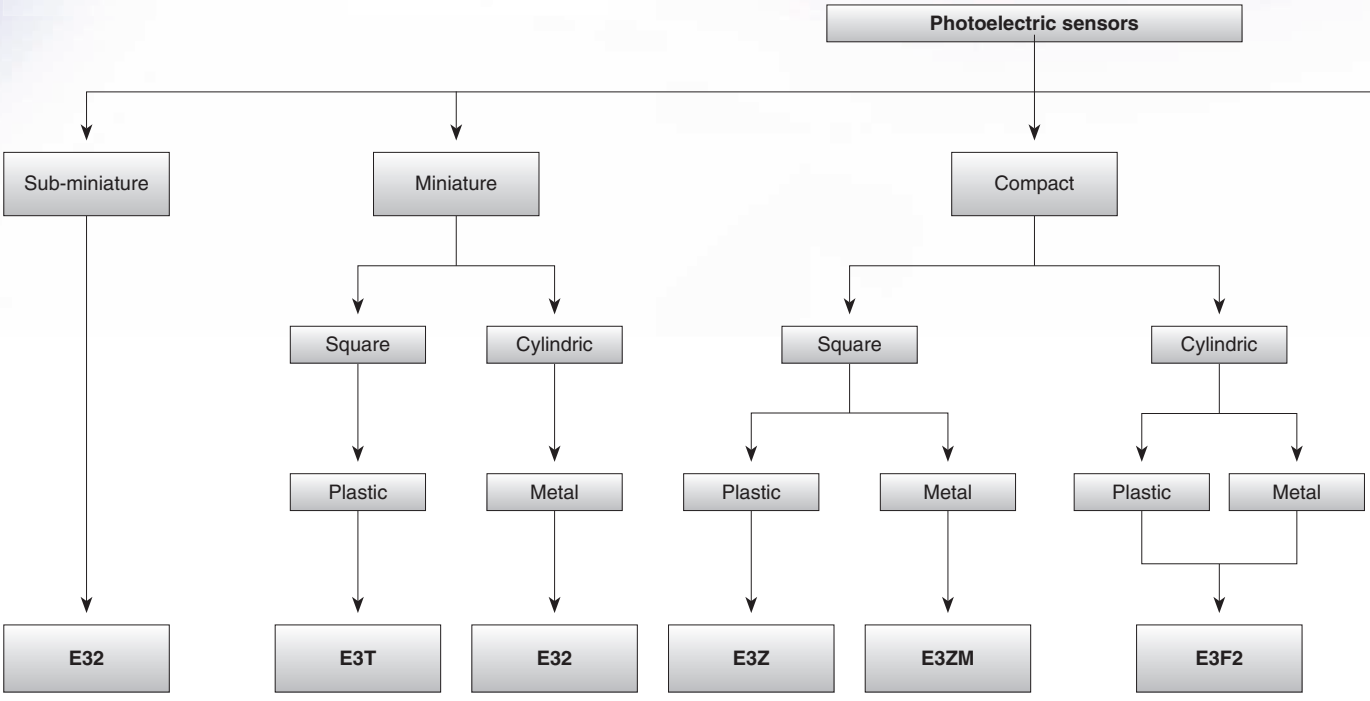
# Photoelectric sensors

## Reliability and accuracy confirmed by millions... every day

Omron invests heavily in intensive research and in new production technologies for photoelectric sensors. These continuous improvement processes ensure that the most popular photoelectric sensor family worldwide (E3Z) is also one of the most reliable with a return quota of less than 20 PPM.


**Modular platform –**
**choose the performance you need**

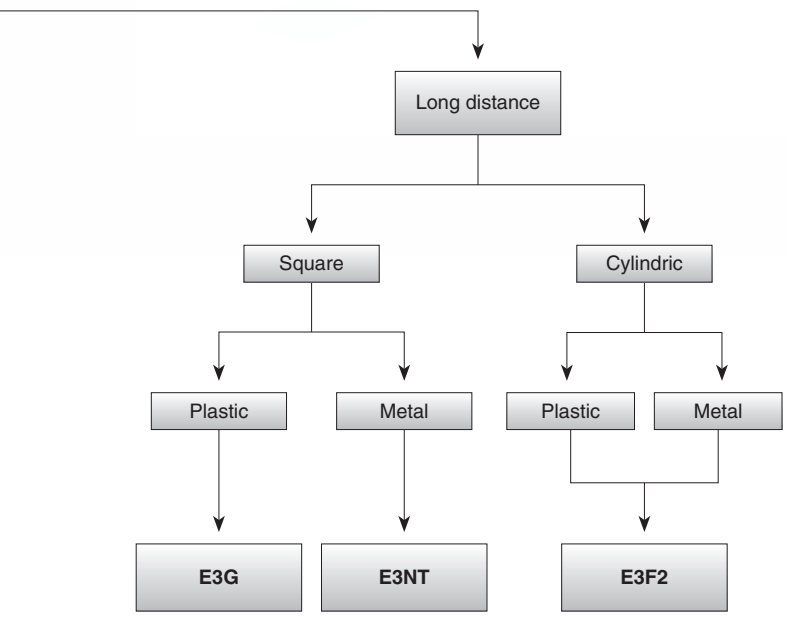
- Highest flexibility for your machine design
- The sensing performance for your application
- The housing design for your machine concept
- The housing material for your operation environment



## Tested reliability for demanding conditions

Omron's sensor design standards exceed legal requirements by far and are based on the application know how of our world wide customers to ensure reliable operation wherever your machines go.

- Highest water resistance
- Highest electromagnetic protection (e.g. from dialing mobile phones)
- Pulse synchronisation for reliable ambient light immunity
- Detergent and chemical resistant tested stainless steel and PTFE housings

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# Selection table

| | | | | | | |
|---|---|---|---|---|---|---|
| | Format | Square | | | | |
| | |  |  |  |  |  |
| | Model | E3T | E3Z | E3ZM | E3S-C | E3G |
| | Type | Miniature | Compact | | | Long distance |
| | Material | PBT | PBT | SUS | Zinc, diecast | PBT |
| Max. sensing distance | Through-beam | 1 m | 30 m | 15 m | 30 m | |
| | Retroreflective | 200 mm | | | | |
| | Retroreflective polarizing | | 4 m | 4 m | 3 m | 10 m |
| | Diffuse reflective (energetic) | 30 mm | 1 m | 1 m | 2 m | 2 m |
| | Diffuse reflective (background suppression) | | 200 mm | 150 mm | 500 mm | 1.2 m |
| LED | Infrared | | ■ | ■ | ■ | ■ |
| | Red | ■ | ■ | ■ | ■ | ■ |
| Operation | Light-ON | ■ | ■ | ■ | ■ | ■ |
| | Dark-ON | ■ | ■ | ■ | ■ | ■ |
| | Selectable | | ■ | ■ | ■ | ■ |
| Voltage | 10 - 24 VDC | ■ | ■ | ■ | | |
| | 10 - 30 VDC | | | | ■ | ■ |
| | 24 - 240 VAC | | | | | ■ |
| IP | IP67 | ■ | ■ | ■ | ■ | ■ |
| | IP69k | | ■ | ■ | | |
| Connection | PVC cable | ■ | ■ | ■ | ■ | ■ |
| | M8 connector | □ | ■ | ■ | | |
| | M12 connector | □ | □ | □ | ■ | ■ |
| | Page | 12 | 13 | Please contact your OMRON representative | 15 | 18 |

| | | | | | |
|---|---|---|---|---|---|
| | Format | Square | Cylindrical | | |
| | |  |  |  |  |
| | Model | E3NT | E32-□C200 | E3F2 | E3F2 |
| | Type | Long distance | Miniature | Compact | Long distance |
| | Material | Al die cast | Polyethylene | ABS, brass, SUS | ABS, brass |
| Max. sensing distance | Through-beam | | 3 m | 7 m | 10 m |
| | Retroreflective | | | 2 m | |
| | Retroreflective polarizing | 16 m | | 2 m | 4 m |
| | Diffuse reflective (energetic) | | 150 mm | 300 mm | 1 m |
| | Diffuse reflective (background suppression) | 3 m | | 100 mm | |
| LED | Infrared | ■ | | ■ | ■ |
| | Red | ■ | ■ | ■ | ■ |
| Operation | Light-ON | ■ | ■ | ■ | ■ |
| | Dark-ON | ■ | ■ | ■ | ■ |
| | Selectable | ■ | | ■ | ■ |
| Voltage | 10 - 24 VDC | | ■ | | ■ |
| | 10 - 30 VDC | ■ | | ■ | ■ |
| | 24 - 240 VAC | | | ■ | |
| IP | IP67 | ■ | ■ | ■ | ■ |
| | IP69k | ■ | | ■ | ■ |
| Connection | PVC cable | | ■ | ■ | ■ |
| | M8 connector | | ■ | □ | |
| | M12 connector | ■ | | ■ | ■ |
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## Special models

| Application | Building installations | Doors and building installations | | Filling and bottle conveying | |
|---|---|---|---|---|---|
| |  |  |  |  |  |
| Model | E3F2-□Z | E3JK | E3G-M | E3S-CR62/67 | E3Z-B |
| Type | Cylindrical AC voltage sensor | Compact AC&DC voltage sensor | Long distance AC&DC voltage sensor | Transparent bottle sensor | PET bottle sensor |
| Key features | 24-240 VAC power supply voltage | 12-240 VDC or 24-240 VAC power supply voltage | | Special optical design for reliable detection of glass bottles compensating 'double-detection-effect' | Inner view optical system for PET bottle detection |
| BGS | | | | | |
| D | ■ | ■ | ■ | | |
| R | ■ | ■ | ■ | ■ | ■ |
| T | ■ | ■ | | | |
| Page | 25 | 27 | 26 | 22 | 21 |

| Application | Mark detection on laminated objects | Mark detection on transparent objects | Precision positioning and counting | PCB detection | Object detection and sensor condition monitoring |
|---|---|---|---|---|---|
| |  |  |  |  |  |
| Model | E3M-V | E3S-G | E3Z Laser | E3S-LS3 | E3Z-□G, E3Z-□J |
| Type | Mark sensor | Mark sensor in forked housing | LASER sensor | Wide beam models | Preventive maintenance |
| Key features | Coaxial optical system for reliable mark detection | Forked shaped housing for simple installation | Visible LASER light | Wide beam for detection of structured objects (e.g. with holes) | 'machine stop' or 'defect' alarm active sensor checking detection of dirt on lens |
| BGS | | | ■ | | |
| D | ■ | | | ■ | |
| R | | | ■ | | ■ |
| T | | ■ | ■ | | ■ |
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| Application | Conveying applications | | | High precision positioning |
|---|---|---|---|---|
| |  |  |  |  |
| Model | E3Z-□H | F3C-AA | E3F2-□41 | E3C-LDA |
| Type | Tampering protection | Conveyor sensor | Cylindrical sensors with 90° optics | High precision LASER sensor |
| Key features | Without adjuster to prevent misalignment | special housing shape fitting between conveyor segments | radial (90°) optics for simple installation and adjustment | up to 10 µm accuracy |
| BGS | | ■ | | |
| D | ■ | | ■ | ■ |
| R | ■ | | ■ | ■ |
| T | ■ | | | |
| Page | Please contact your OMRON representative | | 32 | 31 |

■ Standard □ Available No / not available

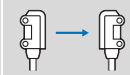
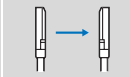
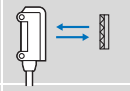
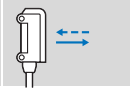
# Miniature size sensors in plastic housing

Small sized square photoelectric sensors with high performance pin-point LED for demanding mounting conditions.

- Ultra small size with high power pinpoint LED where space is crucial
- 3.5 mm thin flat shape or 7 mm wide side view shape
- IP67

CE

## Ordering information

| Sensor type | Shape | | Connection method | Sensing distance | Output form | NPN output *1 | PNP output |
|---|---|---|---|---|---|---|---|
| Through-beam | Side-view |  | Pre-wired | 1 m (Red light) | Light ON | E3T-ST11 | E3T-ST13*2 |
| | | | | | Dark ON | E3T-ST12 | E3T-ST14*2 |
| | Flat |  | | 500 mm (Red light) | Light ON | E3T-FT11 | E3T-FT13*2 |
| | | | | | Dark ON | E3T-FT12 | E3T-FT14* |
| Retroreflective | Side-view |  | | 200 mm (10 mm)*3 (Red light) | Light ON | E3T-SR11 | E3T-SR13*2 |
| | | | | | Dark ON | E3T-SR12 | E3T-SR14*2 |
| Diffuse reflective | Flat |  | | 5 to 30 mm (Red light) | Light ON | E3T-FD11 | E3T-FD13*2 |
| | | | | | Dark ON | E3T-FD12 | E3T-FD14*2 |
| Limited reflective | Side-view |  | | 5 to 30 mm (Red light) | Light ON | E3T-SL21 | E3T-SL23*2 |
| | | | | | Dark ON | E3T-SL22 | E3T-SL24*2 |

*1 The robot cable type is available. Its type ends with "R". (Example: E3T-ST11R)
*2 preferred stock item
*3 Values in parenthese indicate the minimum required distance between the sensor and the reflector.

