Reliable Detection of Transparent Objects

The E3S-DB photoelectric sensor contributes to the food and packaging industry by detecting transparent objects regardless of changes in materials, shapes, and types.

» Consistently accurate clear object detection
» Detergent washdown resistant to IP69K
» Prevents intermittent line stoppages
With the E3S-DB

Typical Problems

Detection of transparent bottles with photoelectric sensors is not stable, which prevents increasing equipment operating rates. Sensors have to be selected on a case-by-case basis or expensive laser sensors have to be used.

With the E3S-DB

These photoelectric sensors can reliably detect transparent glass bottles allowing increased equipment operating rates.

Improved Equipment Operating Rates

Prevent intermittent line stoppage and shorten cycle time with reliable detection capabilities

Increase operating efficiency for transparent bottle detection

New double-slit technology ensures reception of only parallel light to stabilize detection.

Double-slit Optical Design

Light refracted from the bottles increases the incident light, making detection unstable.

New technology

Light refracted by the bottle

Parallel light (used for detection)

Transparent glass bottle

Reflected light

May trigger false outputs.

Model with a slit

E3S-DB

Parallel light

Reflected light is eliminated by the double-slits.

LED

PD

Reflectors

Parallel light

Transparent glass bottle

Refracted light

PD

Reflectors

Parallel light

New double-slit technology ensures reception of only parallel light to stabilize detection.
Three benefits of transparent object detection

- **Improved Equipment Operating Rates**
  - Reliable part detection.

- **Reduced Commissioning and Maintenance**
  - Easy setup and operation.

- **High Usability**
  - IP69K rated, Ecolab certified for washdown resistance.

Increase operating efficiency to detect loose shrinkwrapping

**Typical Problems**
- Detection of transparent film is not consistent, which prevents increasing equipment operating rates.

With the **E3S-DB**
- P-opaquing function ensures attenuation of 70% even with films with little difference in light levels.
  - Stable detection lets you increase equipment operating rates.

**P-opaquing function**
The E3S-DB utilizes the birefringent (double refraction) property of PET bottles to dramatically increase the level of excess gain. The polarization component that is disturbed by the PET bottles as they pass along the line is cut by a special and unique OMRON polarization filter. This greatly lowers the intensity of the light received to provide stable detection with a simple sensitivity adjustment.

![Diagram showing light attenuation comparison between standard retro-reflective sensors and E3S-DB equipped with P-opaquing function.](chart)

*The data are obtained by OMRON from measurement of cigarette pack film.

Shorten cycle time for transparent bottle detection

**Typical Problems**
- When the pitch between glass or PET bottles on conveyor belts is too tight, sensors do not have enough time to turn ON and OFF, which prevents shortening the cycle time.

With the **E3S-DB**
- The narrow beam enables incident light with gaps as narrow as 3 mm.*
  - You can reduce the pitch between workpieces to maximize conveyance.

*When using the E39-R21 Reflector, adjusting the threshold to 25% or less, and using stationary workpieces.

**Narrow beam diameter of minimum 2.5 mm**
The E3S-DB has a response time of 0.5 ms for a pitch of 5 mm, so detection is possible at a conveyor speed of up to 4 m/s. (With the E3S-DB and a sensing distance of 200 mm.)
Reduced Work

Easy setup and operation; reduced commissioning and maintenance work

Large reductions in adjustment time for sensitivity and threshold

Standard sensor with multi-turn adjuster

You have to adjust the sensitivity adjuster on each Sensor individually to achieve the optimum sensitivity for each.

Examples for setting five sensors

With 11 turns, you end up turning the adjuster left and right. Sensitivity depends on the installation location, so all Sensors have to be adjusted individually.

60 s × 5 Sensors = 300 s

E3S-DB Smart teaching type

Set the optimum threshold and sensitivity by adjusting the setting to the same scale (2 s) and pushing a button (1 to 5 s).

1. Set the threshold on the dial.
2. Push the Teaching Button.
3. You can use the same setting on all of the remaining Sensors!

3 s × 5 Sensors = 15 s

Visualization reduces work in changeovers and installation

Visible spot

The visible spot in the Reflector lets you easily adjust the height of the optical axis and reduces time required for adjustment.

Easy to see indicators

Large, easy-to-see light and stability indicators let you easily check operation from any angle.

Spot diameter of minimum 2.5 mm

200 mm

(Actual Size)
Reliable structure that resists water and detergents

- **IP69K water resistance**
  Withstands harsh environments with high temperatures and high water pressures.

