

# Digital Fiber Optic Sensors



ULTIMATE  
CONTROL AND  
PRECISION



**OMRON**<sup>®</sup>  
the problem solvers<sup>™</sup>

## Complete control for precise, space-confined sensing

A close-up photograph of an Omron E3X-DA-N fiber optic sensor. The device is a long, narrow, rectangular unit with a black top and a silver bottom. It features a red LED display showing the number '0000'. To the right of the display is a red emergency stop button. The sensor is connected to a black fiber optic cable. The background is dark, making the sensor stand out.

Omron's new E3X-DA-N series fiber optic sensors offer the industry's most comprehensive combination of advanced performance, versatility, ease of use and long-term reliability. The sensor's easy-to-read digital display and extraordinary configurability let you fine-tune it to your exact application requirements. This is especially important for precision sensing applications, long distance sensing or high-speed applications.

While the sensor is ideal for stand-alone applications, its benefits really shine when many sensors need to be mounted close to one another. The unique, ultra-slim, package design allows gang mounting that saves space, wiring and set up time using the industry's first hand-held remote programmer. The E3X-DA-N is smart, too, with built-in auto-teach functions for faster setup and self-diagnostics that automatically correct for LED degradation over time, so you don't have to.

In addition, Omron offers one of the industry's largest selection of fiber optic cables to choose from to complete your sensing application.

Precision control. User friendly. Smart.

● **Problem solved.**

• has never been so easy.



### Application-Sensitive Fine-Tuning for Precise Control

The E3X-DA-N's precise control starts with its large, easy-to-read digital display. The digital display lets you accurately monitor light incidence level as a number, a percentage or an analog bar graph for easier sensor set up and monitoring. The display also aids in precise configuration of the sensor's hysteresis, switching threshold and excess gain settings. You can even reverse the display so you can read it from either side of the sensor.



### Hand-Held Remote Programming Tool

Use the industry's first hand-held remote programmer to set up and monitor sensor performance from up to 16 feet away. Monitor light incidence and set threshold levels simultaneously using the programmer's dual digital displays. The programmer also lets you copy and paste sensor configurations to multiple sensors and communicate with up to 16 sensors at a time.



### Unique Connector Design Saves Wiring and Installation Time

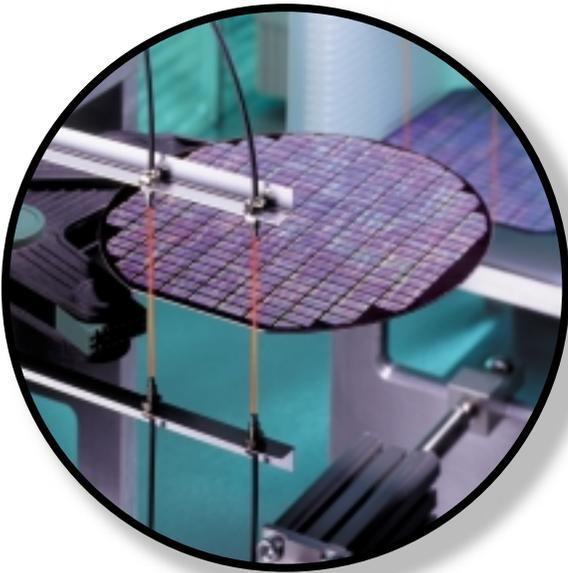
The E3X-DA-N features a unique connector designed to reduce wiring and make installation and maintenance a snap. The "master" connector provides power to as many as 16 amplifiers. "Slave" connectors reduce wiring by carrying signal data only.



### A Wide Variety of Fiber Optic Cables to Match Your Application

Omron offers more than 80 fiber optic cables to complete your sensing applications. Choose from through-beam and diffuse models with standard or armor-clad cables and special sensing heads with side view and bendable probe tips.

# Gain control of your precision sensing applications



The new E3X-DA-N fiber optic sensor lets you reliably detect minute objects at high-speeds in difficult to reach spaces and features many new design innovations that give you...

- MORE** control of your precision sensing needs.
- MORE** control of sensor performance.
- MORE** control of sensing parameters.
- MORE** control of your application.

Through a combination of a new digital display, built-in intelligence and complete configurability, the E3X-DA-N gives you greater control and reliability than any other fiber optic sensor on the market.

● **Problem solved.**

## Digital Display for More Precise Set Up and Control

The E3X-DA-N features a large, easy-to-read digital LED display that enables you to set up and monitor your sensing application using precise numerical values and percentages. There is no guesswork involved. The display gives you real time feedback that aids in precise configuration of the sensor's switching threshold and hysteresis. In addition, the display lets you know when even the slightest misalignment or bit of dust or dirt on the sensor tip is beginning to degrade sensor performance.

### Digital Incident Level Display

The sensor's light intensity is digitally displayed for accurate measurement and easier optical alignment.



*Largest character size in the industry—6 mm*

### Digital Percent Display

In this display mode you can compare actual gain to a preset value in terms of a percent.



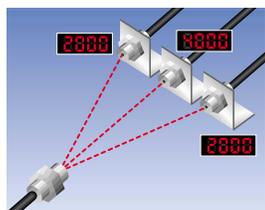
### Dual Analog Bar Graph Display

Graphically monitor the sensor's performance using the analog bar graph display to view real time incident levels compared to the sensing threshold.



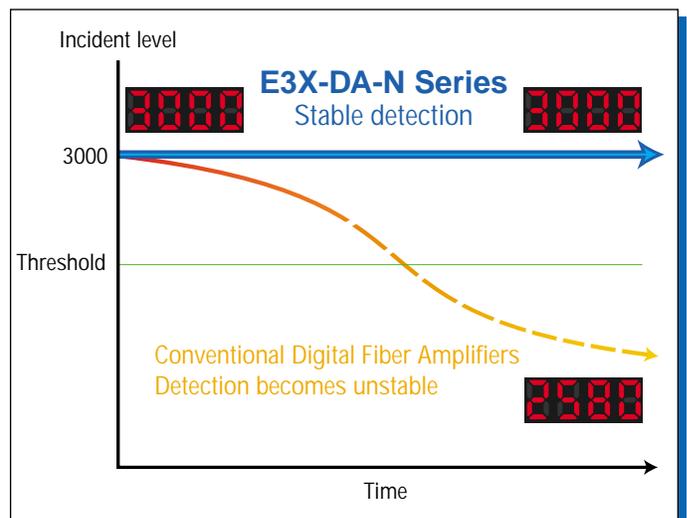
### Optical Axis Adjustment

The large LED characters display real-time readouts of the light incidence level. This lets you quickly and easily adjust the sensor's optical axis to ensure precise positioning for optimal performance.