## Specifications

| Item | Through-beam | | | | Retroreflective | | Limited reflective | | Diffuse reflective | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Side-view | | Flat | | Side-view | | | | Flat | |
| | NPN | PNP | NPN | PNP | NPN | PNP | NPN | PNP | NPN | PNP |
| Light-ON | -ST11 | -ST13 | -FT11 | -FT13 | -SR11 | -SR13 | -SL21 | -SL23 | -FD11 | -FD13 |
| Dark-ON | -ST12 | -ST14 | -FT12 | -FT14 | -SR12 | -SR14 | -SL22 | -SL24 | -FD12 | -FD14 |
| Sensing distance | 1 m (Sensitivity adjustment Unit is available) | | 500 mm | | 200 mm (10 mm) with the E39-R4 | | 5 to 30 mm (50x50 mm white paper) | | 5 to 30 mm (50x50 mm white paper) | |
| Directional angle | Emitter: 3° to 10° Receiver: 3 to 70° | | Emitter: 3° to 13° Receiver: 3 to 70° | | Emitter: 2° to 5° | | --- | | | |
| Light source (wave length) | Red LED ("Pin-point" LED) (λ=650 nm) | | | | | | | | | |
| Power supply voltage | 12 to 24 VDC ±10%, ripple (p-p) 10% max. | | | | | | | | | 24 VDC ±10% |
| Control output | Open collector, load current: 50 mA max. at 24 VDC, residual voltage: 1 V max., operation mode: Light ON or Dark ON (separate models) | | | | | | | | | |
| Protective circuits | Protection from reversed power supply connection and output short-circuit | | | | Protection from reversed power supply connection, output short-circuit, and mutual interference | | | | | |
| Response time | 1 ms max. each for operation and release | | | | | | | | | |
| Ambient temperature | Operating: -25 °C to 55 °C Storage: -40 °C to 70 °C (with no icing or condensation) | | | | | | | | | |
| Vibration resistance | Destruction: 10 to 2,000 Hz, 1.5 mm double amplitude or 300 m/s² (approx. 30 G) for 0.5 hrs each in X, Y, and Z directions | | | | | | | | | |
| Shock resistance | Destruction: 1,000 m/s² (approx. 100 G) 3 times each in X, Y, and Z directions | | | | | | | | | |
| Degree of protection | IEC60529: IP67 | | | | | | | | | |
| Connection method | Prewired (standard length: 2 m) | | | | | | | | | |
| Materials | Case: PBT Lens and cover: Polycarbonate | | | | | | | | | |

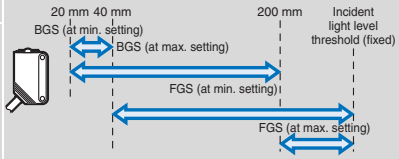

# General purpose sensors in compact plastic housing

Compact housing size and high-power LED for excellent performance-size ratio and best value-performance ratio for standard applications.

- Compact housing size and high power LED for excellent performance-size ratio
- IP67 and IP69k for highest protection in wet environment
- Intensive shielding for highest noise immunity (EMC)
- Tough PBT housing for high mechanical resistance

CE

## Ordering information

| Sensor type | Connection method | Sensing distance | NPN output | PNP output |
|---|---|---|---|---|
| Through-beam | Pre-wired models (2 m)*1 | 30 m (Infrared light) | E3Z-T62 | E3Z-T82 |
| | | | E3Z-T62-60 | E3Z-T82-60 |
| | Connector type | | E3Z-T67 | E3Z-T87 |
| | | | E3Z-T67-60 | E3Z-T87-60 |
| | Pre-wired models (2 m)*1 | 10 m (Red light) | E3Z-T61A | E3Z-T81A |
| | Connector type | | E3Z-T66A | E3Z-T86A |
| Retroreflective model (with M.S.R. function) | Pre-wired (2 m)*1 | 4 m (100 mm)*2 (Red light) | E3Z-R61 | E3Z-R81 |
| | Connector type | | E3Z-R66 | E3Z-R86 |
| Diffuse-reflective | Pre-wired models (2 m)*1, *3 | 1 m (Infrared light) | E3Z-D62 | E3Z-D82 |
| | Connector type | | E3Z-D67 | E3Z-D87 |
| Distance-settable | Pre-wired models (2 m)*1 |  (Red light) | E3Z-LS61 | E3Z-LS81 |
| | Connector type | | E3Z-LS66 | E3Z-LS86 |



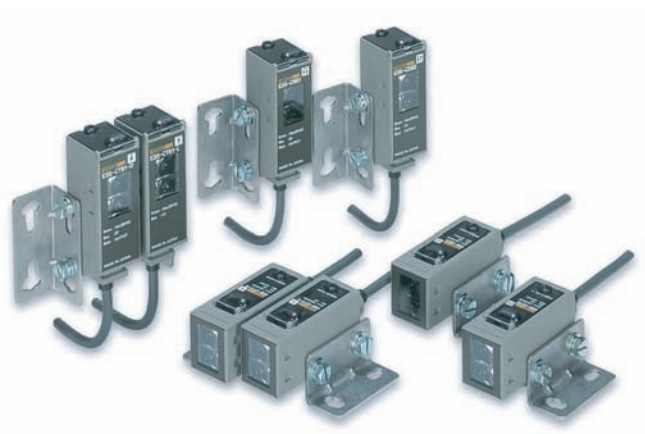
*1 Models provided with a 0.5-m cable are available. When ordering, specify the cable length by adding the code "0.5M" to the model number (e.g., E3Z-T61 0.5M).
*2 The sensing distance specified is possible when the E39-R1S used. Figure in parentheses indicate the minimum required distance between the sensor and reflector.
*3 The connector joint type is available M12. Its model ends with -M1. (Example: E3Z-T61-M1J)

## Specifications

| Output | | Through-beam | | Retroreflective model (with M.S.R. function) | Diffuse-reflective | Distance-settable |
|---|---|---|---|---|---|---|
| Item | NPN | E3Z-T62/T67 | E3Z-T61A/T66A | E3Z-R61/R66 | E3Z-D62/D67 | E3Z-LS61/66 |
| | PNP | E3Z-T82/T87 | E3Z-T81A/T86A | E3Z-R81/R86 | E3Z-D82/D87 | E3Z-LS81/86 |
| **Sensing distance** | | 30 m | 10 m | 4 m (100 mm) *1 (When using the E39-R1S) | 1 m (White paper 300x300 mm) | BGS: White or black paper (100x100 mm): 20 mm to set distance FGS: White paper (100x100 mm): Set distance to 200 mm min. Black paper (100x100 mm): Set distance to 160 mm min. |
| **Directional angle** | | Both emitter and receiver: 3° to 15° | | 2° to 10° | --- | |
| **Light source (wave length)** | | Infrared LED (870 nm) | Red LED (700 nm) | Red LED (680 nm) | Infrared LED (860 nm) | Red LED (680 nm) |
| **Power supply voltage** | | 12 to 24 VDC ±10%, ripple (p-p) : 10% max. | | | | |
| **Control output** | | Load power supply voltage 26.4 VDC max., load current 100 mA max. (residual voltage 2 V max.) Open collector output type (depends on the NPN/PNP output format) Light-ON/Dark-ON switch selectable | | | | |

| Output | | Through-beam | | Retroreflective model (with M.S.R. function) | Diffuse-reflective | Distance-settable |
|---|---|---|---|---|---|---|
| Item | NPN | E3Z-T62/T67 | E3Z-T61A/T66A | E3Z-R61/R66 | E3Z-D62/D67 | E3Z-LS61/66 |
| | PNP | E3Z-T82/T87 | E3Z-T81A/T86A | E3Z-R81/R86 | E3Z-D82/D87 | E3Z-LS81/86 |
| **Protective circuits** | | Reverse polarity protection, output short-circuit protection, mutual interference prevention, output reverse protection | Protection from load short-circuit and reversed power supply connection | Reverse polarity protection, output short-circuit protection, mutual interference prevention, output reverse protection | | Reverse polarity protection, output short-circuit protection, mutual interference prevention |
| **Response time** | | Operation or reset: 2 ms max. | Operation or reset: 1 ms max. | | | |
| **Ambient temperature** | | Operating: -25 °C to 55 °C, Storage: -40 °C to 70 °C (with no icing or condensation) | | | | |
| **Vibration resistance** | | 10 to 55 Hz, 1.5 mm or 300 $m/s^2$ double amplitude for 2 hours each in X, Y, and Z directions | | | | |
| **Shock resistance** | | Destruction: 500 $m/s^2$ for 3 times each in X, Y, and Z directions | | | | |
| **Degree of protection** | | IEC 60529 IP67, IP69k after DIN 40050 part 9 | | | | |
| **Connection method** | | Pre-wired (standard length: 2 m / 500 mm) / M8 connector | | | | |
| **Material** | **Case** | PBT (polybutylene terephthalate) | | | | |
| | **Lens** | Denatured polyacrylate resin | Methacylate resin | | | Denaturated polyallylate |

*1 Values in parentheses indicate the minimum required distance between the sensor and reflector.



# Oil-resistant, compact photoelectric sensor in metal housing

High oil resistance built into a compact housing shape.

- High functional reserve for highest reliability in dirty environments

CE

## Ordering information

| Sensor type | Shape | Connection method | Sensing distance | Model |
|---|---|---|---|---|
| Through-beam | Horizontal model | Pre-wired | 30 m (Infrared light) | E3S-CT11 |
| | | M12 connector | | E3S-CT16 |
| | Vertical model | Pre-wired | | E3S-CT61 |
| | | M12 connector | | E3S-CT66 |
| Retroreflective Models | Horizontal model | Pre-wired | 3 m (Red light) | E3S-CR11 |
| | | M12 connector | | E3S-CR16 |
| | Vertical model | Pre-wired | | E3S-CR61 |
| | | M12 connector | | E3S-CR66 |
| Diffuse-reflective | Horizontal model | Pre-wired | 2 m (Infrared light) | E3S-CD12 |
| | | M12 connector | | E3S-CD17 |
| | Vertical model | Pre-wired | 2 m (Infrared light) | E3S-CD62 |
| | | M12 connector | | E3S-CD67 |

**Note:** All pre-wired models are also available as M12 -junction connector type- M1J.

## Specifications

| Item | | Through-beam | Retroreflective model (with M.S.R. function) | Diffuse-reflective |
|---|---|---|---|---|
| | | **Horizontal E3S-CT11 (-M1J)** | **Horizontal E3S-CR11 (-M1J)** | **Horizontal E3S-CD12 (-M1J)** |
| | | **Vertical E3S-CT61 (-M1J)** | **Vertical E3S-CR61 (-M1J)** | **Vertical E3S-CD62 (-M1J)** |
| **Sensing distance** | | 30 m | 3 m (When using the E39-R1) | 2 m (White paper 300x300 mm) |
| **Light source (wave length)** | | Infrared LED (880 nm) | Red LED (700 nm) | Infrared LED (880 nm) |
| **Supply voltage** | | 10 to 30 VDC [ripple (p-p) 10% included] | | |
| **Protective circuits** | | Reverse polarity protection, output short-circuit protection | Reverse polarity protection, output short-circuit protection, mutual interference prevention | |
| **Response time** | | Operation or reset: 1 ms max. | | Operation/reset: 2 ms max. each |
| **Ambient temperature** | | Operating: -25 °C to 55 °C, Storage: -40 °C to 70 °C (with no icing or condensation) | | |
| **Vibration resistance** | | 10 to 2,000 Hz double amplitude 1.5 mm or 300 $m/s^2$ for 0.5 h in each of X, Y, Z directions | | |
| **Shock resistance** | | 1000 $m/s^2$ (approx.- l00 G) 3 times each in X, Y, and Z directions | | |
| **Protective structure** | | IEC Standard IP67, NEMA 6P (limited to indoors use)*1 | | |
| **Connection method** | |  Pre-wired (standard length: 2 m)<br>Junction connector (standard length: 300 mm)<br>M12 Connector | | |
| **Materials** | **Case** | Zinc diecast | | |
| | **Operation panel cover** | Polyethyl sulfon | | |
| | **Lens** | Acrylics | | |
| **Size in mm** | | 20Hx57Wx23D | | |

*1 NEMA (National Electrical Manufacturers Association) standards

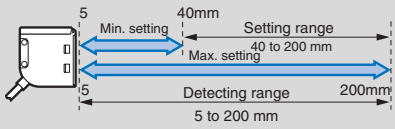
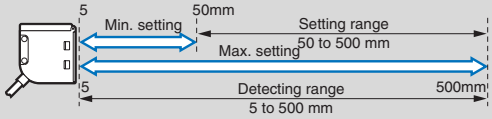
# Distance setting photoelectric sensor in metal housing

- High water, oil and detergent resistance
- Minimal black / white error for highest reliability detecting different colored objects (E3S-CL1)

CE

## Ordering information

Red light Green light

| Sensing/Setting range | Model |
|---|---|
|  | E3S-CL1 |
|  | E3S-CL2 |

## Specifications

| Item | | E3S-CL1 | E3S-CL2 |
|---|---|---|---|
| Sensing distance | | 5 to 200 mm (White paper 200x200 mm) (Setting distance 200 mm) | 5 to 500 mm (White paper 200x200 mm) (Setting distance 500 mm) |
| Light source (wave length) | | Red LED (700 nm) | Infrared LED (860 nm) |
| Power supply voltage | | 10 to 30 VDC [ripple (p-p) 10% included] | |
| Protective circuits | | Reverse polarity protection, output short-circuit protection, mutual interference prevention | |
| Response time | | Operation or reset: 1 ms max. | Operation or reset: 2 ms max. |
| Ambient temperature | | Operating/Storage: -25 °C to 55 °C (with no icing or condensation) | |
| Vibration resistance | | 10 to 55 Hz, 1.5 mm double amplitude for 2 hours each in X, Y, and Z directions | |
| Shock resistance | | Destruction: 500 m/s$^2$ for 3 times each in X, Y, and Z directions | |
| Degree of protection | | IEC standard IP67, NEMA 6P (limited to indoor use) *1 | |
| Connection method | | Pre-wired models (standard length: 2 m) | |
| Reflectivity characteristics (black / white error)*2 | | 2% max. | 10% max. |
| Materials | Case | Zinc diecast | |
| | Operation panel cover | Polyethyl sulfon | |
| | Lens | Acrylics | |
| Size in mm | | 15.4Hx40Wx42D | |

*1 NEMA (National Electrical Manufacturers Association) standards
*2 Sensing distance difference between standard white paper (reflectivity 90%) and standard black paper (reflectivity 5%)

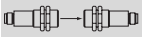
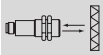

# Standard cylindrical M18 photoelectric sensor

The cylindrical M18 size family offers a large standard portfolio in plastic, brass or stainless steel housings for through-beam, retro-reflective, diffuse-reflective and background-suppression models. For excellent price-performance for your standard applications.

