

Optical Sensors



Leading technology in sensing

Miniature sensor E3T

Compact sensor E3Z

Long range sensor E3NT

Fiber optic amplifier E3X-DA-N

Fiber optic solutions

ZX Laser sensor

Advanced Industrial Automation

OMRON



Optical sensors - Leading technology in sensing

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OPTICAL SENSORS FOR DETECTION AND INSPECTION

Omron 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.

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Sub-miniature through-beam with integrated analysis
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MINIATURE SENSOR E3T



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Sub-miniature optical sensor with integrated amplifier

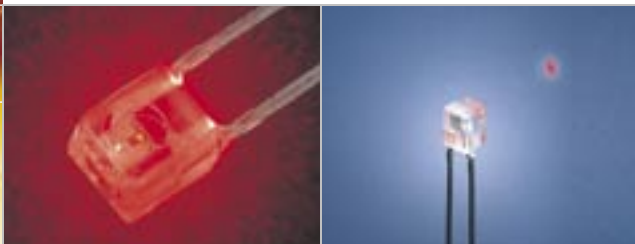
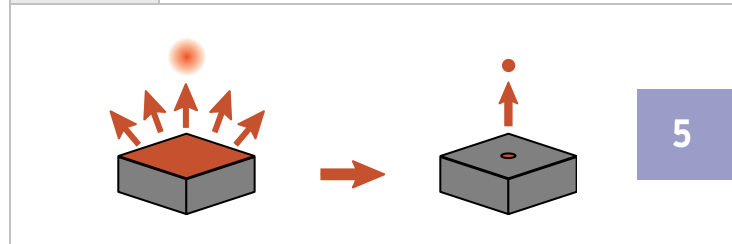
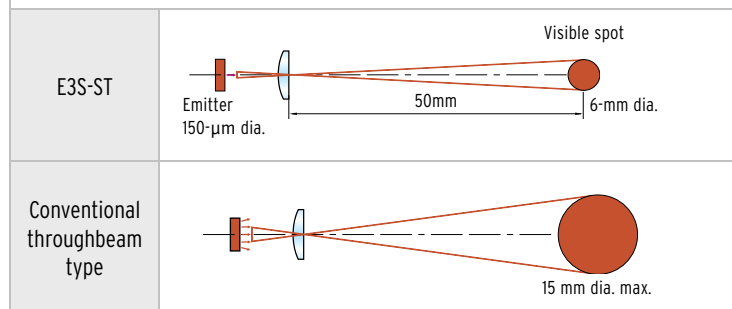
The E3T is a very compact photoelectric sensor series and is available as a through-beam, retro-reflective and scanning type with background suppression. It features integrated optics and electronics, and is ideal for detecting tiny components such as ICs.

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.

Features E3T

- Small spot size
- PNP or NPN output
- Integrated amplifier
- Background suppression
- Light-On or Dark-On
- Function display
- Stability display
- Class IP67 protection

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.



- ▲ A conventional LED emits light from its surface. It has a large degree of dispersion, increasing the loss when creating a small beam.
- ▲ The hyper LED emits light from a small point. It has a small degree of light dispersion, achieving a loss-free, high-output, narrow-visibility beam.

- ▲ High output pin-point light source LED (wave length: 670 nm).
- ▶ Suitable for use in envelope filling machines.



COMPACT SENSOR E3Z



Compact design, ideal for long distances

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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

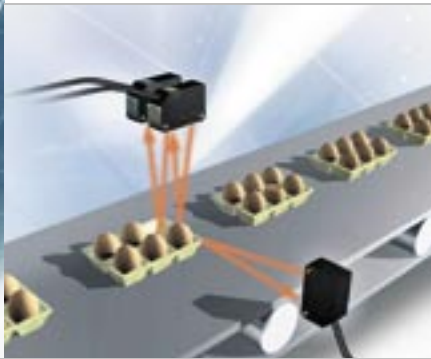
sensors outperform any equivalent sensor on the market, and thanks to their high power reserves, they can easily replace larger sensors.