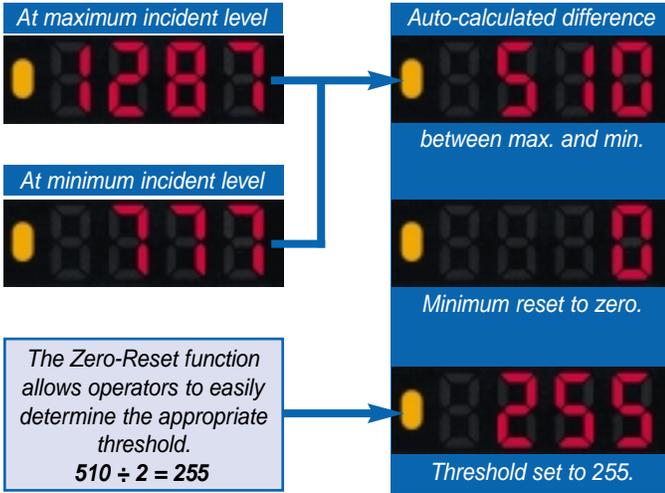
## Auto Power Control Compensates for LED Degradation

The light output from an LED in a standard sensor will degrade over time, which can result in unstable switching performance. Most of this degradation occurs in the first few months of use and requires the user to service the sensors to readjust switching thresholds. With the new E3X-DA-N, Omron has solved this problem by using an innovative Auto Power Control (APC) circuit that constantly monitors the output of the LED and increases power to the LED to keep it at peak performance through the life of the sensor. This results in higher reliability, more stable sensing and lower long-term maintenance costs.



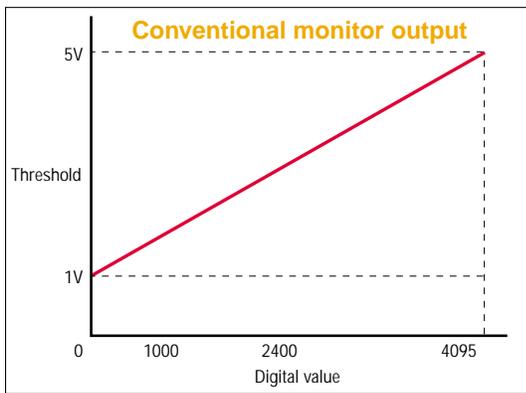
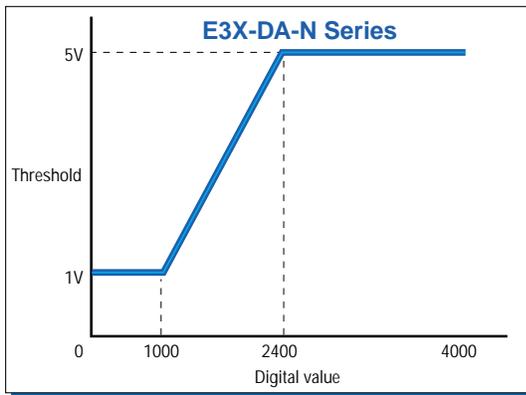
## Zero-Reset Function

The Zero-Reset function makes it easy to determine the correct threshold value for any application. Simply stated, the Zero-Reset function calculates the light incidence level range difference between maximum and minimum levels and sets the minimum level to zero. For example, if the light incidence level for one target is 1287, and the light incidence level for the other target is 777, the Zero-Reset function calculates the actual range (510), and resets the displayed scale from 0 to 510. The appropriate threshold can then be easily determined, (255).



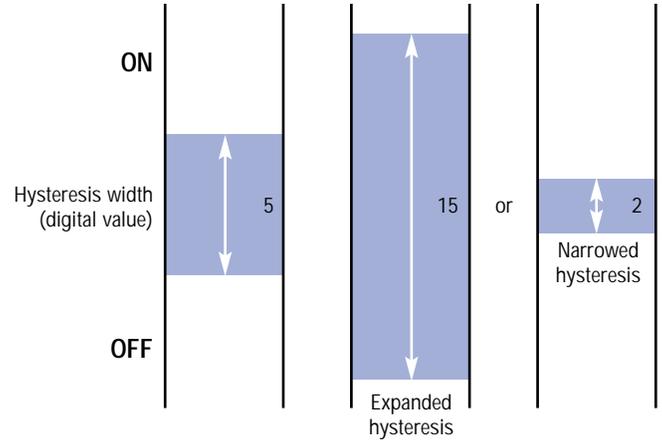
## Monitor Focus Function

In analog output mode, the E3X-DA-N applies the sensor's 1 – 5 VDC analog output across the full sensing range (0 – 4000). For high precision applications, the Monitor Focus Function lets you apply the full output range (1 – 5 VDC) to a smaller, user-defined, digital range (i.e. 1000 – 2400), effectively increasing the precision of your sensing application.



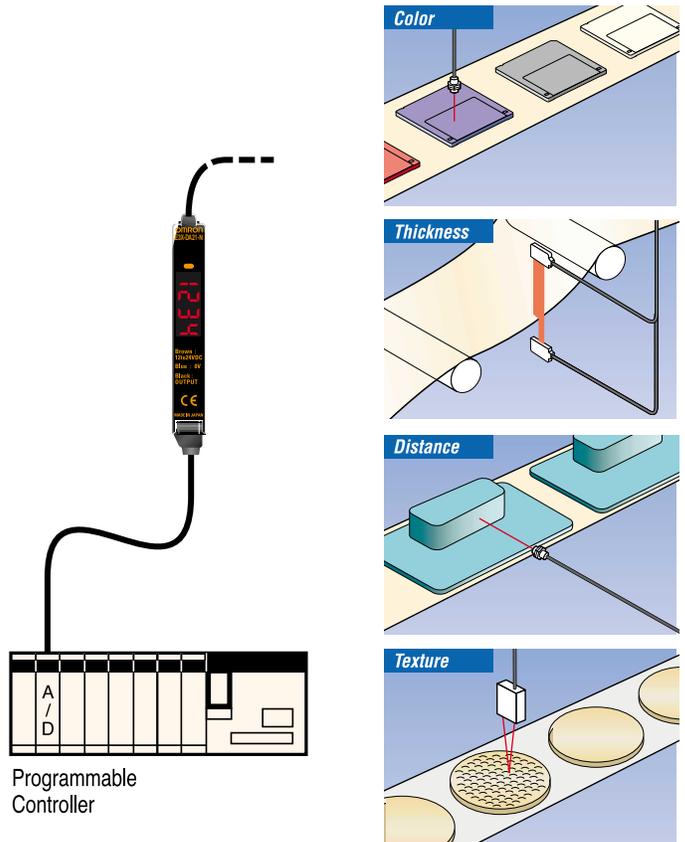
## Adjustable Hysteresis Defines the Sensing Window

In addition to extensive automatic teaching functions, the E3X-DA-N allows you to set the sensor's hysteresis to overcome any irregularities in your process—such as conveyor motion, surface variability or production speed changes—that could cause false readings. The adjustable hysteresis lets you expand or narrow the operational change of state threshold or "dead band" to meet your specific application's requirements.