- Plastic, brass or stainless steel housings
- IP67, IP69k for highest water resistance
- Special beam and LED models available

CE

## Ordering information

| Sensor type | | Appearance | Connection method | Sensing distance | Housing | NPN output | PNP output |
|---|---|---|---|---|---|---|---|
| Through-beam | Multi purpose |  | Pre-wired | 7 m (Infrared LED) | Plastic | E3F2-7C4 | E3F2-7B4 |
| | | | | | Brass | E3F2-7C4-M | E3F2-7B4-M |
| | | | | | Stainless steel | E3F2-7C4-S | E3F2-7B4-S |
| | | | M12 connector | | Plastic | E3F2-7C4-P1 | E3F2-7B4-P1 |
| | | | | | Brass | E3F2-7C4-M1-M | E3F2-7B4-M1-M |
| | | | | | Stainless steel | E3F2-7C4-M1-S | E3F2-7B4-M1-S |
| Retro-reflective[*1] | Non-polarizing (without MSR function) |  | Pre-wired | 0.1 - 2 m[*2] (Infrared LED) | Plastic | E3F2-R2C4-E | E3F2-R2B4-E |
| | | | M12 connector | | Plastic | E3F2-R2C4-P1-E | E3F2-R2B4-P1-E |
| | Polarizing (with MSR function) | | Pre-wired | 0.1 - 2 m (Red LED) | Brass | E3F2-R2C4-M-E | E3F2-R2B4-M-E |
| | | | | | Stainless steel | E3F2-R2C4-S-E | E3F2-R2B4-S-E |
| | | | M12 connector | | Brass | E3F2-R2C4-M1-M-E | E3F2-R2B4-M1-M-E |
| | | | | | Stainless steel | E3F2-R2C4-M1-S-E | E3F2-R2B4-M1-S-E |
| Diffuse reflective | Adjustable sensitivity |  | Pre-wired | 0.3 m | Plastic | E3F2-DS30C4 | E3F2-DS30B4 |
| | | | | | Brass | E3F2-DS30C4-M | E3F2-DS30B4-M |
| | | | | | Stainless steel | E3F2-DS30C4-S | E3F2-DS30B4-S |
| | | | M12 connector | | Plastic | E3F2-DS30C4-P1 | E3F2-DS30B4-P1 |
| | | | | | Brass | E3F2-DS30C4-M1-M | E3F2-DS30B4-M1-M |
| | | | | | Stainless steel | E3F2-DS30C4-M1-S | E3F2-DS30B4-M1-S |
| Background suppression | Fixed sensing distance |  | Pre-wired | 10 cm | Plastic | E3F2-LS10C4 | E3F2-LS10B4 |
| | | | | | Brass | E3F2-LS10C4-M | E3F2-LS10B4-M |
| | | | | | Stainless steel | E3F2-L210C4-S | E3F2-L210B4-S |
| | | | M12 connector | | Plastic | E3F2-LS10C4-P1 | E3F2-LS10B4-P1 |
| | | | | | Brass | E3F2-LS10C4-M1-M | E3F2-LS10B4-M1-M |
| | | | | | Stainless steel | E3F2-LS10C4-M1-S | E3F2-LS10B4-M1-S |

[*1] Retroreflective models incl. reflectors E39-R1 or E39-R1S are also available
[*2] With reflector E39-R1S

## Specifications

| Item | E3F2-7□ | E3F2-R2□4-□ | E3F2-R2R□ | E3F2-DS30□ | E3F2-LS10□4-□ |
|---|---|---|---|---|---|
| Sensing distance type | Through-beam | Retroreflective | | Diffuse reflective | |
| | multi purpose | Non-polarizing | Polarizing | Adjustable sensing distance | Background suppression |
| Light source (wave length) | Infrared LED (880 nm / 850 nm) | | Red LED (660 nm) | Infrared LED (880 nm) | Red LED (660 nm) |
| Power supply voltage | 10 to 30 V DC | | | | |
| Protective circuits | Output short-circuit and power supply reverse polarity | | | | |
| Response time | ≤ 2.5 ms | | | | |
| Ambient temperature | Operating: -25 to 55 °C / Storage: -30 to 70 °C (with no icing or condensation) | | | | |
| Vibration resistance | 10 to 55 Hz, 1.5 mm double amplitude for 2 hrs each direction (X, Y, Z) | | | | |
| Shock resistance | Destruction: 500 m/s$^2$ each direction (X, Y, Z) | | | | |
| Degree of protection | IP67 [*1]; NEMA 1, 2, 4; IP69k after DIN 40050 part 9 | | | | |
| Connection method |  2 m, 5 m pre-wired cable (PVC, dia. 4 mm (18 / 0.12) [*2]) or M12-connector | | | | |
| Material | Plastic (case: ABS; lens: PMMA) | | | | |
| | Nickel brass | – | Nickel brass | Nickel brass | Nickel brass |
| | Stainless steel [*3] | – | Stainless steel [*3] | Stainless steel [*3] | Stainless steel [*3] |

[*1] The enclosure rating IP67 of OMRON internal standards correspond to stricter test requirements than the standard IEC 60529 (refer to chapter “Precautions”)
[*2] For other cable materials (e.g. PUR) please contact your OMRON sales representative.
[*3] Material-specification for stainless steel housing case: 1.4305 (W.-No.), 303 (AISI), 2346 (SS). For other stainless steel materials please contact your OMRON sales representative.

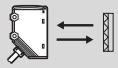
# Long distance sensors in plastic housing

Long distance retro-reflective and diffuse reflective sensors in plastic housing.

- Diffuse reflective model with
- M12 rotary connector or pre-wired models

CE

## Ordering information

| Sensor type | Shape | Size in mm (HxWxD) | Connection method | Sensing distance | NPN/PNP selector |
|---|---|---|---|---|---|
| Retroreflective models (with M.S.R. function) |  | 45x17.8x21 | Pre-wired | 10 m (500 mm) *1 (Red light) | E3G-R13-G |
| | | 43x67.8x21 | Connector type | | E3G-R17-G |
| | | | | | |
| Distance setting |  | 45x67.8x21 | Pre-wired | 0.2 to 2 m White paper 300 x 300 mm (Infrared light) | E3G-L73 |
| | | 43x67.8x21 | Connector type | | E3G-L77 |

*1 Values in parentheses indicate the minimum required distance between the sensor and reflector.

## Specifications

| Item | | Retroreflective models (M.S.R. function) | | Distance-setting | |
|---|---|---|---|---|---|
| | | E3G-R13-G | E3G-R17-G | E3G-L73 | E3G-L77 |
| Sensing distance | | 10 m (500 mm) *1 (When using the E39-R2) | | 0.2 to 2 m (White paper 300x300 mm) (setting distance 0.5 to 1.2 m) | |
| Light source (wave length) | | Red LED (700 nm) | | Infrared LED (860 nm) | |
| Power supply voltage | | 10 to 30 VDC (Ripple (p-p) 10% included) | | 10 to 30 VDC (Ripple (p-p) 10% included) | |
| Protective circuits | | Reverse polarity protection, output short-circuit protection, mutual interference prevention | | Reverse polarity protection, output short-circuit protection, mutual interference prevention | |
| Response time | | Operation / reset: 1 ms each | | Operation/reset: 5 ms each | |
| Ambient temperature | | Operating: -25 °C to 55 °C, Storage: -30 °C to 70 °C (with no icing or condensation) | | | |
| Vibration resistance | | Destruction: 10 to 55 Hz, 1.5 mm double amplitude for 2 hours each in X, Y, and Z directions | | | |
| Shock resistance | | 500 m/s$^2$ 3 times in each of X, Y and Z directions | | | |
| Degree of protection | | IEC 60529 IP67 (with Protective Cover attached) | | | |
| Connection method | | Pre-wired (standard length: 2 m) | M12 connector | Pre-wired (standard length: 2 m) | M12 connector |
| Materials | Case | PBT (polybutylene terephthalate) | | | |
| | Lens | Acrylics (PMMA) | | | |
| | Mounting brackets | Stainless steel (SUS304) | | | |

*1 Values in parentheses indicate the minimum required distance between the sensor and reflector.


# Harsh environment long-distance photoelectric sensor

Harsh environment long-distance retro-reflective and diffuse-reflective photoelectric sensors in rugged aluminium die cast housing.

- 4 Diffuse reflective E3NT-L application optimized models (long distance, window heating, analog output, fast response)
- Retro-reflective E3NT-R models with sensing distance of up to 16 m
- Two programmable outputs for 'window teaching'
- Double triangulation for stable detection of shiny objects
- IP67 and IP69k for highest resistance in wet environments

CE

## Ordering information

| Sensing method | Type | Connector appearance | Connection method | Sensing / Setting distance | Model |
|---|---|---|---|---|---|
| Distance setting (BGS / FGS) | Long distance | horizontal | M12 connector (5-pole) | 0.2 m .. 3.0 m (90% remission)<br>0.2 m .. 2.7 m (6% remission) | E3NT-L17-20 |
| | | vertical | | | E3NT-L37-20 |
| | Fast response | horizontal | | 0.2 m .. 2.0 m | E3NT-L17 |
| | | vertical | | | E3NT-L37 |
| | Window heating | horizontal | | | E3NT-LH17 |
| | | vertical | | | E3NT-LH37 |
| | Analog and digital output | horizontal | | | E3NT-L27 |
| | | vertical | | | E3NT-L47 |
| Retro reflective (with MSR-polarisation) | Long distance | horizontal | | 0.2 m .. 16.0 m (with E39-R8) | E3NT-R17 |
| | | vertical | | | E3NT-R37 |

## Specifications

| Item | | E3NT-L17<br>E3NT-L37 | E3NT-L27<br>E3NT-L47 | E3NT-LH17<br>E3NT-LH37 | E3NT-L17-20<br>E3NT-L37-20 | E3NT-R |
|---|---|---|---|---|---|---|
| Sensing distance | | 2 m | | | 3 m | 16 m |
| Light source (wave length) | | Infrared LED 850-880 nm | | | | Red LED 660 nm |
| Power supply voltage | | 12 to 24 VDC (10 to 30 VDC) | | | 12 to 24 VDC (11 to 30 VDC) | 12 to 24 VDC (10 to 30 VDC) |
| Protective circuits | | Reversed power supply, overload, short-circuit (pulsed) | | | | |
| Response time | | ≤ 2.5 ms | ≤ 5 ms | ≤ 2.5 ms | ≤ 20 ms | ≤ 2.0 ms |
| Ambient temperature | | - 25 °C ... + 55 °C | - 10 °C ... + 55 °C (analog output) | - 40 °C ... + 55 °C | - 25 °C ... + 55 °C | |
| Vibration resistance (to IEC 68-2-6) | | ± 1.5 mm, 1 h , 10 - 70 Hz | | | | |
| Shock resistance (to IEC 68-2-27) | | 300 m/s² | | | | |
| Degree of protection | | IP67 (after IEC 60529), IP69k (after DIN 40050 part 9) | | | | |
| Connection method | | M12 connector, 5-pole (piercing) | | | | |
| Materials | Housing | Powder-coated aluminum, 231 GD AlSi12 (Cu) | | | | |
| | Front pane | Glas | | | | |
| Size in mm | | 65.1Hx88.7Wx27D | | | | |

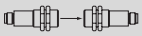
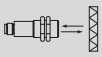
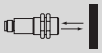

# Long distance cylindrical M18 photoelectric sensors

The long distance types within the E3F2 family provide enhanced sensing distances and functional reserve for enhanced reliability in dirty environments.