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.

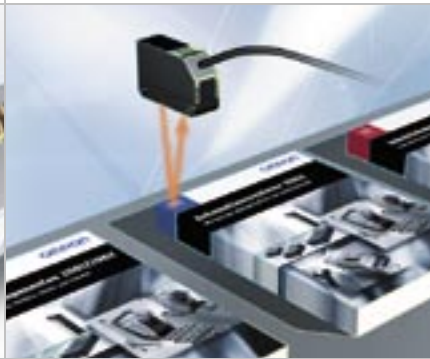
Features E3Z

- 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

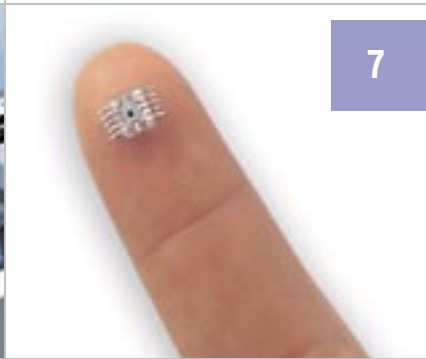
▼ No mutual influence occurs, even when several sensors are operating in close proximity to each other.



▼ One switching point for different colored objects.



▼ Omron's highly integrated optical IC technology offers excellent EMC.



▶ Conveyor systems in the beverage industry.



LONG RANGE SENSOR E3NT-L

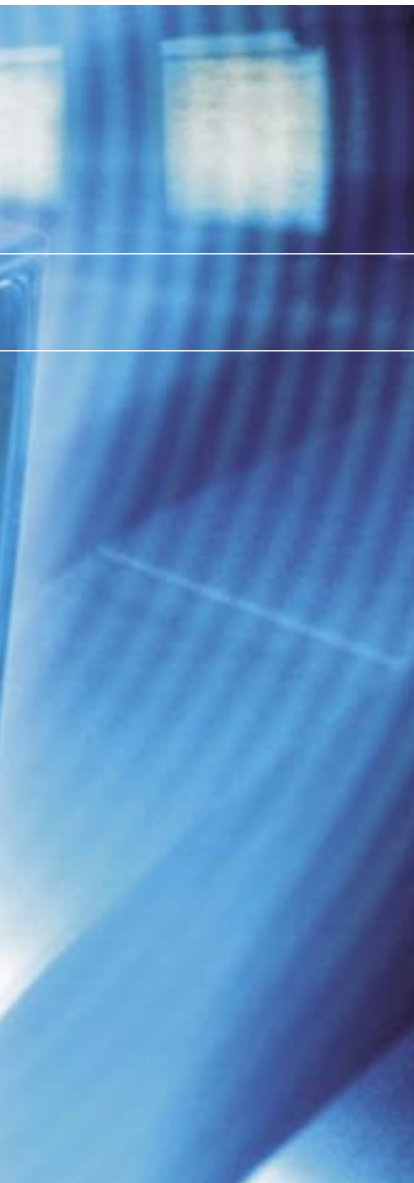
With background suppression and digital display



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.



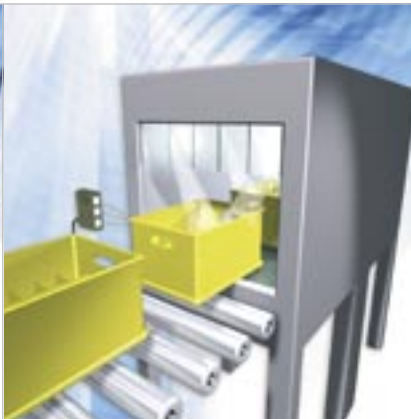
Features E3NT-L

- 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

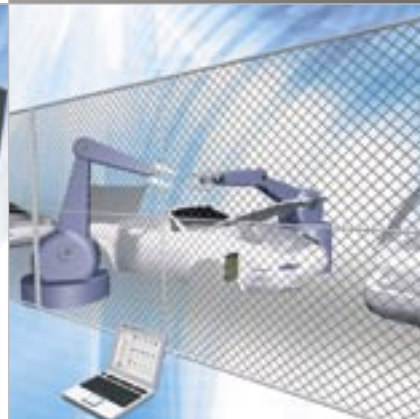
▼ This robust sensor is ideal for operation in the harshest of environments.