## Analog Output Version Available

For sensing applications that require the ability to discriminate between more than two targets, analog output (1 – 5 VDC) versions of the E3X-DA-N are available. Because the linear analog output is directly proportional to the light incidence level, you can discriminate between objects based on the sensor's output voltage, making the E3X-DA-N ideal for detecting the differences in colors, thickness, distance, or textures. The analog output version is wire selectable between digital and analog output modes.





## The industry's most convenient setup tool for stand-alone or multiple sensor installations

Access all of the E3X-DA-N's advanced features from the industry's first truly 'remote' control. This unique Omron advancement combines easy setup with powerful configuration options to help you quickly integrate the E3X-DA-N into your process and harness its power to your greatest benefit.

### Copy and Paste Setups

Save sensor setup time by quickly copying the configuration settings from one sensor and pasting them to as many additional sensors as necessary using the remote control.



### Hands-On Control from a Distance

This new remote is available with either a 5 foot or 16 foot cable and can perform teaching and setting functions that previously could only be done directly on the sensor. Now, if you have sensors in potentially hazardous environments, you can monitor and program them from a safe distance.



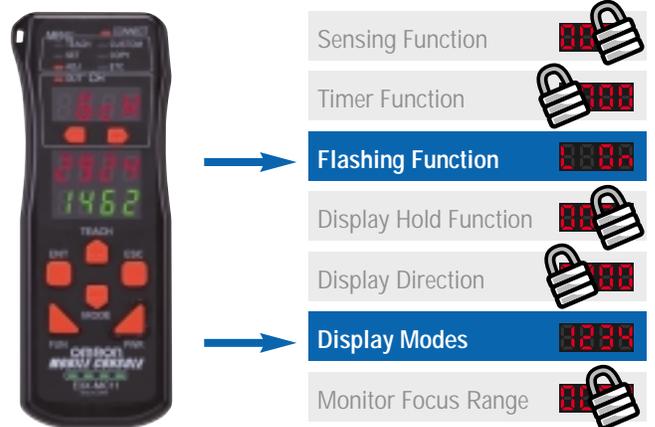
### Dual Display Simplifies Real-Time Configuration

The remote shows the incident and threshold levels simultaneously so you can fine-tune the threshold point while monitoring the incident level.



### Use the 'Function Lock' to Protect Your Essential Settings

Protect the integrity of your settings and your machine's performance with the 'Function Lock' feature. Unlike conventional sensors, from the E3X-DA-N's remote, you can selectively lock out functions that you do not want changed. This allows you to give your employees on the shop floor a level of autonomy without compromising your performance goals.



## Saving Multiple Settings

The remote control's large memory can store up to 10 different sensor configurations so you can quickly configure sensors in different locations around your process.



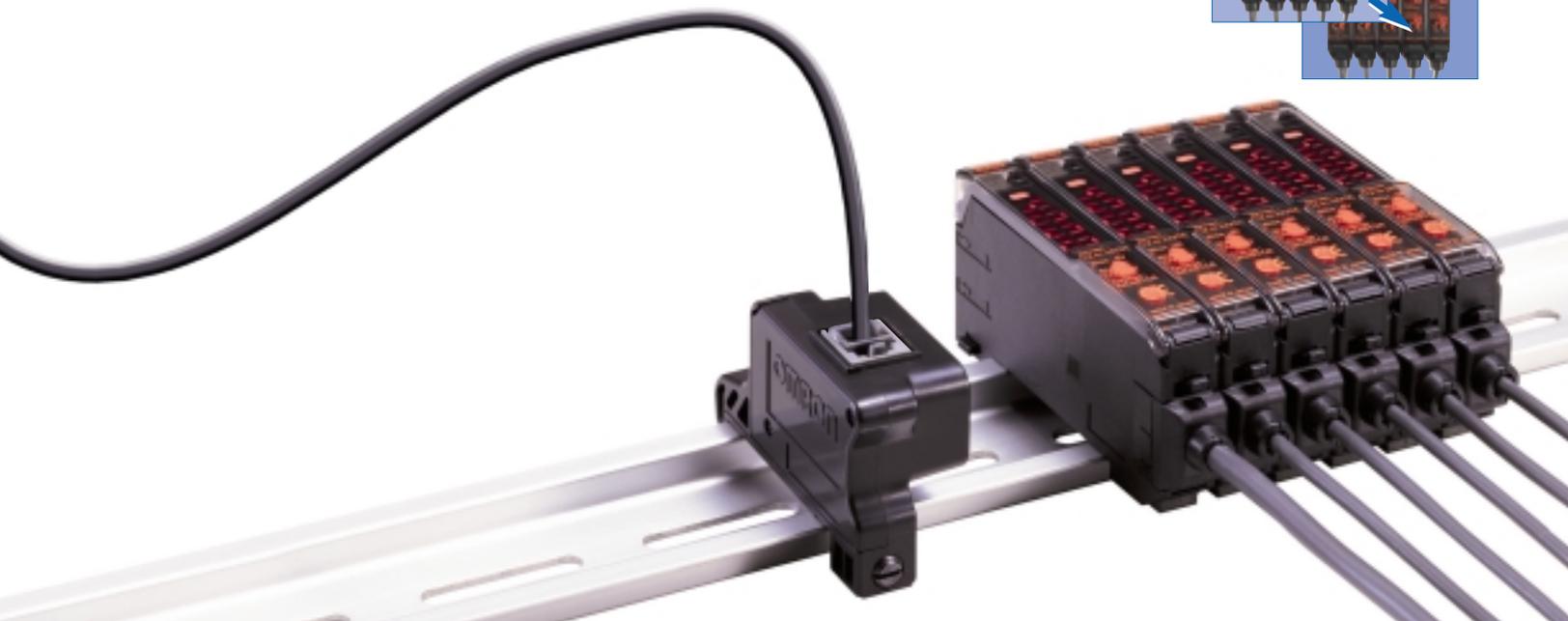
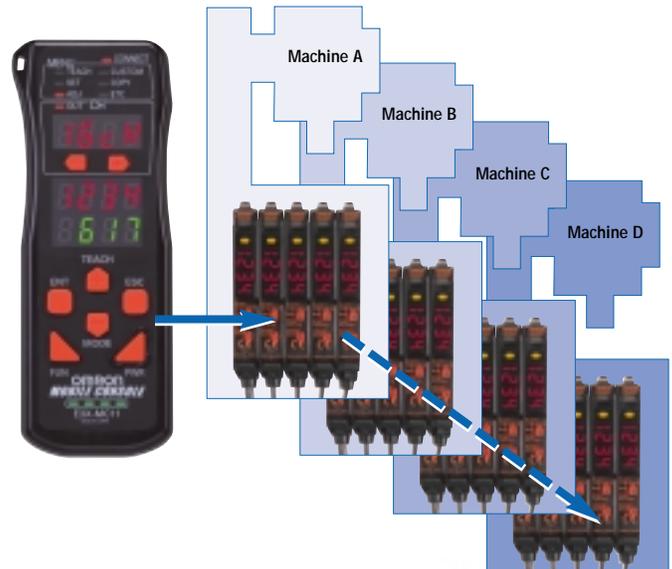
## Simultaneous Group Teaching