- High-power LED for enhanced sensing distance

CE

## Ordering information

| Sensor type | | Appearance | Connection method | Sensing distance | Housing | NPN output | PNP output |
|---|---|---|---|---|---|---|---|
| Through-beam | Precision positioning Test input |  | Pre-wired | 10 m | Plastic | E3F2-10C4 | E3F2-10B4 |
| | | | | | Brass | E3F2-10C4-M | E3F2-10B4-M |
| | | | M12 connector | | Plastic | E3F2-10C4-P1 | E3F2-10B4-P1 |
| | | | | | Brass | E3F2-10C4-M1-M | E3F2-10B4-M1-M |
| Retro-reflective [*1] | Polarizing (Adjustable sensitivity) |  | Pre-wired | 0.1 - 4 m [*2] | Brass | E3F2-R4RC4-M-E | E3F2-R4RB4-M-E |
| | | | M12 connector | | Brass | E3F2-R4RC4-M1-M-E | E3F2-R4RB4-M1-M-E |
| Diffuse reflective | Adjustable sensitivity |  | Pre-wired | 1 m | Plastic | E3F2-D1C4 | E3F2-D1B4 |
| | | | | | Brass | E3F2-D1C4-M | E3F2-D1B4-M |
| | | | M12 connector | | Plastic | E3F2-D1C4-P1 | E3F2-D1B4-P1 |
| | | | | | Brass | E3F2-D1C4-M1-M | E3F2-D1B4-M1-M |

[*1] Retroreflective models incl. reflectors E39-R1 or E39-R1S are also available
[*2] with reflector E39-R1S

## Specifications

| Item | E3F2-10□ | E3F2-R4□ | E3F2-DS1□ |
|---|---|---|---|
| Type | Through-beam | Retroreflective | Diffuse reflective |
| | multi purpose | Polarizing | Adjustable sensing distance |
| Light source (wave length) | Infrared LED (880 nm) | Red LED (660 nm) | Infrared LED (880 nm) |
| Power supply voltage | 10 to 30 V DC | | |
| Protective circuits | Output short-circuit and power supply reverse polarity | | |
| Ambient temperature | Operating: -25 to 55 °C / Storage: -30 to 70 °C (with no icing or condensation) | | |
| Vibration resistance | 10 to 55 Hz, 1.5 mm double amplitude for 2 hrs each direction (X, Y, Z) | | |
| Shock resistance | Destruction: 500 m/s$^2$ each direction (X, Y, Z) | | |
| Degree of protection | IP67 [*1]; NEMA 1, 2, 4; IP69k after DIN 40050 part 9 | | |
| Connection method |  2 m, 5 m pre-wired cable (PVC, dia. 4 mm (18 / 0.12) [*2]) or M12-connector | | |
| Material | Plastic (case: ABS; lens: PMMA) | | |
| | Nickel brass | Nickel brass | Nickel brass |

[*1] The enclosure rating IP67 of OMRON internal standards correspond to stricter test requirements than the standard IEC 60529 (refer to chapter “Precautions”)
[*2] For other cable materials (e.g. PUR) please contact your OMRON sales representative.


# PET bottle detection photoelectric sensor

The E3Z-B features the inner view optical system for reliable PET bottle detection.

- Uses OMRON's unique optical system
- Detects a wide range of bottles from 500 ml bottles to 2 l bottles, and from single bottles to sets of stocked bottles
- IP67 / IP69k tested for highest water resistance

CE

## Ordering information

| Sensor type | Shape | | Connection method | Sensing distance | Model | |
|---|---|---|---|---|---|---|
| | | | | | NPN output | PNP output |
| Retroreflective model (without M.S.R. function) |  | *1 | Pre-wired*2 | 500 mm (80 mm)*3 (Red light) | E3Z-B61 | E3Z-B81 |
| | | | Connector type | | E3Z-B66 | E3Z-B86 |
| | | | Pre-wired models | 2 m (500 mm)*3 (Red light) | E3Z-B62 | E3Z-B82 |
| | | | Connector type | | E3Z-B67 | E3Z-B87 |

*1 The reflector is sold separately.
*2 The cable of 0.5 m length is also available. Specify the cable length at the end of the model name. (Example: E3Z-B61 0.5M)
*3 The specified sensing distance is possible when the E39-R1S is used. Figures in parentheses indicate the minimum required distance between the sensor and the reflector.

## Specifications

| Sensor type | | Retroreflective model (without M.S.R. function) | | | |
|---|---|---|---|---|---|
| Model | NPN output | E3Z-B61 | E3Z-B66 | E3Z-B62 | E3Z-B67 |
| Item | PNP output | E3Z-B81 | E3Z-B86 | E3Z-B82 | E3Z-B87 |
| Sensing distance | | 500 mm (80 mm)*1 (When using the E39-R1S) | | 2 m (100 mm)*1 (When using the E39-R1S) | |
| Directional angle | | | | | |
| Light source (wave length) | | Red LED (680 nm) | | | |
| Power supply voltage | | 12 to 24 VDC ±10%, ripple (p-p) : 10% max. | | | |
| Control output | | Load power supply voltage 26.4 VDC max., load current 100 mA max. (residual voltage 1 V max.) Open collector output type (depends on the NPN/PNP output format) Light-ON/Dark-ON switch selectable | | | |
| Protective circuits | | Reverse polarity protection, output short-circuit protection, mutual interference prevention | | | |
| Response time | | Operation or reset: 1 ms max. | | | |
| Ambient temperature | | Operating: -25 °C to 55 °C, Storage: -40 °C to 70 °C (with no icing or condensation) | | | |
| Vibration resistance | | 10 to 55 Hz, 1.5 mm or 300 m/s$^2$ double amplitude for 2 hours each in X, Y, and Z directions | | | |
| Shock resistance | | Destruction: 500 m/s$^2$ for 3 times each in X, Y, and Z directions | | | |
| Degree of protection | | IEC 60529 IP67, IP69k (DIN40050) | | | |
| Connection method | |  Pre-wired type (Standard cable length 2 m / 500 mm) |  M8 connector |  Pre-wired type (Standard cable length 2 m / 500 mm) |  M8 connector |
| Indicator lamp | | Operation indicator (orange) | | | |
| Material | Case | PBT (polybutylene terephthalate) | | | |
| | Lens | Methacylate resin | | | |

*1 Figures in parentheses indicate the minimum required distances between the sensors and reflectors.

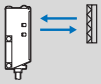

# Transparent bottle sensor

The special optical design of the E3S-CR62/67 ensures reliable detection of glass bottles compensating the often noticed 'double-detection-effect' when using other sensors.

- Special optical system for reliable bottle detection preventing 'lens effect'
- Thin beam for reliable bottle counting

CE

## Ordering information

| Sensor type | Shape | Connection method | Sensing distance | | Model |
|---|---|---|---|---|---|
| | | | Reflector E39-R6 | Reflector E39-R1 | |
| Retroreflective models |  | Pre-wired type | 250 mm (Red light) | 1 m (250 mm) (Red light) *1 | E3S-CR62-C |
| | | Connector type | | | E3S-CR67-C |

*1 Values in parentheses indicate the minimum required distance between the sensor and reflector.

## Specifications

| Item | | E3S-CR62-C | E3S-CR67-C |
|---|---|---|---|
| Sensing distance | | 250 mm (When using the E39-R6), 1 m (250 mm)*1 (When using the E39-R1) | |
| Light source (wave length) | | Red LED (660 nm) | |
| Power supply voltage | | 10 to 30 VDC, ripple (p-p) : 10 % max. | |
| Protective circuits | | Load short protection, reverse connection protection, mutual interference protection function | |
| Response time | | Operation or reset: 1 ms max. | |
| Ambient temperature | | Operating: -25 °C to 55 °C, Storage: -40 °C to 70 °C (with no icing or condensation) | |
| Vibration resistance | | Destruction: 10 to 2,000 Hz, 1.5 mm double amplitude or 300 $m/s^2$ (approx. 30 G) for 0.5 hrs each in x, y, and Z directions | |
| Shock resistance | | 1000 $m/s^2$ (approx. l00 G) 3 times each in X, Y, and Z directions | |
| Degree of protection | | IEC Standard IP67; NEMA 6P (restricted to indoor use) | IEC Standard IP67 NEMA 6P (restricted to indoor use) |
| Connection method | | Pre-wired models (standard length: 2 m) | Connector type |
| Materials | Case | Zinc diecast | |
| | Lens | Acrylics | |
| | Display operation panel | Polyethyl sulfon | |
| Size in mm | | 20Hx57Wx23D | |

*1 Values in parentheses indicate the minimum required distance between the sensor and reflector.

## LASER sensor in compact size housing

The E3Z LASER sensor in compact plastic housing features visible LASER light for precision positioning and detection applications.

- Visible LASER light for precision positioning and small object detection
- High power LED for high functional reserve

### Ordering information

| Sensing method | Connection method | Response time | Sensing distance | Model | |
|---|---|---|---|---|---|
| | | | | NPN output | PNP output |
| Through-beam | Pre-wired (2 m) | 1 ms | 60 m | E3Z-LT61 | E3Z-LT81 |
| | Standard M8 connector | | | E3Z-LT66 | E3Z-LT86 |
| Retroreflective with M.S.R. function | Pre-wired (2 m) | | 15 m (300 mm), (Using E39-R1)<br>7 m (200 mm), (Using E39-R12)<br>7 m (200 mm), (Using E39-R6) | E3Z-LR61 | E3Z-LR81 |
| | Standard M8 connector | | | E3Z-LR66 | E3Z-LR86 |
| Distance-settable (BGS-Models) | Pre-wired (2 m) | | 20 to 40 mm (Min. distance)<br>20 to 300 mm (Max. distance) | E3Z-LL61 | E3Z-LL81 |
| | Standard M8 connector | | | E3Z-LL66 | E3Z-LL86 |
| | Pre-wired (2 m) | 0.5 ms | 25 to 40 mm (Min. distance)<br>25 to 300 mm (Max. distance) | E3Z-LL63 | E3Z-LL83 |
| | Standard M8 connector | | | E3Z-LL68 | E3Z-LL88 |

### Specifications

| Sensing method | | Through-beam | Retro-reflective with M.S.R. function | Diffuse-reflective | |
|---|---|---|---|---|---|
| Response | | Standard response | | | High-speed response |
| Model / Item | NPN output | E3Z-LT61/-LT66 | E3Z-LR61/-LR66 | E3Z-LL61/-LL66 | E3Z-LL63/-LL68 |
| | PNP output | E3Z-LT81/-LT86 | E3Z-LR81/-LR86 | E3Z-LL81/-LL86 | E3Z-LL83/-LL88 |
| Sensing distance | | 60 m | 0.3 to 15 m<br>(when using E39-R1S)<br>0.2 to 7 m<br>(when using E39-R12)<br>0.2 to 7 m<br>(when using E39-R6) | White paper<br>(100x100 mm)<br>20 to 300 mm<br>Black paper<br>(100x100 mm)<br>20 to 160 mm | White paper<br>(100x100 mm)<br>25 to 300 mm<br>Black paper<br>(100x100 mm)<br>25 to 100 mm |
| Light source (wavelength) | | Red LED (655 nm), JIS Class 1, IEC Class 1, FDA Class II | | | |
| Power supply voltage | | 12 to 24 VDC ±10%, ripple (p-p): 10% max. | | | |
| Ambient temperature range | | Operating: -10 °C to 55 °C, Storage: -25 °C to 70 °C (with no icing or condensation) | | | |
| Vibration resistance | | Destruction: 10 to 55 Hz, 1.5 mm double amplitude for 2 hours each in X, Y, and Z directions | | | |
| Shock resistance | | Destruction: 500 m/s$^2$ 3 times each in X, Y, and Z directions | | | |
| Degree of protection | | IP67 (IEC 60529) | | | |
| Connection method | | Pre-wired cable (standard length: 2 m): E3Z-L□□1/-L□□3<br>Standard M8 connector: E3Z-L□□1/-L□□3 | | | |
| Material | Case | PBT (polybutylene terephthalate) | | | |
| | Lens | Modified polyacrylate resin | Methacrylic resin | Modified polyacrylate resin | |

# Compact size photoelectric sensors for condition monitoring and preventive maintenance

The E3Z 'Preventive maintenance' family features active or passive sensor function checking capabilities detecting misalignments, dirt covers, defective sensors, jammed products, etc.