▲ 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.

FIBER-OPTIC AMPLIFIER E3X-DA-N

With digital display



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 μ s
- 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.

FIBER OPTICS FOR MULTIPLE SOLUTIONS

E32 fiber optics range for E3X-DA-N/E3X-NA

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.

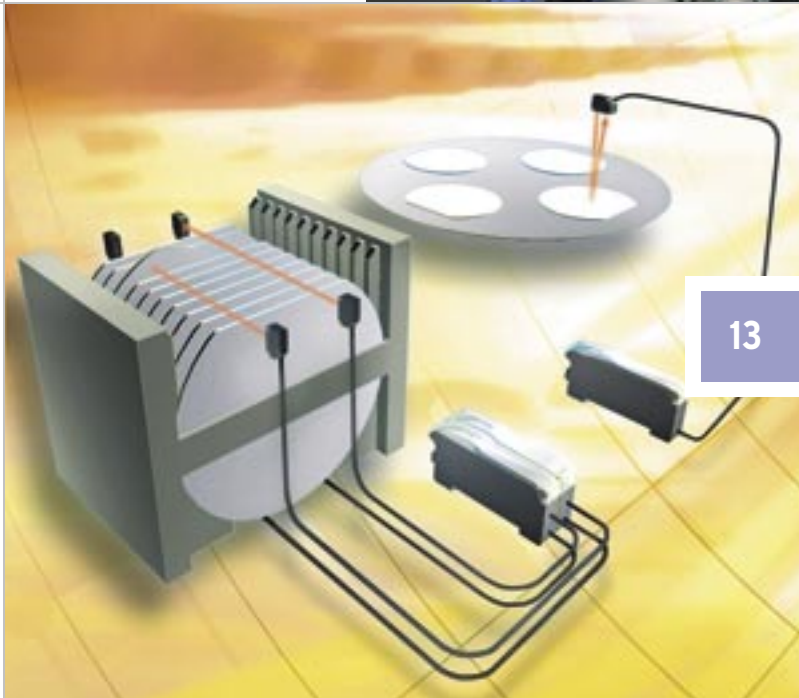
Features E32 fiber

- 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.



- ▶ Various tasks sometimes require different physical solutions.



- ▲ Beam spot size on lens can be changed.



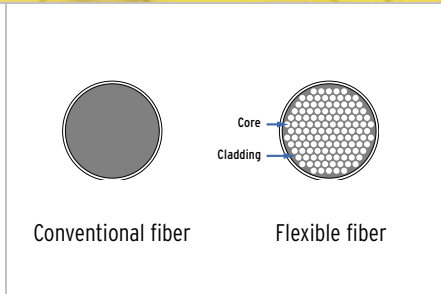
- ▲ Screen fiber for area detection, ideal for tiny object detection and precise positioning.



- ▲ 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.