Save even more time with the group teaching function. You have the option of individually configuring each E3X-DA-N sensor in a group, or setting the mode and threshold setting once for an entire group of up to 16 sensors.



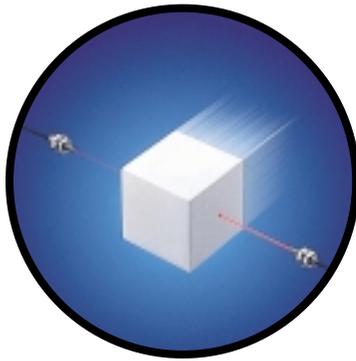
## Copy Settings to Other Amplifier Groups

Another time-saving feature of the remote control is the ability to copy the configuration settings for an entire group of sensors and paste the settings to a new group of sensors on another machine. This is a real time saver for OEMs and users with many similar machines.

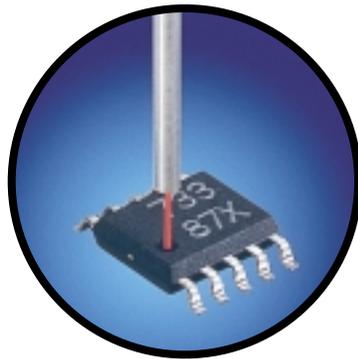


# Auto-Teaching Functions to Simplify Setup and Maximize Productivity

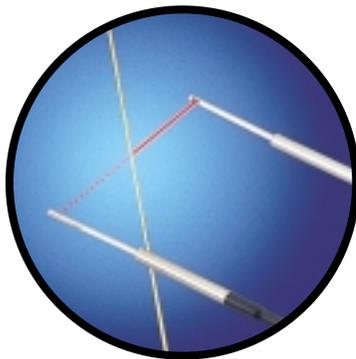
The sensor's "one-touch" teaching function greatly simplifies setup and shortens the time from package to productivity. To ensure the most precise performance, Omron's E3X-DA-N sensor comes equipped with four different self-teaching routines. In this way, you can select the method that best meets each sensor application.



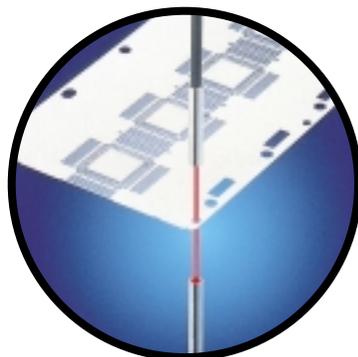
**Maximum sensitivity** is ideal for through-beam sensing, large object detection and sensing applications without a background.



**Two-point teaching** with or without object can detect minute level differences and discriminate among different colors.



**One-point teaching** (with object) allows precise detection of small and/or thin moving objects like fine wire.



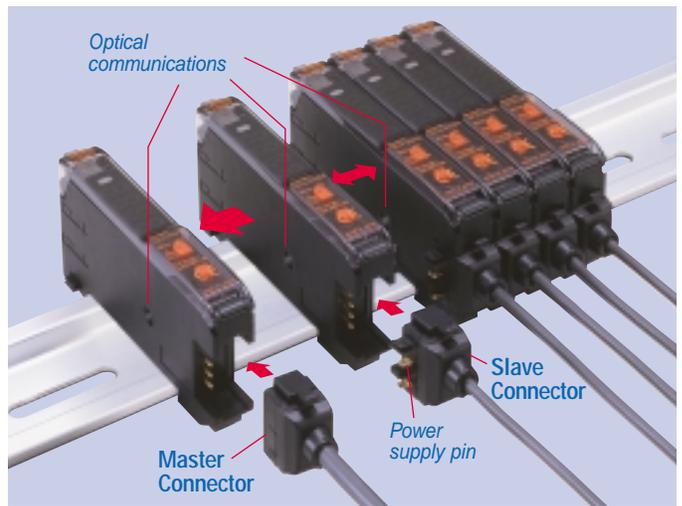
**Pinpoint teaching** for positioning provides precision to detect placement of small components and alignment of fiducial marks or sprocket holes.

Using the remote programmer, you can quickly program all the sensors in a group with the same set up parameters, or set each one individually.

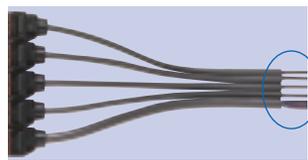
# Designed for Easy Installation and Maintenance

## Time and Cost Saving Features

The E3X-DA-N allows you to mount up to 16 sensors on a DIN rail by simply sliding them together. The sensor's unique connector design reduces wiring and space requirement because one master connector supplies power to all other slave connectors. The removable connector design of the E3X-DA-N allows users to easily detach the sensor without disturbing the fiber installation or output wiring. If maintenance is required, simply copy the old sensor's settings to the remote control, remove the sensor without having to undo wiring and fiber cable routing, and paste the old sensor settings into the new sensor. It is that easy! Optical communications ports built into each sensor enables them to communicate with one another and the Mobile Console remote control. In this way the Mobile Console can be used to program individual sensors, or an entire group, without the need for a physical connection to the sensors.