- **Resistance to detergents certified by Ecolab**
  Third-party certification has been received from the Ecolab company in Europe for applications in washdown environments.

**Rotating connector/cable**

Connectors and cables can be rotated for ease of wiring.

**Information printed on sensor**

Smart Teaching and wiring information is printed on the Sensor to eliminate the need for manuals onsite.

**PC Monitoring Software helps you visualize detection status (to be released soon).**

You can easily monitor Sensor status.

- **Testing** Check detection stability for new workpieces or when using a new Reflecter.
- **Setup** Check the optimum threshold.
- **Maintenance** Check Sensor detection status data.
Example in beverage line

Benefit Icons

**Improved equipment operating rates**
Devices that ensure rapid recovery or stable operation.

**Reduced work**
Devices that reduce the work required for setup, adjustment, or changeovers.

Transparent Object Detection
Photoelectric Sensors

**E3S-DB**
- Easy threshold setting for each transparent object
- Smart teaching.
- Reduced work in changeovers and adjustment
- Small spot.

Digital Temperature Controllers

**E5[C] Series**
- Reduced work in creating communications programs
- Programless communications.
- Reduced time in adjusting pid values
- Control simulator.

Filling Equipment

AC Servomotors and Servo Drives

**R88M-K** and **R88D-KN-ECT**
**G5 Series**
- Rapid recovery with servomotor torque error monitoring
- Torque error monitoring.
- Reduced work in changeovers and adjustment
- Parameter setting and switching.

Multi-function Compact Inverters

**MX2 Series**
**V1 Type**
- Reduced work in changeovers and adjustment
- Parameter setting and switching.

Solid-state Relays with Built-in CTs

**G3PF**
- Rapid recovery by identifying faulty locations
- SSR short-circuit failure detection.
- Heater burnout detection.

Image Inspections

**R88M-K and R88D-KN-ECT**
**G5 Series**
- Rapid recovery with error detection for various devices
- Records device status when errors occur.
- High-speed execution of user programs.
- Function blocks to monitor safety device operation time for preventive maintenance.

Machine Automation Controllers

**NJ/NX Series**
- Rapid recovery with error detection for various devices
- Records device status when errors occur.
- High-speed execution of user programs.
- Function blocks to monitor safety device operation time for preventive maintenance.

**E3NX-FA**
- Alarm output for reduced light level for preventive maintenance
- Sensor incident level monitoring.
- Reduced work in changeovers and adjustment
- Threshold setting.

Hot-water Washing
OMRON helps you increase equipment operating rates while reducing work. We also provide a wide range of safety components for machine and equipment safety measures.

**Programmable Terminals**

**NA Series**

- **Reduced Work in Setting and Adjusting Various Devices**
  - Set and change parameters on a touch panel.

- **Preventive Maintenance for Various Devices**
  - Monitors device status to quickly identify error locations.

- **Reduced Work in Changeovers**
  - Records device parameters for each product to quickly and accurately make changeovers.

**Transparent Object Detection**

- **Photoelectric Sensors**
  - E3S-DB
    - Detect all sorts of transparent objects with high sensitivity for reliable operation
      - P-opaquaing function
      - Optimum double-slit optical design.

**Digital Temperature Controllers**

- **E5/C Series**
  - Rapid Recovery by Identifying Faulty Locations with Temperature Control
    - Heater burnout detection.
    - Temperature sensor burnout detection.

**Switch Mode Power Supplies**

- **S8VS**
  - Long-life Power Supplies for Preventive Maintenance against Stoppage
    - Maintenance forecast monitor.

**Buffer Blocks**

- **S8T-DCBU**
  - Stable Operation because Power Is Supplied during Momentary and Long-term Power Interruptions

**Vision Systems**

- **FH Series**
  - Stable Operation by Preventing Excessive Filtering Out
    - High-accuracy OCRs.
  - Reduced Work in Dictionary Registration
    - Built-in dictionary.