ZX LASER SENSOR



Unique plug & play concept for precise measurement



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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

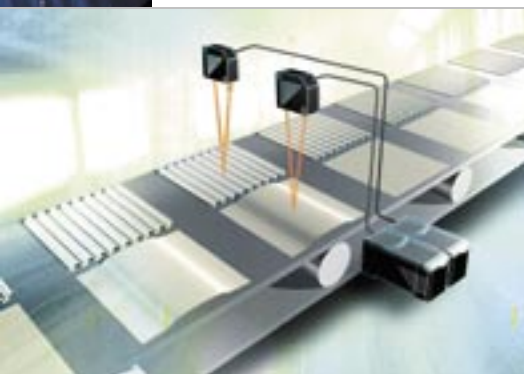
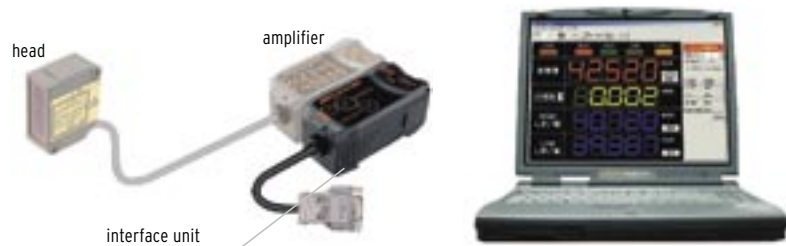
Sensor head ZX-LD_V

- Measurement range: $30 \pm 2\text{ mm}$
- Sensing accuracy: up to $0.25\ \mu\text{m}$
- Measurement width: 1 to 2.5 mm , 5 mm , 10 mm
- Sensing distance up to $500\text{ mm}/2000\text{ mm}$
- Resolution: $4\ \mu\text{m}$
- Size of sensing head: $45\text{ mm} \times 55\text{ mm} \times 21\text{ mm}$

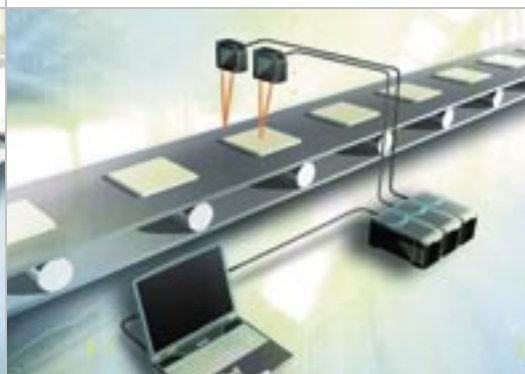
Sensor head ZX-LD

- Measurement range of $40 \pm 10\text{ mm}$, $100 \pm 40\text{ mm}$, $300 \pm 20\text{ mm}$
- Sensing accuracy: up to 0.002 mm
- Focused spot beam or line beam
- Size of sensing head: $33\text{ mm} \times 39\text{ mm} \times 17\text{ mm}$

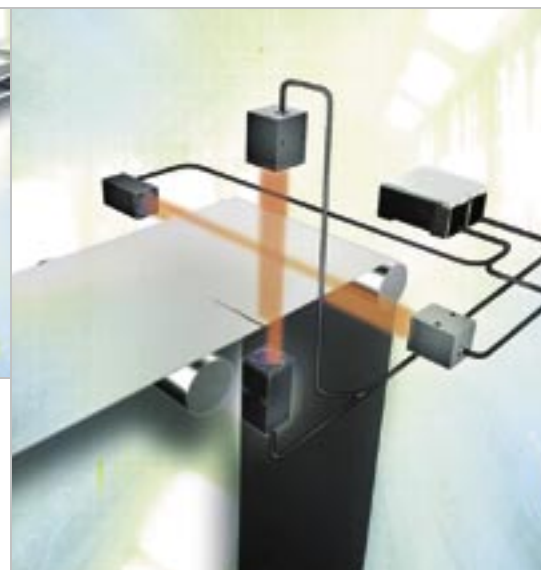
▶ Smart monitor software tool enables easy system set-up via PC or Notebook.



▲ Detects the smallest height differences, measures fluctuations.