Previous models required three wiring connections for each sensor. **Shown: 15 wires** plus extension connector wires.



The new **E3X-DA-N** requires three wires for the master sensor only. Each additional sensor in a group requires only one wiring connection. **Shown: ONLY 7 WIRES** with no additional extension connectors.

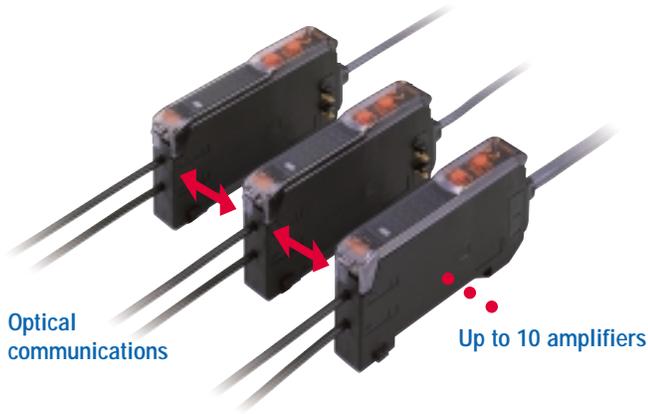
## Reversible Display

The E3X-DA-N's reversible display allows you to select the orientation of the digital display that works best in your application.



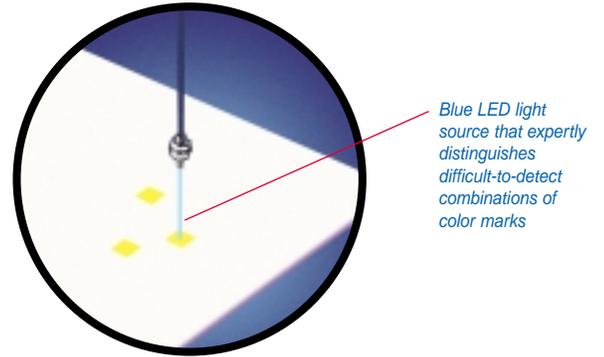
## Eliminate Mutual Interference with Built-in Optical Communications

Another E3X-DA-N innovation eliminates false sensor signals in applications that require many sensors to be located in close proximity to one another. Built-in optical communications enable up to 10 E3X-DA-N sensors to automatically adjust themselves to operate at different pulse modulation frequencies, eliminating the mutual interference problems that can occur when light from one sensor inadvertently interferes with the operation of another closely mounted sensor.



## Additional Sensor Versions for Special Requirements

For particularly difficult or sensitive sensing applications that cannot be solved using the standard version of the E3X-DA-N with a red LED light source, a special blue LED version is also available. The blue LED version enables the sensor to expertly distinguish subtle differences in target characteristics such as color or light reflectivity. For example, it is ideal for detecting color marks when there is little difference between the mark and the background. The blue LED version is available pre-wired only with an NPN output.



## Available with Quick Change Connectors or Pre-wired

The E3X-DA-N sensors are available with industry-standard M8 size connectors that accept popular "NanoChange" cordsets. The M8 connector assures reliable connection even in applications involving high levels of vibration and offers higher IP ratings for harsh environments. For stand-alone applications, standard pre-wired versions are also available.



## Power Saving Features

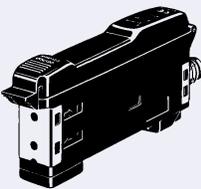
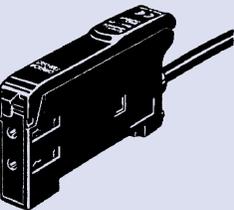
You can also control the sensor's current consumption by customizing the brightness of the sensor's display. Depending on the sensor's location, you can either dim the entire face or have the display entirely unlit. If it is necessary to read only certain digits, you can use the remote programmer to configure the sensor to display only the desired digits.



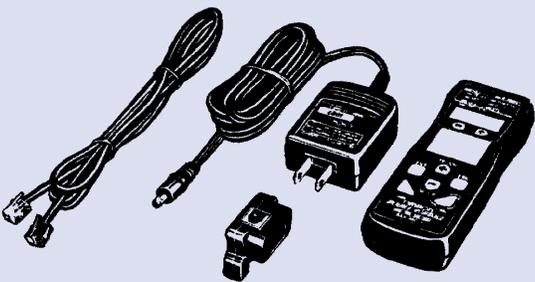
# Ordering Information

## Amplifiers

Order connector cables separately for connector-ready models.

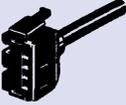
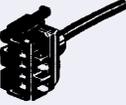
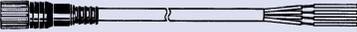
Type	Appearance	Applicable connector cables (order separately)	Output	Part number NPN output	PNP output
Expandable amplifiers, digital output models, detachable connector		E3X-CN master and slave cables, single ended, 2 m (6.56 ft) length	ON/OFF output	E3X-DA6	E3X-DA8
Expandable amplifiers, analog/digital output models, detachable connector			ON/OFF output and analog output	E3X-DA7	E3X-DA9
Amplifiers with M8 connector		XS3F single-ended cables and XS3W double-ended cables	ON/OFF output	E3X-DA14V	E3X-DA44V
Amplifiers with cable		Pre-wired with 2 m (6.56 ft) cable	ON/OFF output	E3X-DA11-N	E3X-DA41-N
			ON/OFF output and analog output	E3X-DA21-N	E3X-DA51-N
Amplifier with blue LED			ON/OFF output	E3X-DAB11-N	---

## Remote Control Programmer

Appearance	Power Supply Method	Remarks	Part number
	Chargeable battery	Head, 5 ft. cable, and AC adapter are provided as accessories	E3X-MC11
	---	1.5 m (5 ft) cable	E39-Z12-1
	---	5 m (16 ft) cable	E39-Z12-2
	---	Replacement optical communication head	E3X-MC11-H1

Note: An installation and operation manual is available for the Remote Control Programmer (E3X-MC11). Order manual number E01SAZ1.