- E3Z-□-J0: 'Machine stop' or 'Sensor defect' alarm output if beam interruption is too long
- E3Z-□-G0: Active sensor functionality check by test input forcing state change at receiver
- E3Z-□-G2: Detection of dirt cover by power reduction

CE

## Ordering information

| Sensor type | Sensing distance | Output specifications | Preventive maintenance function | | | |
|---|---|---|---|---|---|---|
| | | | anti-tampering | self diagnosis | emission stop | light intensivity switching |
| Through-beam | 15 m | NPN | E3Z-T61H | E3Z-T61-J0SHW | E3Z-T61-G0SHW | E3Z-T61-G2SHW |
| | | PNP | E3Z-T81H | E3Z-T81-J0SHW | E3Z-T81-G0SHW | E3Z-T81-G2SHW |
| Retroreflective | 4 m | NPN | E3Z-R61H | E3Z-R61-J0SHW | E3Z-R61-G0SHW | E3Z-R61-G2SHW |
| | | PNP | E3Z-R81H | E3Z-R81-J0SHW | E3Z-R81-G0SHW | E3Z-R81-G2SHW |
| Diffuse-reflective | 1 m | NPN | E3Z-D62H | E3Z-D62-J0SHW | E3Z-D62-G0SHW | E3Z-D62-G2SHW |
| | | PNP | E3Z-D82H | E3Z-D82-J0SHW | E3Z-D82-G0SHW | E3Z-D82-G2SHW |

## Specifications

| | E3Z-T□ | E3Z-R□ | E3Z-D□ |
|---|---|---|---|
| **Sensing distance** | 15 m | 4 m | 1 m |
| **Light source** | Infrared LED (870 nm) | Red LED (660 nm) | Infrared LED (860 nm) |
| **Power supply voltage** | 12 to 24 VDC ±10% | | |
| **Ambient temperature** | Operating: -25 °C to 55 °C, Storage: -40 °C to 70 °C (with no icing or condensation) | | |
| **Vibration resistance** | 10 to 55 Hz, 1.5 mm or 300 $m/s^2$ double amplitude for 2 hours each in X, Y, and Z directions | | |
| **Degree of protection** | IP67, IP69k | | |
| **Material** | PBT | | |

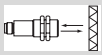
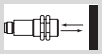
# AC voltage sensor in cylindrical M18 housing

The E3F2 family of cylindrical M18 sized photoelectric sensors features models for direct AC voltage switching.

- 24 to 240 VAC power supply
- UL and CSA approved

CE

## Ordering information

| Sensing method | | Appearance | Connection method | Sensing distance | Model | |
|---|---|---|---|---|---|---|
| | | | | | Light-ON | Dark-ON |
| Through-beam | |  | pre-wired | 3 m | E3F2-3Z1 | E3F2-3Z2 |
| Retro-reflective | Non-polarizing (without MSR function) |  | pre-wired | 0.1 - 2 m (with reflector E39-R1) | E3F2-R2Z1-E | E3F2-R2Z2-E |
| Diffuse reflective | Fixed sensing distance wide-beam characteristics |  | pre-wired | 0.1 m | E3F2-DS10Z1-N | E3F2-DS10Z2-N |

Note: Standard cable length is 2 m. Models provided with a 5 m long cable are available. When ordering, specify the cable length by adding the length of the cable (e.g. E3F2-R2Z1 2M or E3F2-R2Z1 5M). For other cable length please contact your OMRON sales representative.

## Specifications

| Item | E3F2-3Z1<br>E3F2-3Z2 | E3F2-R2Z1<br>E3F2-R2Z2 | E3F2-DS10Z1<br>E3F2-DS10Z2 |
|---|---|---|---|
| **Type** | Through-beam | Non-polarizing Retroreflective | Diffuse reflective (wide-beam characteristic) |
| **Power supply voltage** | 24 to 240 VAC ±10 %, 50 / 60 Hz | | |
| **Rated sensing distance** *1 | 3 m | 0.1 - 2 m (with reflector E39-R1) | 0.1 m (5 x 5 cm white mat paper) |
| **Ambient temperature** | Operating: -25 to 55 °C / Storage: -30 to 70 °C (with no icing or condensation) | | |
| **Vibration resistance** | 10 to 55 Hz, 1.5 mm double amplitude for 2 hrs each direction (X, Y, Z) | | |
| **Shock resistance** | 500 m/sqr (approx. 50 g) for each direction (X, Y, Z) | | |
| **Enclosure rating** | IP67 *2; NEMA 1, 2, 4; IP69k after DIN 40050 part 9 | | |
| **Light source** | Infrared LED (880 nm) | | |
| **Connection method** | 2 m, 5 m pre-wired cable (PVC dia. 4 mm (14 / 0.15) *3) | | |
| **Housing materials** | Plastic (case: ABS; lens: PMMA) | | |

*1 For stable sensing distance in detail, please refer to 'Engineering data'
*2 The enclosure rating IP67 of OMRON internal standards correspond to stricter test requirements than the standard IEC 60529 (refer to chapter “Precautions”)
*3 For other cable materials (e.g. PUR) please contact your OMRON sales representative.

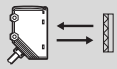
# Long distance all voltage photoelectric sensor in plastic housing

The E3G-M series offers the long sensing distance of the E3G family for all voltage (AC and DC) installations.

- 12 to 240 VDC and 24 to 240 VAC power supply
- Terminal block connection

CE

## Ordering information

| Sensor type | Shape | Connection method | Sensing distance | Timer function | Relay contact output |
|---|---|---|---|---|---|
| Retroreflective models (with M.S.R. function) |  | Terminal block | 10 m (500 mm) *1 (Red light) | --- | E3G-MR19-G |
| | | | | ON or OFF delay 0 to 5 s (adjustable) | E3G-MR19T-G |
| Distance setting |  | | 0.2 to 2 m White paper 300x300 mm (Infrared light) | --- | E3G-ML79-G |
| | | | | ON or OFF delay 0 to 5 s (adjustable) | E3G-ML79T-G |

*1 Values in parentheses indicate the minimum required distance between the sensor and reflector.

## Specifications

| Sensor type | | Retroreflective models (M.S.R. function) | | Distance-setting | |
|---|---|---|---|---|---|
| Item | Model | E3G-MR19-G | E3G-MR19T-G | E3G-ML79-G | E3G-ML79T-G |
| Sensing distance | | 10 m (500 mm) *1 (When using the E39-R2) | | 0.2 to 2 m (White paper 300 x 300 mm) | |
| Light source (wave length) | | Red LED (700 nm) | | Infrared LED (860 nm) | |
| Power supply voltage | | 12 to 240 VDC ±10% ripple (p-p) : 10% max. 24 to 240 VAC ±10% 50/60 Hz | | 12 to 240 VDC ±10% ripple (p-p) : 10% max. 24 to 240 VAC ±10% 50/60 Hz | |
| Control output | | Relay output: switch-over contact 250 VAC 3A (cos$\phi$= 1) max. 30 VDC 3A max. L-ON/D-ON switch selectable | | Relay output: switch-over contact 250 VAC 3A (cos$\phi$= 1) max. 30 VDC 3A max. L-ON/D-ON switch selectable | |
| Response time | | Operation/reset: 30 ms each | | Operation/reset: 30 ms each | |
| Timer function | | --- | ON delay/OFF delay 0 to 5 s (Adjuster variable system) | --- | ON delay/OFF delay 0 to 5 s (Adjuster variable system) |
| Ambient temperature | | Operating: -25 °C to 55 °C, Storage: -30 °C to 70 °C (with no icing or condensation) | | | |
| Vibration resistance | | Destruction: 10 to 55 Hz, 1.5 mm double amplitude for 2 hours each in X, Y, and Z directions | | | |
| Shock resistance | | 500 m/s$^2$ 3 times in each of X, Y and Z directions | | | |
| Protective structure | | IEC 60529 IP67 (with protective cover attached) | | | |

*1 Values in parentheses indicate the minimum required distance between the sensor and reflector.

# AC&DC voltage sensor in compact size housing

The compact sized E3JK family provides 12-240 VDC and 24-240 VAC power supply voltage and is ideally suited to AC installations. The wide voltage range also reduces the product variety needed for different voltage requirements.

- Built-in amplifier accepts wide supply voltage range
- Compact, space-saving construction 50Hx50Wx17.4D mm
- Relay outputs with long life expectancy and high switching capacity (3 A, 250 VAC)

CE

## Ordering information

| Sensor type | Shape | Connection method | Sensing distance | Output form | Output | Model | |
|---|---|---|---|---|---|---|---|
| | | | | | | NPN | PNP |
| Through-beam |  | Pre-wired | 5 m (Infrared light) | Light ON | Relay output | | E3JK-5M1 |
| | | | | Dark ON | | | E3JK-5M2 |
| | | | | Light ON/ Dark ON (selectable) | DC transistor output | E3JK-5S3 | |
| Retroreflective model (with M.S.R. function) |  | | 2.5 m (3 m)*1 (Red light) | Light ON | Relay output | | E3JK-R2M1 |
| | | | | Dark ON | | | E3JK-R2M2 |
| | | | | Light ON/Dark ON (selectable) | DC transistor output | E3JK-R2S3 | E3JK-R2R3 |
| Retroreflective model (without M.S.R. function) | | | 4 m (5 m)*1 (Red light) | Light ON | Relay output | | E3JK-R4M1 |
| | | | | Dark ON | | | E3JK-R4M2 |
| | | | | Light ON/Dark ON (selectable) | DC transistor output | E3JK-R4S3 | |
| Diffuse-reflective |  | | 300 mm (Infrared light) | Light ON | Relay output | | E3JK-DS30M1 |
| | | | | Dark ON | | | E3JK-DS30M2 |
| | | | | Light ON/Dark ON (selectable) | DC transistor output | E3JK-DS30S3 | |

*1 The value within the parentheses indicates the sensing distance applied when the E39-R2 reflector is used.

**Note:** The UL-listed model ends with '-US'. (Example: E3JK-5M1-US). Note that the DC transistor type of the E3JK is UL-unlisted.

## Specifications

| Item | Through-beam | | Retroflective model (with M.S.R. function) | | Retroflective model (without M.S.R. function) | | Diffuse-reflective | |
|---|---|---|---|---|---|---|---|---|
| | E3JK-5M□ | E3JK-5S3 | E3JK-R2M□ | E3JK-R2□3 | E3JK-R4M□ | E3JK-R4S3 | E3JK-DS30M□ | E3JK-DS30S3 |
| Sensing distance | 5 m | | 2.5 m (When using the E39-R1) | | 4 m (When using the E39-R1) | | 300 mm (White paper 100x100 mm) | |
| Light source (wave length) | Infrared LED (950 nm) | | Red LED (660 nm) | | | | Infrared LED (950 nm) | |
| Power supply voltage | 12 to 240 VDC ±10% ripple (p-p) : 10% max. 24 to 240 VAC ±10% 50/60 Hz | | | | | | | |
| Response time | ≤ 30 ms | ≤ 10 ms | ≤ 30 ms | ≤ 5 ms | ≤ 30 ms | ≤ 5 ms | ≤ 30 ms | ≤ 5 ms |
| Ambient temperature | Operating: -25 °C to 55 °C, Storage: -30 °C to 70 °C (with no icing or condensation) | | | | | | | |
| Vibration resistance | 10 to 55 Hz, 1.5 mm double amplitude for 2 hours each in X, Y, and Z directions | | | | | | | |
| Shock resistance | Destruction: 500 m/s$^2$ for 3 times each in X, Y, and Z directions | | | | | | | |
| Degree of protection | IEC60529 IP64 | | | | | | | |
| Connection method | Pre-wired models (standard length: 2 m) | | | | | | | |
| Material Case | ABS | | | | | | | |
| Size in mm | 50Hx50Wx22D | | | | | | | |

# Photoelectric sensor for mark detection

The coaxial optical system of the E3M-V provides reliable mark detection on laminated objects

- Detects laminated or light-dispersing objects in stable operation without being influenced by mirror reflection
- Automatically sets to the optimum threshold level by auto-teaching
- Green LED

CE

## Ordering information

| Connection method | Setting distance | Spot diameter | Model | |
|---|---|---|---|---|
| | | | NPN output | PNP output |
| Connector type*1 | 10+3 mm | 1x4 mm | E3M-VG11 | E3M-VG16 |
| | | 4x1 mm | E3M-VG21 | E3M-VG26 |
| Pre-wired | | 1x4 mm | E3M-VG12 | E3M-VG17 |
| | | 4x1 mm | E3M-VG22 | E3M-VG27 |

*1 Possible to switch between vertical or horizontal connection using the M12 rotary connector

## Specifications

| Item | E3M-VG11 | E3M-VG12 | E3M-VG21 | E3M-VG22 | E3M-VG16 | E3M-VG17 | E3M-VG26 | E3M-VG27 |
|---|---|---|---|---|---|---|---|---|
| Sensing distance | 10±3 mm | | | | | | | |
| Spot size (HxW) | 4x1 mm | | 1x4 mm | | 4x1 mm | | 1x4 mm | |
| Light source (wavelength) | Green LED (525 nm) | | | | | | | |
| Power supply voltage | 10 to 30 VDC, ripple (p-p) 10% max. | | | | | | | |
| Control output | Load power supply voltage:30 VDC max.<br>Load current: 100 mA max.<br>(Residual voltage: 1.2 V max.)<br>NPN open collector output type | | | | Load power supply voltage:30 VDC max.<br>Load current: 100 ma max.<br>(Residual voltage: 2 V max.)<br>PNP open collector output type | | | |
| Response time | ON: 50 µs max.<br>OFF: 70 µs max. | | | | | | | |
| Ambient illumination (on receiver lens) | Incandescent lamp:3,000 lx max.<br>Sunlight: 10,000 lx max. | | | | | | | |
| Ambient temperature | Operating: -20 °C to 55 °C / Storage: -30 °C to 70 °C (with no icing) | | | | | | | |
| Vibration resistance*1 | Destruction: 10 to 55 Hz, 1-mm double amplitude or 150 m/s2 for 2 hrs each in X, Y, and Z directions | | | | | | | |
| Shock resistance*2 | Destruction: 500 m/s$^2$, 3 times each in X, Y, and Z directions | | | | | | | |
| Degree of protection | IEC60529 IP67 (with protective cover) | | | | | | | |
| Connection method | Connector | Pre-wired | Connector | Pre-wired | Connector | Pre-wired | Connector | Pre-wired |
| Material | Case: Polybutylene terephthalate<br>Lens: Acrylic (PMMA) | | | | | | | |

*1 The sensor withstands 0.75 mm double amplitude or 100 m/s² if the mounting bracket is attached to the sensor
*2 The sensor withstands 300 m/s² if the mounting bracket is attached to the sensor.