**Safety Light Curtains**

- **F3SG-R Series**
- **F3SJ Series**
  - Finger, Arm, and Body Protection

**Safety Door Switches**

- **D4SL-N Series**
- **D40Z Series**
  - Open/Close Detection of Mechanical Guards and Covers

**Emergency Stop Switches**

- **A165E Series**
- **A22E Series**
  - Emergency Stopping of Machines

*Catalog numbers are shown in the brackets "()".*
Ordering Information

Sensors

<table>
<thead>
<tr>
<th>Sensing method</th>
<th>Appearance</th>
<th>Sensitivity adjustment</th>
<th>Connection method</th>
<th>Sensing distance*2</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retro-reflective (with MSR function)</td>
<td></td>
<td></td>
<td>Pre-wired (2 m)</td>
<td></td>
<td>E3S-DBN11 2M</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Connector (M12)</td>
<td></td>
<td>E3S-DBN21</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>M12 Smartclick pre-wired connector (0.3 m) (with E39-R8)</td>
<td></td>
<td>E3S-DBN31 0.3M</td>
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<tr>
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<td></td>
<td></td>
<td>Pre-wired (2 m)</td>
<td></td>
<td>E3S-DBN12 2M</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Narrow beam 0.5 m (with E39-R21)</td>
<td></td>
<td>E3S-DBP12 2M</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Connector (M12)</td>
<td></td>
<td>E3S-DBN22</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>M12 Smartclick pre-wired connector (0.3 m) (with E39-R8)</td>
<td></td>
<td>E3S-DBN32 0.3M</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Pre-wired (2 m)</td>
<td></td>
<td>E3S-DBN11T 2M</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Narrow beam 0.5 m (with E39-R21)</td>
<td></td>
<td>E3S-DBP11T 2M</td>
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<tr>
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<td></td>
<td></td>
<td>Connector (M12)</td>
<td></td>
<td>E3S-DBN22T</td>
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<tr>
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<td></td>
<td></td>
<td>M12 Smartclick pre-wired connector (0.3 m) (with E39-R8)</td>
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<td>E3S-DBN32T 0.3M</td>
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<td></td>
<td></td>
<td>Pre-wired (2 m)</td>
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<td>E3S-DBN12T 2M</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Narrow beam 0.5 m (with E39-R21)</td>
<td></td>
<td>E3S-DBP12T 2M</td>
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<td></td>
<td></td>
<td></td>
<td>Connector (M12)</td>
<td></td>
<td>E3S-DBN22T</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>M12 Smartclick pre-wired connector (0.3 m) (with E39-R8)</td>
<td></td>
<td>E3S-DBN32T 0.3M</td>
</tr>
</tbody>
</table>

*1. A Reflector is not included with the Sensor. Select a Reflector (sold separately) according to the application.
*2. There is no close-range dead zone between the Sensor and Reflector.

Ratings and Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Model</th>
<th>Sensing method</th>
<th>Retro-reflective (with MSR function)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>NPN output</td>
<td>PNP output</td>
</tr>
<tr>
<td>Sensing distance</td>
<td></td>
<td>E3S-DBN:1</td>
<td>E3S-DBN:1T</td>
</tr>
<tr>
<td>Item</td>
<td></td>
<td>E3S-DBP:1</td>
<td>E3S-DBP:1T</td>
</tr>
<tr>
<td>Sensing distance</td>
<td></td>
<td>0 to 3.5 m (with E39-R8)</td>
<td>0 to 0.5 m (with E39-R21)</td>
</tr>
<tr>
<td>Power consumption</td>
<td></td>
<td>720 mW max. (current consumption: 30 mA max. at power supply voltage of 24 VDC)</td>
<td></td>
</tr>
<tr>
<td>Control output</td>
<td></td>
<td>Load power supply voltage: 30 VDC max., Load current: 100 mA max. (Residual voltage: 2 V max.)</td>
<td></td>
</tr>
<tr>
<td>Control output</td>
<td></td>
<td>Open-collector output (NPN/PNP output depending on model.)</td>
<td></td>
</tr>
<tr>
<td>Response time</td>
<td></td>
<td>Operate or reset: 0.5 ms max.</td>
<td></td>
</tr>
<tr>
<td>Smart Teaching lock function</td>
<td></td>
<td>Provided. — Provided. —</td>
<td></td>
</tr>
<tr>
<td>Automatic compensation (AC3)</td>
<td></td>
<td>Provided (OFF by default). — Provided (OFF by default). —</td>
<td></td>
</tr>
<tr>
<td>Ambient illumination (Receiver side)</td>
<td></td>
<td>Incandescent lamp: 3,000 lx max., Sunlight: 10,000 lx max.</td>
<td></td>
</tr>
</tbody>
</table>

Materials

| Case | Polybutylene terephthalate (PBT)/ABS |
| Lens | Methacrylic resin (PMMA) |
| Indicators | Methacrylic resin (PMMA) |
| Sensitivity adjuster and operation selector | Polyester elastomer |
| Cable | Polyvinyl chloride (PVC) |

Dimensions

Models with M12 Connector

E3S-DBN2□(T) E3S-DBP2□(T)

Smart Teaching Type

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