## Connector Cables

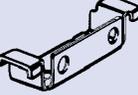
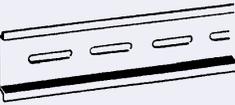
Type	Appearance	Cable length	Amplifier	Number of conductors	Part number
Master connector (See Note 1)		2 m (6.56 ft)	E3X-DA6, E3X-DA8	3	E3X-CN11
			E3X-DA7, E3X-DA9	4	E3X-CN21
Slave connector (See Note 1)		2 m (6.56 ft)	E3X-DA6, E3X-DA8	1	E3X-CN12
			E3X-DA7, E3X-DA9	2	E3X-CN22
Straight M8 connector, single ended		2 m (6.56 ft)	E3X-DA14V, E3X-DA44V	4	XS3F-M421-402-A
Right angle M8 connector, single ended		2 m (6.56 ft)	E3X-DA14V, E3X-DA44V	4	XS3F-M422-402-A
Straight M8 connector, double ended		2 m (6.56 ft)	E3X-DA14V, E3X-DA44V	4	XS3W-M421-402-R

Note 1: When using five E3X-DA6/DA7/DA8/DA9 amplifiers ganged together, order one master and four slave connector cables. The master connector cable distributes the power signal to all ganged amplifiers; slave connector cables handle output signal transmission only.

Amplifier Units			Applicable Connector Cables	
Type	NPN	PNP	Master Connector	Slave Connector
Digital output models	E3X-DA6	E3X-DA8	+	E3X-CN11 (3-wire)
Analog/digital output	E3X-DA7	E3X-DA9		E3X-CN21 (4-wire)

**Example: When Using 5 Sets** Amplifier Units (5 Units) + Master Connector (1), Slave Connectors (4)

## Accessories

Type	Appearance	Remarks	Part number
Mounting bracket		For surface mounting the sensor	E39-L143
DIN rail track		50 cm (1.64 ft) length	PFP-50N
		1 m (3.28 ft) length	PFP-100N
End plate		End plate For DIN track mounting of amplifiers	PFP-M

## Fiber Optic Cables

The E3X-DA-N amplifiers use Omron's E32-series fiber optic cables. With a choice of over 80 sensing heads, you are sure to find one that matches your application requirements. A selection of E32 cables and their respective sensing distances are at the end of the E3X-DA-N data sheet (Cat. No. E313-E3-1). Order fiber optic cables separately.

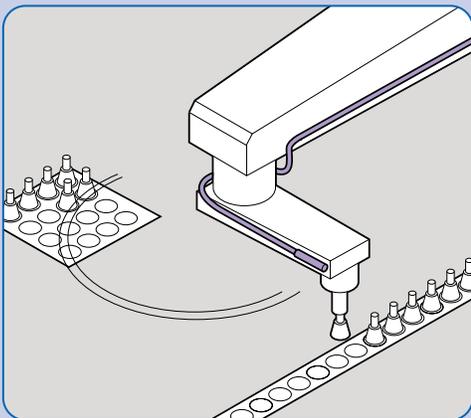
## Choose from a wide variety of new problem solving fiber optic cables for the E3X-DA-N



Omron offers one of the industry's widest selections of fiber optic cables. In addition to many standard cables that let you detect small objects in difficult to reach places, Omron offers the world's best selection of specialty fiber optic sensing cables. Available in through-beam, diffuse reflective and retro-reflective options, these specialty cables combine unique fiber configurations, materials, and distinctive sensing head designs that can address the toughest sensing problems.

Every sensing application is unique. Whether it's a harsh environment (high heat, high moisture, high vibration or highly corrosive), minute object or high-speed detection application, or hard to reach area, Omron has the fiber optic cable to reliably solve your sensing problems. For more information on the fiber optic cables listed below, please refer to either the E3X-DA-N data sheet (Cat. No. E313-E3-1) or the Fiber Optic Sensor Cables data sheet (Cat.No. E00FAD1).

### Constant Flexing Applications



The special construction of these fiber optic cables resists breaking and enables them to withstand the punishing effects of constant flexing or tight bending. The stranded fiber core can be bent to a radius as small as 4 mm with no loss in light intensity. They are ideal for use on moving and articulating equipment such as robotic arms.

#### Available Models

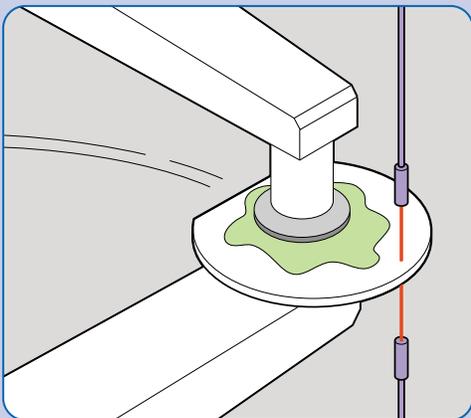
- E32-T11 (Through-Beam, M4 threaded)
- E32-T21 (Through-Beam, M3 threaded)
- E32-D11 (Diffuse, M6 threaded)
- E32-D21 (Diffuse, M3 threaded)

**NEW**



- E32-T22B (Through-Beam, 1.5 mm dia.)
- E32-D21B (Diffuse, M4 threaded)
- E32-D22B (Diffuse, 1.5 mm dia.)

### Chemical Resistant Applications



Teflon® coated fiber optic cables provide long lasting reliability in sensing environments where corrosive fluids and gasses are present. They are designed for use where strong chemicals are manufactured or being used for processing or cleaning.

#### Available Models

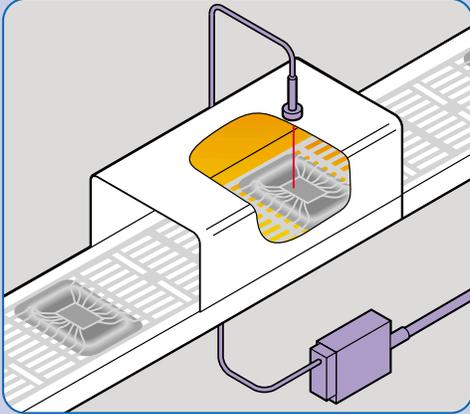
- E32-T12 F (Through-Beam, 5 mm dia.)
- E32-D12F (Diffuse, 6 mm dia.)

**NEW**



- E32-T14F (Through-Beam, 5 mm dia., Side View)

## High Temperature Applications



Omron offers a variety of heat resistant fiber optic cables that can operate reliably in temperatures up to 300°C (572°F). The fluororesin or armored stainless steel sheaths protect the fibers for use in ovens and other high heat applications.