# Groove-type photoelectric sensor for mark detection

The pre-aligned emitter and receiver of this 1 cm groove-type simplifies the installation and reduces the possibility for misalignment for detecting marks on transparent film.

- Green or red LED
- IP65
- Fork opening: 10x35 mm

CE

## Ordering information

| Type | LED | Groove width | Model | |
|---|---|---|---|---|
| | | | NPN output | PNP output |
| Adjustable sensitivity | green | 1 cm | E3S-GS1E4 | E3S-GS1B4 |
| 10-cycle trimmer | red | | E3S-GS1RE4 | E3S-GS1RB4 |
| | green | | E3S-GS1GE4 | E3S-GS1GB4 |

## Specifications

| Item | | | E3S-GS1E4/ E3S-GS1B4 | E3S-GS1RE4A/ E3S-GS1RB4A | E3S-GS1GE4A/ E3S-GS1GB4A |
|---|---|---|---|---|---|
| Power supply voltage | | | 12 to 24 VDC, ripple (p-p): 10% max. | | |
| Current consumption | | | 40 mA max. | | |
| Sensing distance | | | 1 cm | | |
| Standard objects | | | Transparent (2x3 mm) | | |
| Control output | DC solid-state | Load | Models with suffix -E4: 80 mA max.<br>Models with suffix -B4: 100 mA max. | | |
| | | Voltage output | 2 V max. | | |
| Response time (ON, OFF) | | | 1 ms max. | | |
| Sensitivity | | | Adjustable | 10-cycle trimmer | |
| Operation mode | | | Wire-selectable (refer to 'output circuit.') | | |
| Indicators | | | Light indicator (red), stability indicator (green) | | |
| Enclosure rating | | IEC 144 | IP65 | IP65 | |
| | | NEMA | 1, 2, 12 | 1, 2, 12 | |
| Housing material | | | Plastic | | |
| Light source | | | Green LED | Red LED | Green LED |
| Ambient temperature | | | Operating: -25 to 55 °C | | |

## Photoelectric sensor for structured object detection

The special wide beam optics of the E3S-LS3 ensures reliable detection of structured objects (with holes or different heights) and is therefore ideally suited to detect printed circuit boards (PCBs), for example.

- Wide beam for reliable detection of structured and irregular shaped objects

CE

### Ordering information

| Sensor type | Connection method | Detection distance | Timer function | Model | Output |
|---|---|---|---|---|---|
| Limited reflective | Pre-wired (2 m) | 20 to 35 mm (Red light) | No | E3S-LS3N | NPN Light ON |
| | | 10 to 60 mm (Red light) | | E3S-LS3NW | |
| | Pre-wired (2 m) | 20 to 35 mm (Red light) | No | E3S-LS3P | PNP Light ON |
| | | | Yes | E3S-LS3PT | |
| | Pre-wired M8 3-pin connector (0.3 m) | | No | E3S-LS3P-M5J | |
| | | | Yes | E3S-LS3PT-M5J | |
| | Pre-wired M8 4-pin connector (0.3 m) | | No | E3S-LS3P-M3J | |
| | | | Yes | E3S-LS3PT-M3J | |
| | Pre-wired (2 m) | 10 to 60 mm (Red light) | No | E3S-LS3PW | |
| | | | Yes | E3S-LS3PWT | |
| | Pre-wired M8 3-pin connector (0.3 m) | | No | E3S-LS3PW-M5J | |
| | | | Yes | E3S-LS3PWT-M5J | |
| | Pre-wired M8 4-pin connector (0.3 m) | | No | E3S-LS3PW-M3J | |
| | | | Yes | E3S-LS3PWT-M3J | |

### Specifications

| Item | | E3S-LS3□ | E3S-LS3PT | E3S-LS3□W | E3S-LS3PWT |
|---|---|---|---|---|---|
| Sensing | White paper * | 20 to 35 mm | | 10 to 60 mm | |
| | Black paper * | 20 to 30 mm | | 15 to 50 mm | |
| Light source (wave length) | | Red LED (660 nm) | | | |
| Power supply voltage | | 12 to 24 VDC ±10%, ripple (p-p) 10% max. | | | |
| Response time | | 1 ms max. for operation and reset respectively | | | |
| Timer function | | Available with E3S-LS3P(W)T models only. Time range: 0.1 to 1.0 s (adjustable) | | | |
| Ambient temperature | | Operating: -10 to 55 °C (with no icing or condensation)<br>Storage: -25 to 70 °C (with no icing or condensation) | | | |
| Vibration resistance | | 10 to 55 Hz with a 1.5-mm double amplitude for 2 hrs each in X, Y and Z directions | | | |
| Shock resistance | | 500 m/s$^2$, 3 times each in X, Y and Z directions | | | |
| Degree of protection | | IEC60529 IP40 | | | |
| Connection method | | Pre-wired (standard length: 2 m) / Pre-wired M8 connector (standard length: 0.3 m) | | | |
| Material | Case | ABS | | | |
| | Lens | Acrylic | | | |

## High precision LASER sensor

The separate amplifier high-precision photoelectric sensors feature a large variety of different LASER sensing heads for highest precision positioning and application detection.

- Up to 10 µm accuracy
- Easy installation due to adjustable focus point and optical axis
- Wide range sensor head portfolio with different laser beam shapes
- Stable detection of transparent objects such as plastic or glass materials
- Controller functions with easy wiring concept and power tuning function

CE

## Ordering information

### Sensor heads

| Sensing method | Focus | Model number | Remarks |
|---|---|---|---|
| Diffuse reflective | Spot | E3C-LD11 | Mounting a beam unit (sold separately) allows the use of line and area beams. |
| | Line | E3C-LD21 | This model number is for the set consisting of the E39-P11 mounted to the E3C-LD11. |
| | Area | E3C-LD31 | This model number is for the set consisting of the E39-P21 mounted to the E3C-LD11. |
| Coaxial retroreflective | Spot (variable) | E3C-LR11 *1 | Mounting a beam unit (sold separately) allows the use of line and area beams. |
| | Spot (2.0-mm fixed dia.) | E3C-LR12 *1 | --- |

*1 Select a reflector (sold separately) according to the application.

### Amplifier units

| Item | | Functions | pre-wired | | with connector | |
|---|---|---|---|---|---|---|
| | | | NPN output | PNP output | NPN output | PNP output |
| Advanced models | Twin-output models | Area output, self-diagnosis, differential operation | E3C-LDA11 | E3C-LDA41 | E3C-LDA6 | E3C-LDA8 |
| | External-input models | Remote setting, counter, differential operation | E3C-LDA21 | E3C-LDA51 | E3C-LDA7 | E3C-LDA9 |

## Specifications

### Sensor heads

| Item | Diffuse reflective | | | Coaxial retroreflective | | | |
|---|---|---|---|---|---|---|---|
| | E3C-LD11 | E3C-LD21 | E3C-LD31 | E3C-LR11 | E3C-LR11 + E39-P31 | E3C-LR11 + E39-P41 | E3C-LR12 |
| Light source (emission wavelength) | Red semiconductor laser diode (650 nm), 2.5 mW max. (JIS standard: Class 2, FDA standard: Class II) | | | | | | 1 mW max. (JIS standard Class 1) |
| Sensing distance | High-resolution mode: 30 to 1,000 mm<br>Standard mode: 30 to 700 mm<br>Super-high-speed mode: 30 to 250 mm | | | 7 m<br>5 m<br>2 m | 1,700 mm,<br>1,300 mm<br>700 mm | 900 mm<br>700 mm<br>400 mm | 7 m<br>5 m<br>2 m |
| Beam size | 0.8 mm max. (at distances up to 300 mm) | 33 mm (at 150 mm) | 33x15 mm (at 150 mm) | 0.8 mm max. (at distances up to 1,000 mm) | 28 mm (at 150 mm) | 28x16 mm (at 150 mm) | 2.0 mm dia. (at distances up to 1,000 mm) |
| Functions | Variable focal point mechanism (beam size adjustment) , optical axis adjustment mechanism (axis adjustment) | | | | | | |
| Indicators | LDON indicator: Green; Operation indicator: Orange | | | | | | |


# Radial cylindrical M18 photoelectric sensor

Radial (angled) optics for easy mounting, installation and adjustment

- Diffuse reflective and retro-reflective models
- IP67 and IP69k

CE

## Ordering information

| Sensor type | | Appearance | Connection method | Sensing distance | Housing | NPN output | PNP output |
|---|---|---|---|---|---|---|---|
| Retro-reflective*1 | Polarizing (Adjustable sensitivity) |  | Pre-wired | 0.1 - 2 m*2 | Plastic | E3F2-R2RC41-E | E3F2-R2RB41-E |
| | | | | | Brass | E3F2-R2RC41-E | E3F2-R2B41-E |
| | | | M12 connector | | Plastic | E3F2-R2RC41-1-E | E3F2-R2RB41-1-E |
| | | | | | Brass | E3F2-R2RC41-M1-M-E | E3F2-R2RB41-M1-M-E |
| Diffuse reflective | Adjustable sensitivity |  | Pre-wired | 0.3 m | Plastic | E3F2-DS30C41 | E3F2-DS30B41 |
| | | | | | Brass | E3F2-DS30C41-M | E3F2-DS30B41-M |
| | | | M12 connector | | Plastic | E3F2-DS30C41-P1 | E3F2-DS30B41-P1 |
| | | | | | Brass | E3F2-DS30C41-M1-M | E3F2-DS30B41-M1-M |

*1 Retroreflective models incl. reflectors E39-R1 or E39-R1S are also available.
*2 With reflector E39-R1S.

## Specifications

| Item | E3F2-R2R□41-□ | E3F2-DS30□41-□ |
|---|---|---|
| Sensing distance type | Retroreflective | Diffuse reflective |
| | Polarizing, adjustable sensing distance | Adjustable sensing distance |
| Light source (wave length) | Red LED (660 nm) | Infrared LED (880 nm) |
| Power supply voltage | 10 to 30 V DC | |
| Protective circuits | Output short-circuit and power supply reverse polarity | |
| Response time | ≤ 2.5 ms | |
| Ambient temperature | Operating: -25 °C to 55 °C / Storage: -30 °C to 70 °C (with no icing or condensation) | |
| Vibration resistance | 10 to 55 Hz, 1.5 mm double amplitude for 2 hrs each direction (X, Y, Z) | |
| Shock resistance | Destruction: 500 m/s$^2$ each direction (X, Y, Z) | |
| Enclosure ratings | IP67 *1; NEMA 1, 2, 4; IP69k after DIN 40050 part 9 | |
| Connection method | 2 m, 5 m pre-wired cable (PVC, dia. 4 mm (18 / 0.12) *2) or M12-connector | |
| Material | Nickel brass | Nickel brass |
| | Stainless steel | Stainless steel |

*1 The enclosure rating IP67 of OMRON internal standards correspond to stricter test requirements than the standard IEC 60529 (refer to chapter “Precautions”).
*2 For other cable materials (e.g. PUR) please contact your OMRON sales representative.

| Output | | Incremental | | | | |
|---|---|---|---|---|---|---|
| | |  |  |  | |  |
| Model | | E6A2-C | E6B2-C | E6C2-C | E6C3-C | E6F-C |
| Type | | Miniature | Compact | Water resistant | | Rugged housing |
| Resolution range | Min | 10 | | | 100 | |
| | Max | 500 | 2,000 | | 3,600 | 1,000 |
| Output | NPN | ■ | ■ | ■ | ■ | ■ |
| | PNP | | ■ | ■ | | |
| Size | | 25 mm | 40 mm | 50 mm | 50 mm | 60 mm |
| Max force | radial | 10 | 30 | 50 | 80 | 120 |
| | axial | 5 | 20 | 30 | 50 | 50 |
| IP rating | IP50 | ■ | ■ | | | |
| | IP64 | | | ■ | | |
| | IP65 | | | | ■ | ■ |
| Max. rotation frequency | | 5,000 | 6,000 | | 5,000 | |
| Page | | 34 | | 35 | | |

| Output | | Incremental | Absolute | | |
|---|---|---|---|---|---|
| | |  |  |  |  |
| Model | | E6H-C | E6C-N | E6C3-A | E6F-A |
| Type | | Hollow shaft | Multiturn | Water resistant | Rugged housing |
| Resolution Range | Min | 300 | 500 | 6 | 256 |
| | Max | 3,600 | 500 | 1,024 | |
| Output | NPN | ■ | ■ | ■ | ■ |
| | PNP | | | ■ | ■ |
| Size | | 40 mm (hollow) | 50 mm (full and hollow) | 50 mm | 60 mm |
| Max force | radial | 29.4 | 30 | 80 | 120 |
| | axial | 4.9 | 20 | 50 | 50 |
| IP rating | IP50 | ■ | ■ | | |
| | IP64 | | | | |
| | IP65 | | | ■ | ■ |
| Max. rotation frequency | | 10,000 | 1,500 | 5,000 | 5,000 |
| Page | | 36 | | 37 | |

■ Standard

No / not available

## Miniature size rotary encoder

The E6A family of rotary encoders features a small sized dia 25 mm housing.