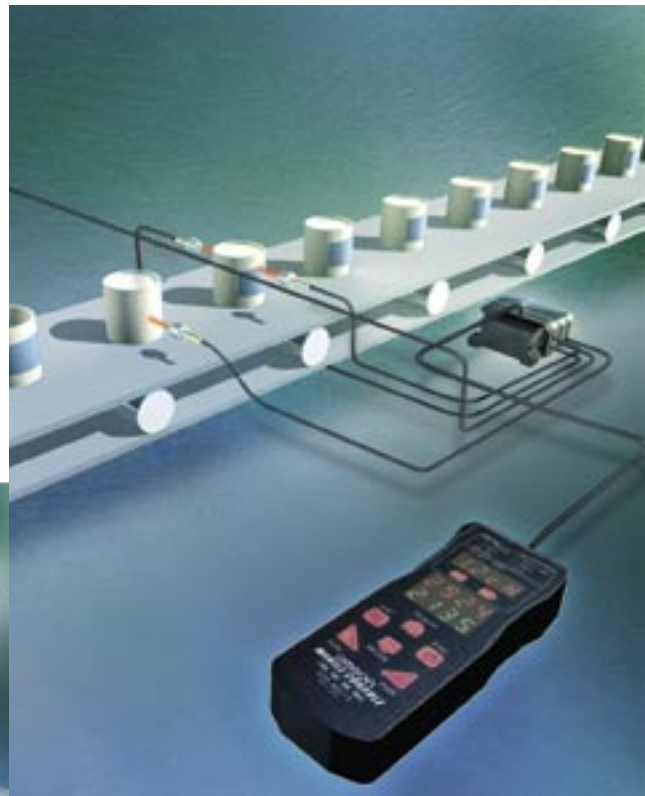
▲ Measures thickness of vibrating systems for variations in surface.



▲ 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.

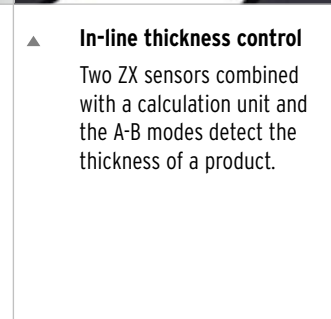
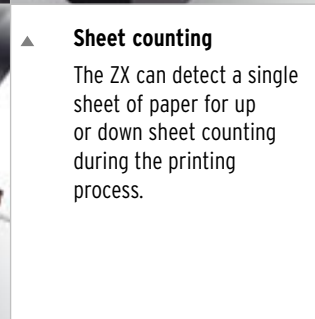
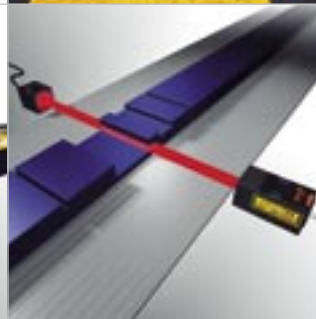
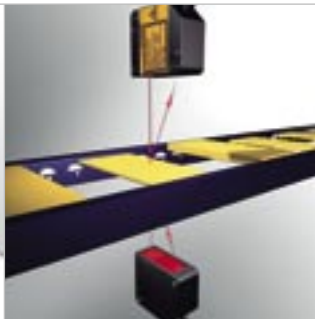
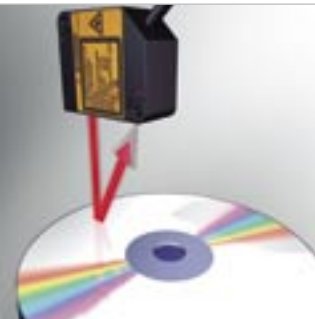
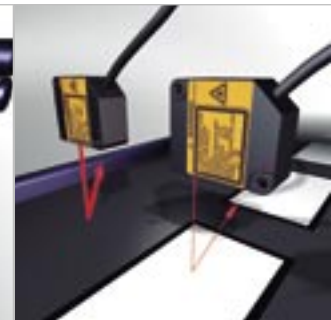
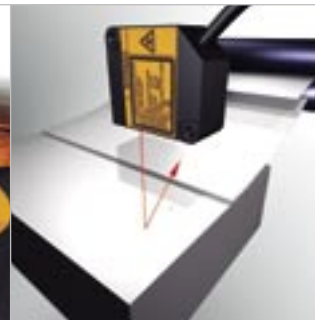
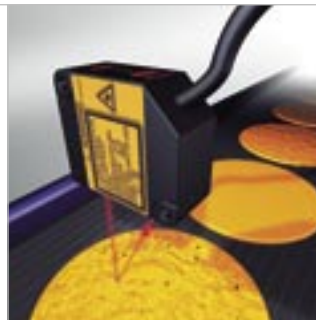