### Available Models

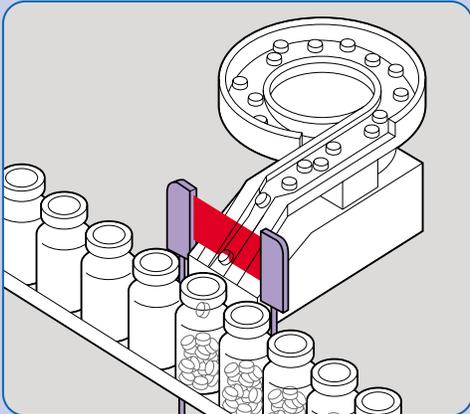
E32-T51 (Through-Beam, M4 threaded)  
 E32-T61 (Through-Beam, M4 threaded, stainless steel sheath)  
 E32-T84S (Through-Beam, L-shaped)  
 E32-D51 (Diffuse, M6 threaded)  
 E32-D61 (Diffuse, M6 threaded, stainless steel sheath)

**NEW**



E32-T54 (Through-Beam, 2 mm dia., Side View)

## Wide Area Sensing Applications



Applications that require a larger target area for sensing small, randomly positioned objects are ideal for Omron's wide area sensing fiber optic cables. They project a wide plane of light that can detect very small objects anywhere within the width of the beam. Use them for detecting pills in packaging and similar applications.

### Available Models

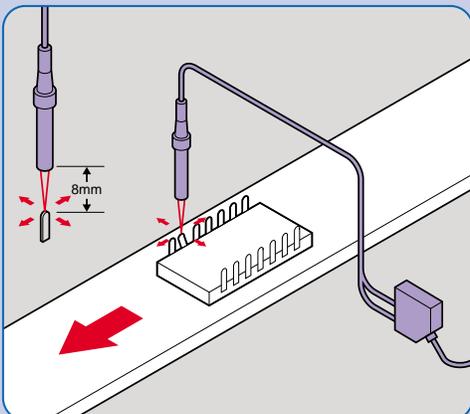
E32-M21 (Through-Beam, multi-head)  
 E32-T16 (Through-Beam, 10 mm sensing area)  
 E32-T16P (Through-Beam, 11 mm sensing area)

**NEW**



E32-T16W (Through-Beam, 30 mm sensing area)  
 E32-T16J (Through-Beam, 11 mm sensing area, side view)  
 E32-D36P1 (Diffuse, 150 mm sensing area)

## Precise Positioning Applications



When it is critical to position objects or machinery accurately and consistently, Omron provides a solution with a unique coaxial cable design that surrounds the light emitting fiber with light detection fibers.

### Available Models

E32-CC200 (Diffuse, M6 threaded)  
 E32-D32L (Diffuse, 3 mm dia.)  
 E32-D32 (Diffuse, 2 mm dia., 4 receivers)

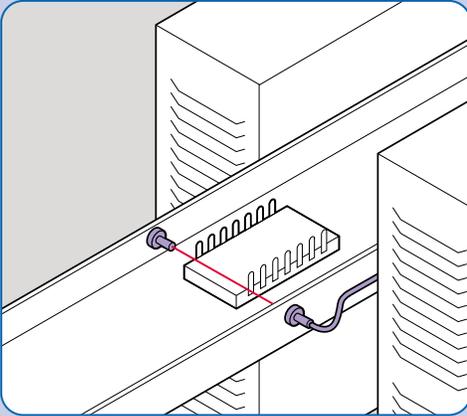
**NEW**



E32-C31 (Diffuse, M3 threaded 75 mm range)  
 E32-C41 (Diffuse, M3 threaded 35 mm range)  
 E32-C42 (Diffuse, 2 mm dia., 6 receivers)

# Fiber Optic Applications

## Detection of Minute Objects



Detect items as small as 0.5 mm using Omron's ultra-thin fiber optic cables. These cables enable you to detect extremely small objects in very space-restricted areas. Most are available with bendable "probe" tips that let you mount the head away from the detection area and bend the probe tip to the precise sensing area.

### Available Models

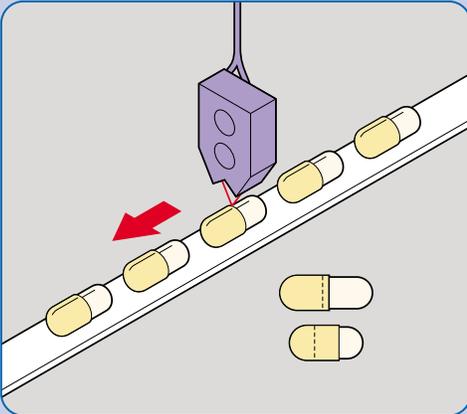
E32-T22 (Through-Beam, 2 mm dia.)  
 E32-TC200B (Through-Beam, 1.2 mm dia. probe tip)  
 E32-TC200F (Through-Beam, 0.9 mm dia. probe tip)  
 E32-DC200B (Diffuse, 2.5 mm dia. probe tip)  
 E32-DC200F (Diffuse, 1.2 mm dia. probe tip)  
 E32-D33 (Diffuse, 0.8 mm dia. probe tip)

**NEW**



E32-D331 (Diffuse, 0.5 mm dia. probe tip)

## Background Suppression Applications



Fiber optic cables with convergent beam head configurations solve the problem of background reflections in space-restricted areas. These special cables can also be used for precise positioning of objects or machinery. Left- and right-side emitter models eliminate interference when using two or more E32-L56□□ sensing heads.