- Small sized dia 25 mm housing

CE

### Ordering information

| Size in mm | Output phase | Power supply voltage | Output form | Resolution (pulse/rotation) | Model |
|---|---|---|---|---|---|
| Ø 20 | A | 5 to 12 VDC | NPN voltage output | 10, 60, 100, 200, 300, 360, 500 | E6A2-CS3E |
| | | | NPN open collector | 10, 60, 100, 200, 300, 360, 500 | E6A2-CS3C |
| | | 12 to 24VDC | | 10, 60, 100, 200, 300, 360, 500 | E6A2-CS5C |
| | A, B | 5 to 12 VDC | NPN voltage output | 100, 200, 360, 500 | E6A2-CW3E |
| | | | NPN open collector | 100, 200, 360, 500 | E6A2-CW3C |
| | | 12 to 24VDC | | 100, 200, 360, 500 | E6A2-CW5C |
| | A, B, Z | 5 to 12 VDC | NPN voltage output | 100, 200, 360, 500 | E6A2-CWZ3E |
| | | | NPN open collector | 100, 200, 360, 500 | E6A2-CWZ3C |
| | | 12 to 24VDC | | 100, 200, 360, 500 | E6A2-CWZ5C |

# E6B2-C

## Compact size rotary encoder

The E6B family of incremental rotary encoders features a housing size dia 40 mm.

- Line driver output models available

CE

### Ordering information

| Size in mm | Power supply voltage | Output form | Resolution (pulse/rotation) | Model |
|---|---|---|---|---|
| Ø 40 | 5 to 24 VDC | NPN open collector output | 10, 20, 30, 40, 50, 60, 100, 200, 300, 360, 400, 500, 600, 720, 800, 1,000, 1,024, 1,200, 1,500 1,800, 2,000 | E6B2-CWZ6C |
| | 12 to 24VDC | PNP open collector output | 100, 200, 360, 500, 600, 1,000, 2,000 | E6B2-CWZ5B |
| | 5 to 12 VDC | NPN voltage output | 10, 20, 30, 40, 50, 60, 100, 200, 300, 360, 400, 500, 600, 1,000, 1,200, 1,500 1,800, 2,000 | E6B2-CWZ3E |
| | 5 VDC | Line driver output | 10, 20, 30, 40, 50, 60, 100, 200, 300, 360, 400, 500, 600, 1,000, 1,024, 1,200, 1,500 1,800, 2,000 | E6B2-CWZ1X |

## Improved water resistant rotary encoder

The E6C family of dia 50 mm incremental rotary encoders features an improved water resistance compared to standard models.

- IP64f or IP65f drip-proof, oil-proof construction

CE

### Ordering information

| | Size in mm | Power supply voltage | Output form | Resolution (pulse/rotation) | Model |
|---|---|---|---|---|---|
| **Standard models** | Ø 50 | 5 to 24 VDC | NPN open collector output | 10, 20, 30, 40, 50, 60, 100, 200, 300, 360, 400, 500, 600 | E6C2-CWZ6C |
| | | | | 720, 800, 1,000, 1,024, 1,200, 1,500, 1,800, 2,000 | |
| | | 12 to 24VDC | PNP open collector output | 100, 200, 360, 500, 600 | E6C2-CWZ5B |
| | | | | 1,000, 2,000 | |
| | | 5 to 12 VDC | NPN voltage output | 10, 20, 30, 40, 50, 60, 100, 200, 300, 360, 400, 500, 600 | E6C2-CWZ3E |
| | | | | 720, 800, 1,000, 1,024, 1,200, 1,500, 1,800, 2,000 | |
| | | 5 VDC | Line driver output | 10, 20, 30, 40, 50, 60, 100, 200, 300, 360, 400, 500, 600 | E6C2-CWZ1X |
| | | | | 720, 800, 1,000, 1,024, 1,200, 1,500, 1,800, 2,000 | |
| **8 dia. tough model** | | 12 to 24VDC | Complimentary output | 100, 200 | E6C3-CWZ5GH |
| | | | | 300, 360, 500, 600, 720, 800, 1,000, 1,024, 1,200, 1,500, 1,800, 2,000, 2,048, 2,500, 3,600 | |
| | | 5 to 12 VDC | NPN voltage output | 100, 200 | E6C3-CWZ3EH |
| | | | | 300, 360, 500, 600, 720, 800, 1,000, 1,024, 1,200, 1,500, 1,800, 2,000, 2,048, 2,500, 3,600 | |
| | | 5 to 12 VDC | Line driver output | 100, 200 | E6C3-CWZ3XH |
| | | | | 300, 360, 500, 600, 720, 800, 1,000, 1,024, 1,200, 1,500, 1,800, 2,000, 2,048, 2,500, 3,600 | |

# E6F-C

## Rugged housing rotary encoder

The E6F family of dia 60 mm rotary encoders features a rugged housing.

- Strong shaft for max 120 N in radial direction and max 50 N in thrust direction
- Water- and oil-proof structure (IP65f)

CE

### Ordering information

| Size in mm | Supply voltage | Output form | Resolution (pulse/rotation) | Model |
|---|---|---|---|---|
| Ø 60 | 12 to 24VDC | Complimentary output | 100, 200, 360, 500, 600 | E6F-CWZ5G |
| | | | 1000 | |

# E6H-C

## Rotary encoders - Incremental

## Hollow shaft rotary encoder

The E6H family of incremental encoders features a dia 40 mm hollow shaft.

- Wide operating voltage range from 5 to 24 VDC.
- Line drive output available (100 m max.)

CE

### Ordering information

| Size in mm | Supply voltage | Output form | Resolution (pulse/rotation) | Model |
|---|---|---|---|---|
| Ø 40 | 5 to 24 VDC | Open collector output | 300, 360, 500, 600, 720, 800, 1,000, 1,024 | E6H-CWZ6C |
| | | | 1,200, 1,500, 1,800, 2,000, 2,048 | |
| | | | 2,500, 3,600 | |
| | 5 to 12 VDC | Voltage output | 300, 360, 500, 600, 720, 800, 1,000, 1,024 | E6H-CWZ3E |
| | | | 1,200, 1,500, 1,800, 2,000, 2,048 | |
| | | | 2,500, 3,600 | |
| | 5 to 12 VDC | Line drive output | 300, 360, 500, 600, 720, 800, 1,000, 1,024 | E6H-CWZ3X |
| | | | 1,200, 1,500, 1,800, 2,000, 2,048 | |
| | | | 2,500, 3,600 | |

# E6C-N

## Rotary encoders- Absolut

## Multiturn rotary encoder

The E6C-N rotary encoder provides a multiturn function for applications with rotations over 360°.

- Multiturn function

CE

### Ordering information

| Size | Name | Model |
|---|---|---|
| Ø 50 | Shaft model with cable | E6C-NN5C |
| | Hollow-shaft model with cable | E6C-NN5CA |
| | Shaft model with connector | E6C-NN5C-C |
| | Hollow-shaft model with connector | E6C-NN5CA-C |

## Improved water resistant rotary encoder

The E6C family of dia 50 mm incremental rotary encoders features an improved water resistance compared to standard models.

- IP65f drip-proof, oil-proof construction

CE

### Ordering information

| Size in mm | Supply voltage | Output form | Output code | Resolution (pulse/rotation) | Connection method | Model |
|---|---|---|---|---|---|---|
| Ø 50 | 12 to 24VDC | NPN open collector output | Gray code | 256 | Connector type | E6C3-AG5C-C |
| | | | | 256, 360, 720, 1,024 | Pre-wired type | E6C3-AG5C |
| | | | Binary | 32, 40 | | E6C3-AN5C |
| | | | BCD | 6, 8, 12 | | E6C3-AB5C |
| | | PNP open collector output | Gray code | 256, 360, 720, 1,024 | | E6C3-AG5B |
| | | | Binary | 32, 40 | | E6C3-AN5B |
| | | | BCD | 6, 8, 12 | | E6C3-AB5B |
| | 5 VDC | NPN voltage output | Binary | 256 | | E6C3-AN1E |
| | 12 VDC | | | | | E6C3-AN2E |

# E6F-A

## Rugged housing rotary encoder

The E6F family of dia 60 mm rotary encoders features a rugged housing.

- Stronger shaft and higher durability (120 N in radial direction and 50 N in thrust direction) than previous E6F encoders
- Drip-proof construction meets IP64f standards
- High-resolution models (1,024 pulses max. per revolution)
- Faster response for high-speed control applications (grey code: 20 kHz).

### Ordering information

| Size in mm | Supply voltage | Output form | Output code | Resolution (pulses/revolution) | Connection method | Model |
|---|---|---|---|---|---|---|
| Ø 60 | 12 to 24 VDC | NPN open collector | BCD | 360 | Pre-wired | E6F-AB5C |
| | | | | | Connector type | E6F-AB5C-C |
| | | PNP open collector | | | Pre-wired | E6F-AB5B |
| | | | Gray code | 256, 360, 720, 1,024 | Pre-wired | E6F-AG5B |

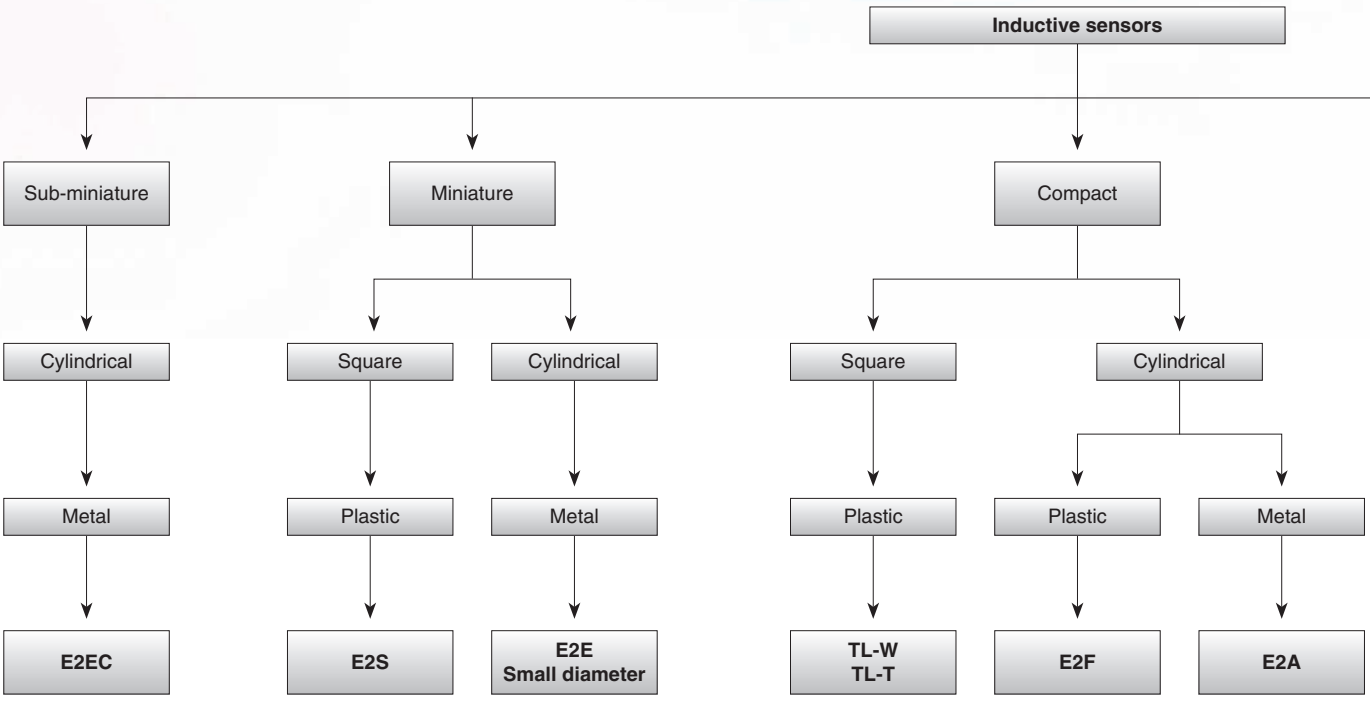
# Inductive sensors

## Reliability and accuracy confirmed by millions... every day

Omron invests heavily in intensive research and new production technologies for inductive sensors. These continuous improvement processes ensure that the most popular cylindrical inductive sensors E2A, E2E and E2F each feature one of the lowest return rates.