- ▶ For services such as remote maintenance, it is important to parameterize and configure sensors via the control unit.



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



- ▲ **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.

- ▲ **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.

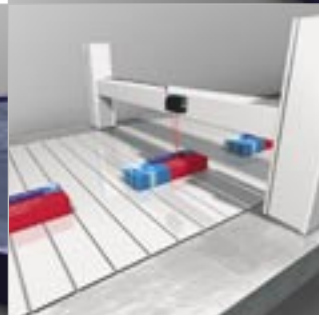
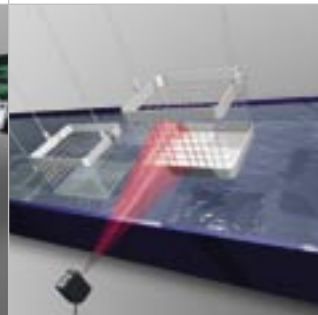
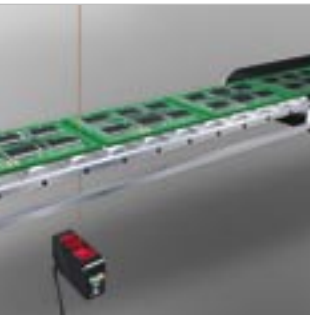
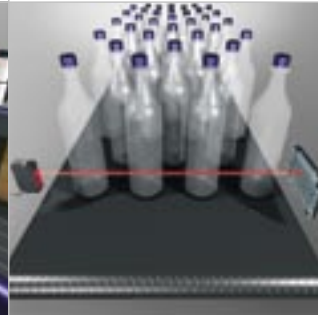
▼ Through-beam E3Z-TA sensors with visible red light are ideal for precise detection of position. A variety of slits are available, and mounting in a stack for height differentiation is possible with interference filters.

▼ 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.

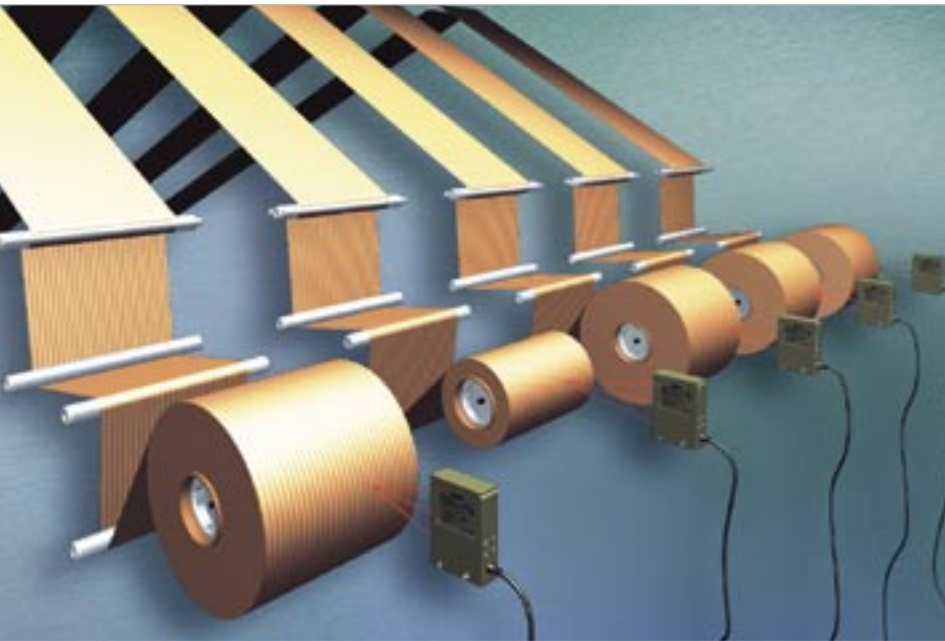
▼ The E3Z-G, with two optical axes, allows simple direction identification by evaluating whether one or two beams are interrupted.

