature E2S, Flat TL-W, Standard TL-N |
| Peripheral Equipment E2E/E2EG | Accessories Y92 |

## Vision Sensors


## Rotary Encoders

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<tbody>
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  - Level controllers

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  - Photoelectric sensors
  - Proximity sensors
  - Rotary encoders
  - Vision systems
  - RFID systems
  - Safety switches
  - Safety relays
  - Safety sensors