### Available Models

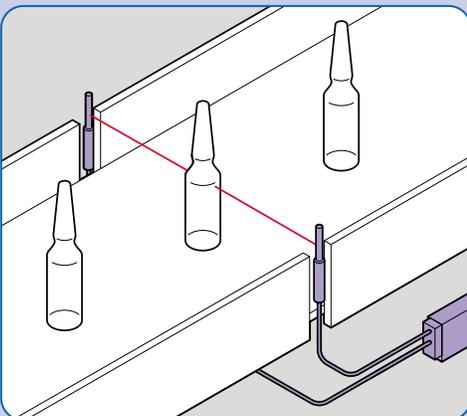
E32-L24L (Convergent Beam, 4 mm range, Side View)  
 E32-L25 (Convergent Beam, 3 mm range, Side View)  
 E32-L25L (Convergent Beam, 7.2 mm range)  
 E32-L25A (Convergent Beam, 3.3 mm range)

**NEW**



E32-L56□□ (Convergent Beam, 4-12 mm range)  
 E32-L56E1 (Left-Side Emitter)  
 E32-L56E2 (Right-Side Emitter)

## Long Range Detection of Small Objects

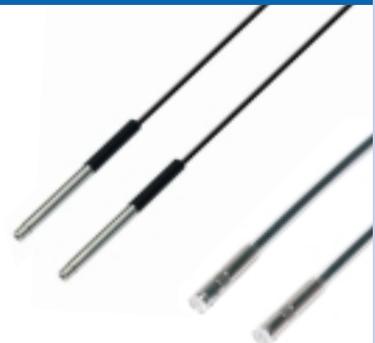


A wide variety of fiber optic cables with special sensing heads and lenses are available for detecting small objects over longer distances in space confined areas. They are available in through-beam or diffuse versions with threaded and non-threaded heads for more versatile mounting.

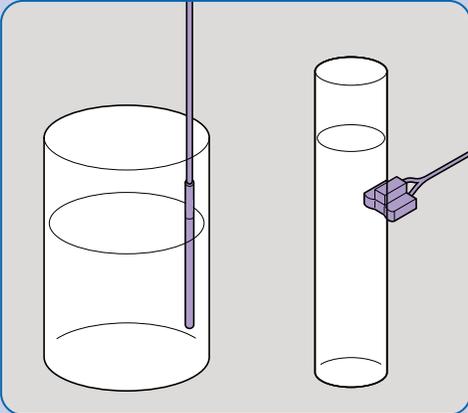
### Available Models

E32-T11L (Through-Beam, M4 threaded)  
 E32-T12L (Through-Beam, 3 mm dia.)  
 E32-T14L (Through-Beam, 3 mm dia., Side View)  
 E32-T17L (Through-Beam, M14 threaded)  
 E32-T21L (Through-Beam, M3 threaded)  
 E32-T22L (Through-Beam, 2 mm dia.)  
 E32-D11L (Diffuse, M6 threaded)  
 E32-D12 (Diffuse, 3 mm dia.)  
 E32-D21L (Diffuse, M4 threaded)  
 E32-D22L (Diffuse, 3 mm dia.)

**Special Models**



## Fluid Level Detection



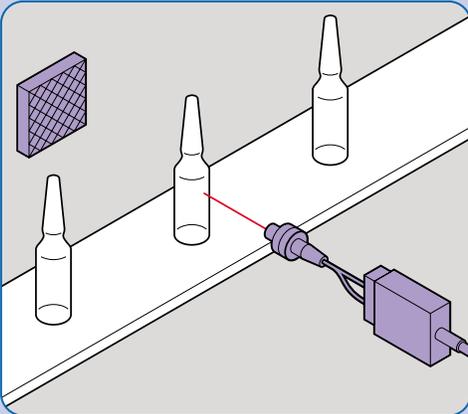
Omron offers two fiber optic sensing solutions for fluid level detection in space-confined areas: an immersion style sensing head can be submerged in the fluid to be monitored, and a tube-mounted sensing head that can sense fluids through a clear tube.

**Available Models**  
E32-D82F (Immersion type)  
E32-L25T (External tube mount)

## Special Models



## Transparent Object Detection



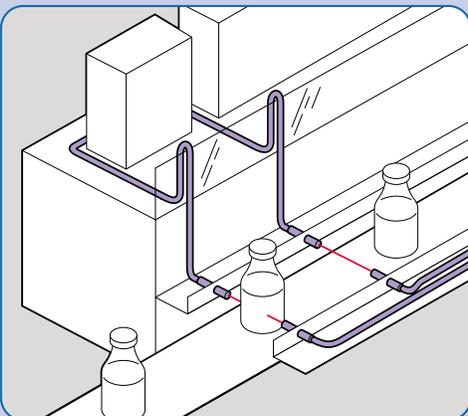
Sensing transparent objects is always a challenge. Omron solves this problem with two fiber optic cables that are polarized and reflectors specially designed for sensing small transparent objects in tight spaces. They are ideal for sensing lenses, clear plastics, and transparent packaging materials.

**Available Models**  
E32-R21 (Retroreflective, 10 – 250 mm range)  
E32-R16 (Retroreflective, 150 – 1,500 mm range)

## Special Models



## Extreme Bending Applications



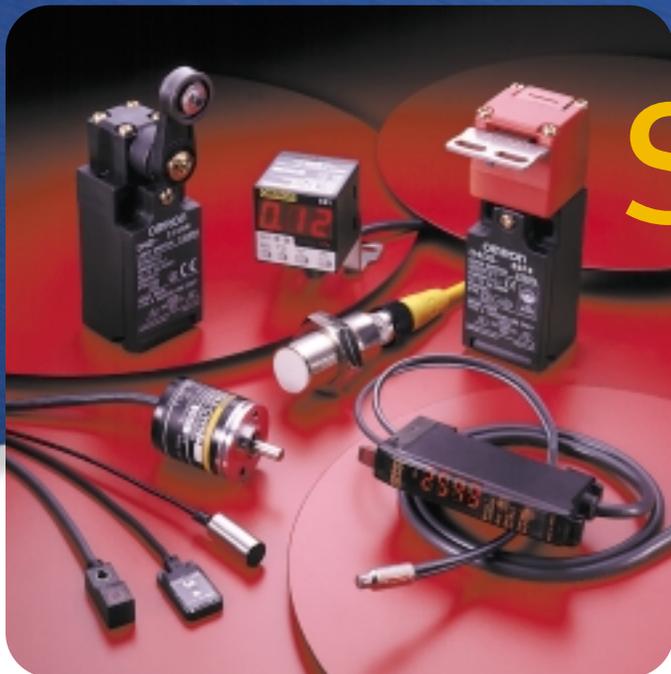
For machine applications that require extreme bending of fiber optic cables to conform to tight spaces, Omron offers a variety of cables that feature a unique multi-core construction. Unlike single-core cables that can lose their light transmission capability when bent tightly, the multi-core design ensures optimal light transmission even when bent 180° with a bending radius of 1 mm.

**Available Models**  
E32-T11R (Through-beam, M4 threaded)  
E32-T21R (Through-beam, M3 threaded)  
E32-D11R (Diffuse, M6 threaded)  
E32-D21R (Diffuse, M3 threaded)

## Special Models



SENSING PROBLEMS?



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