▼ 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.



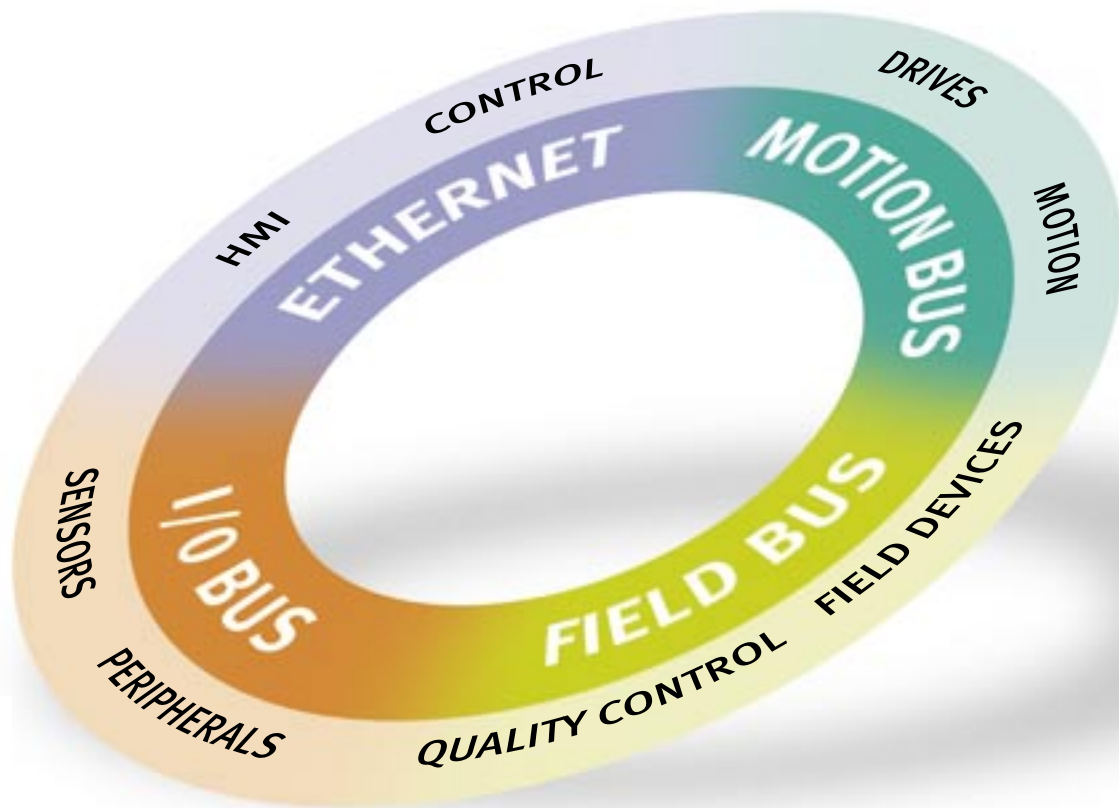
◀ Small packages only 4mm high can be detected on a conveyor belt with the E3Z-LS using background suppression. Shiny or glossy, uneven objects are detected by switching to the foreground suppression mode.



◀ 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.

SMART & SEAMLESS TECHNOLOGY



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Transparency and integration for machine automation

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			
Optical Fiber	Digital (Autotuning)	E3X-DA-N E32	
	Fiber Amplifier Sensor Communication Units	E3X-DRT21 E3X-SRT21 E3X-CIF11	
	Adjustor (Manual)	E3X-NA	
General Purpose	Miniature	E3Z	
	Slim, Subminiature	E3T	
	Distance-settable (Metal Case)	E3NT-L	
	Oil Resistance, Long Distance (Metal Case)	E3S-C	
	Distance-settable (Metal Case)	E3S-CL	
	Long Distance	E3G	
	Distance-settable (Miniature)	E3G-L1/L3	
	Distance-settable (Miniature, Plastic Case)	E3S-LS	
	M18 Cylindrical Housing	E3F2	
Built-in Power Supply	AC/DC-switchable	E3JK	
Application	Very Small Spot/Mark	RGB Color E3MC	
	Laser	Distance-settable F3C-AL	
	Glossy Objects	Optical Fiber Glossy Objects E3X-NL	
	Transparent Objects	Clear Bottles	E3S-CR62/67
		Transparent Objects	E3S-R
	Liquid Level	Optical Fiber, Contact	E32-D82F
		Optical Fiber, Pipe Mounting	E32-L25T
	Vacuum	Vacuum, Optical Fiber	E32-V
PCB	PCB	E3S-LS3N	
UV	UV Power Monitors	F3UV	
Peripheral Equipment	Sensor Adjustors	E39-L150/L151/L93	
	Covers	E39-L97/L98	
	Accessories	E39-L/S/R	

Displacement Sensors/ Length-measuring Sensors		
Displacement Sensors	Smart Sensors	ZX
Length-measuring Sensors	Parallel Beam Linear Sensors	Z4LB V2

Vision Sensors	
High-performance Vision Sensor	F160
Pattern Matching Sensor	F250
Vision Sensor	F10
Integrated Control Software for F150-3	F150-3
Color Vision Sensor	Vision Composer
Cameras, Lenses, Lighting	F400

Safety Sensors / Components		
Safety Sensors	Safety Light Curtain Type 4	F3SN-A
	Multibeam Safety Sensor Type 4	F3SH-A
	Safety Light Curtain Type	F3S-B
	Single Beam Safety Sensor	E3FS
	Muting Controller	F3SP-U1P
	Muting Controller	F3SP-U2P
Safety Relays	Safety Relay Unit	G9SA
	Safety Relay Unit	G9SB
	Safety Relay	G7S
	Safety Relay	G7SA
	Safety Relay Unit	CQM1-SF200
		CS1W-SF200
Safety Switches	Safety Door Switches	D4DS
	Safety Door Switches	D4BS
	Safety Door Switches	D4GS-N
	Safety Guard Lock Switches	D4DL
	Safety Guard Lock Switches	D4BL
	Safety Hinge Switches	D4DH
	Safety Limit Switches	D4D_N
	Safety Limit Switches	D4B_N
	Manual Reset Limit Switches	D4D-_R
	Emergency Stop Pushbuttons	A165E
	Emergency Stop Pushbuttons	A22E
	Enabling Switch	A4E

Proximity Sensors		
Cylindrical	Standard	E2A
	Antispatter	E2EQ
	Chemical Resistance	E2FQ
Rectangular	Subminiature	E2S
	Flat	TL-W
	Standard	TL-N
Capacitive	Liquid Level	E2K-L
	Long Distance	E2K-C
	Flat	E2K-F
	Chemical Resistance	E2KQ-X
Peripheral Equipment E2E/E2EG	Accessories	Y92

Rotary Encoders		
Incremental	25 dia.	E6A2-C
	40 dia.	E6B2-C
	50 dia.	E6C2-C
	60 dia.	E6F-C
	40 dia. (Hollow Shaft)	E6H-C
Absolute	50 dia.	E6C3-A
	60 dia.	E6F-A
Easy Scale	Linear Encoder	E6L

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