**Modular platform – choose the performance you need**

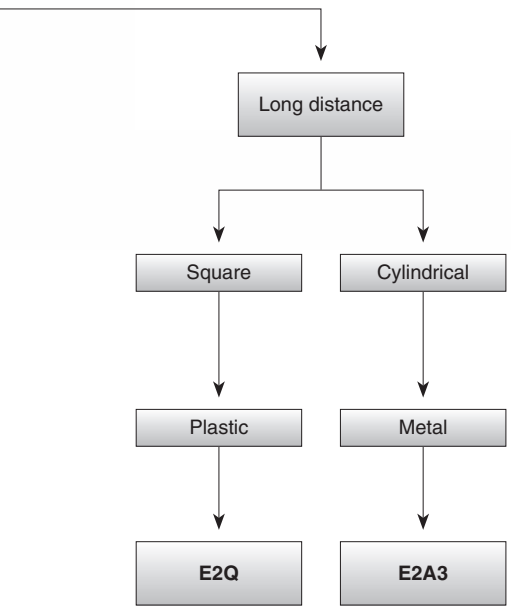
- Highest flexibility for your machine design
- The sensing performance for your application
- The housing design for your machine concept
- The housing material for your operation environment



## Tested reliability for demanding conditions

Omron's sensor design standards exceed legal requirements by far and are based on the application know how of our world wide customers to ensure reliable operation wherever your machines go.

- Highest water resistance
- Highest electromagnetic protection (e.g. from dialing mobile phones)
- Low frequency modulation for metal chip immunity
- Detergent and chemical resistant tested stainless steel and PTFE housings

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# Selection table

| | | | | | | |
|---|---|---|---|---|---|---|
| **Format** | | **Cylindrical** | | | | |
| | |  |  |  |  |  |
| **Model** | | **E2EC** | **E2E small diameter** | **E2A** | **E2F** | **E2A3** |
| **Type** | | **Subminiature** | **Miniature** | **Compact** | | **Long distance** |
| **Material** | | **Brass** | **Brass** | **Brass, SUS** | **Polyarylate** | **Brass** |
| **Max. sensing distance** | **dia 3** | 0.8 mm | | | | |
| | **dia 4** | | 0.8 mm | | | |
| | **M5** | | 1 mm | | | |
| | **dia 5.4** | 1.5 mm | 1 mm | | | |
| | **M8** | | | 4 mm | 1.5 mm | 3 mm |
| | **M12** | 4 mm | | 8 mm | 2 mm | 6 mm |
| | **M18** | | | 16 mm | 5 mm | 11 mm |
| | **M30** | | | 30 mm | 10 mm | 20 mm |
| | **19x6x6** | | | | | |
| | **22x8x6** | | | | | |
| | **26x40x12** | | | | | |
| | **31x18x10** | | | | | |
| | **53x40x23** | | | | | |
| | **67x40x40** | | | | | |
| **Mount.** | **Shielded** | ■ | ■ | ■ | ■ | ■ |
| | **Non-shielded** | | | ■ | | |
| **Oper. mode** | **NO** | ■ | ■ | ■ | ■ | ■ |
| | **NC** | ■ | ■ | ■ | ■ | ■ |
| | **NO + NC** | | | ■ | | |
| **Wiring** | **DC 2-wire** | ■ | | ■ | | |
| | **DC 3-wire** | ■ | ■ | ■ | ■ | ■ |
| | **DC 4-wire** | | | ■ | | |
| | **AC 2-wire** | | | □ | ■ | |
| **Voltage** | **10-30 VDC** | ■ | ■ | ■ | ■ | ■ |
| | **10-60 VDC** | | | | | |
| | **12-240 VAC** | | | □ | ■ | |
| **IP rating** | **IP67** | ■ | ■ | ■ | ■ | ■ |
| | **IP69k** | | | ■ | | ■ |
| | **Page** | 42 | 43 | 44 | 46 | 47 |

**Special models**

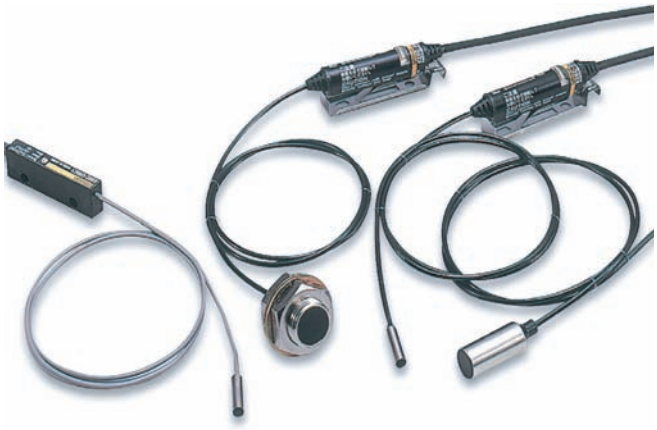
| | | | | | |
|---|---|---|---|---|---|
| **Type** | **AC power supply** | **Vehicle usage certified** | **ATEX 3D certified** | **Oil resistant** | **Increased frequency** |
| |  |  |  |  |  |
| **Model** | **E2□-Y** | **E2AU** | **E2AX** | **E2E** | **E2EL** |
| **Application** | • building installations | • utility vehicles<br>• mobile construction equipment<br>• RCVs (refuse collecting vehicles)<br>• mobile agricultural equipment | • powder handling and packaging<br>• wood cutting/ wood chip handling | • automotive manufacturing lines | • counting<br>• rotation speed control |
| **Key features** | • 24-240 VAC direct switching | • e1 mark<br>• high EMC immunity (additional test up to 100V/m) | • ATEX certification Group II category 3D (94/9/EG Appendix VIII)<br>• typically for explo-sive areas zone 22 with non-leading dust | • tested oil resistance on commonly used lubricants | • up to 5 kHz response (switching) frequency |
| **3 mm** | | | | | |
| **5.4 mm** | | | | | |
| **6.5 mm** | | | | | ■ |
| **M8** | ■ | | | ■ | ■ |
| **M12** | ■ | ■ | ■ | ■ | |
| **M18** | ■ | ■ | ■ | ■ | |
| **M30** | ■ | ■ | ■ | ■ | |
| **Page** | 59 | 53 | 54 | 62 | 57 |

| | | | | | |
|---|---|---|---|---|---|
| Format | | Square | | | |
| | |  |  |  |  |
| Model | | E2S | TL-W | TL-T | E2Q2 / E2Q4 |
| Type | | Miniature | Compact | Compact | Long distance |
| Material | | Polyarylate | ABS | PBT | PBT |
| Max. sensing distance | dia 3 | | | | |
| | dia 4 | | | | |
| | M5 | | | | |
| | dia 5.4 | | | | |
| | M8 | | | | |
| | M12 | | | | |
| | M18 | | | | |
| | M30 | | | | |
| | 19x6x6 | 1.6 mm | | | |
| | 22x8x6 | 2.5 mm | 1.5 mm | | |
| | 26x40x12 | | | 4 mm | |
| | 31x18x10 | | 5 mm | | |
| | 53x40x23 | | 20 mm | | |
| | 67x40x40 | | | | 40 mm |
| Mount. | Shielded | | ■ | ■ | ■ |
| | Non-shielded | ■ | ■ | ■ | ■ |
| Oper. mode | NO | ■ | ■ | ■ | ■ |
| | NC | ■ | ■ | ■ | |
| | NO + NC | | | ■ | ■ |
| Wiring | DC 2-wire | ■ | ■ | | |
| | DC 3-wire | ■ | ■ | ■ | ■ |
| | DC 4-wire | | | ■ | ■ |
| | AC 2-wire | | | | |
| Voltage | 10-30 VDC | ■ | ■ | ■ | |
| | 10-60 VDC | | | | ■ |
| | 12-240 VAC | | | | |
| IP rating | IP67 | ■ | ■ | ■ | ■ |
| | IP69k | | | | |
| | Page | 48 | 49 | 50 | 51 / 52 |

## Special models

| Spatter resistant | Metal chip immune | Anti-microbial housing | Chemical resistant | High precision positioning | SMART inductive sensor |
|---|---|---|---|---|---|
|  |  |  |  |  |  |
| **E2EQ** | **E2EZ** | **E2F-D** | **E2FQ** | **E2C-EDA** | **ZX-E** |
| • welding applications | • metal cutting in machine tool industry | • meat and dairy products processing<br>• pharmaceutical packaging" | • applications with aggressive chemicals (etching, cleaning, water treatment | • precision positioning | • high precision distance measurement |
| • PTFE coating preventing the attachment of spatters | • immune to aluminium and cast iron chips on sensing surface | • anti-microbial housing material inhibiting and reducing bacteria and microbe growth | • PTFE housing | • repeat accuracy 1 µm | • 1 µm measurement resolution |
| | | | | ■ | ■ |
| | | | | ■ | ■ |
| | | | | | |
| | | | | | |
| ■ | ■ | ■ | ■ | | |
| ■ | ■ | ■ | ■ | ■ | ■ |
| ■ | ■ | | ■ | | |
| 58 | 60 | 56 | 61 | 63 | 90 |

■ Standard  □ No / not available



# Sub-miniature sensor for demanding mounting conditions

The E2EC family features the smallest sensor heads for reliable sensing in areas where mounting space is crucial. The miniature sizes of the sensing heads are achieved by separating the sensing part from the amplifier. In contrast to standard separate amplifier models the E2EC family simplifies the installation as the amplifier is built into the cable.

- 3 mm diameter sensing head for the most demanding mounting conditions
- 18 mm long ultra short M12 size housing

CE

## Ordering information

### DC 2-wire

| Size | Shape | Sensing distance | Operating status | |
|---|---|---|---|---|
| | | | NO | NC |
| 3-mm dia. *1 | Shielded | 0.8 mm | E2EC-CR8D1 | E2EC-CR8D2 |
| 5.4-mm dia.*1 | | 1.5 mm | E2EC-C1R5D1 | E2EC-C1R5D2 |
| 8-mm dia. *1 | | 3 mm | E2EC-C3D1 | E2EC-C3D2 |
| M12*1 | | 4 mm | E2EC-X4D1 | E2EC-X4D2 |

*1 A different frequency type is available. (E2EC-□□5; e.g.E2EC-CR8D15)

## Specifications

| Item | | E2EC-CR8D□ | E2EC-C1R5D□ | E2EC-C3D□ | E2EC-X4D□ |
|---|---|---|---|---|---|
| Sensing distance | | 0.8 mm ±15% | 1.5 mm ±10% | 3 mm ±10% | 4 mm ±10% |
| Response frequency | | 1.5 kHz | | 1 kHz | |
| Power supply voltage (Operating voltage) | | 12 to 24 VDC (10 to 30 VDC) ripple (p-p): 10% max. | | | |
| Protective circuit | | Surge absorber, short-circuit protection | | | |
| Ambient temperature | | Operating / Storage: -25 °C to 70 °C (with no icing or condensation) | | | |
| Vibration resistance | | 10 to 55 Hz, 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions | | | |
| Shock resistance | | Destruction: 1,000 $m/s^2$ for 10 times each in X, Y, and Z directions | | | |
| Degree of protection | | IEC60529 IP67 | | | |
| Material | Case | Brass | | | |
| | Sensing surface | ABS | | | |

**Note:** The response frequencies for DC switching are average values measured on condition that the distance between each sensing object is twice as large as the size of the sensing object and the sensing distance set is half of the maximum sensing distance.

# Miniature inductive proximity sensor

The E2E small diameter line with housing sizes dia 4 mm, M5 or dia 5.4 mm is part of the E2E family and is the ideal solution for tight mounting spaces.

- Miniature housing sizes dia 4 mm, M5 or dia 5.4 mm
- IP67

CE

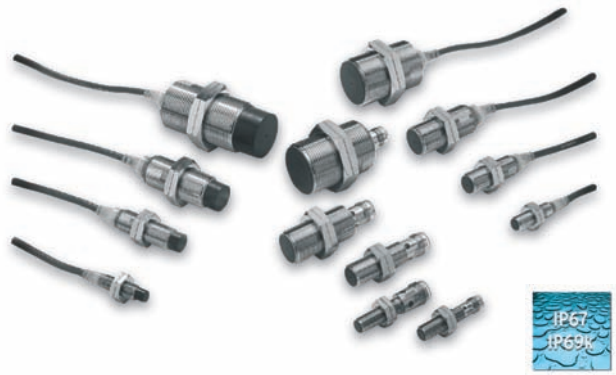
## Ordering information

| Size | Shape | Sensing distance | Connection | Housing material | Output | Operation mode NO | Operation mode NC |
|---|---|---|---|---|---|---|---|
| dia 4 mm | Shielded | 0.8 mm | Pre-wired | brass | PNP | E2E-CR8C1 | E2E-CR8C2 |
| | | | | | NPN | E2E-CR8C1 | E2E-CR8C2 |
| | | | M8 connector | | PNP | E2E-CR8C1-M5 | E2E-CR8C2-M5 |
| | | | | | NPN | E2E-CR8C1-M5 | E2E-CR8C2-M5 |
| M5 | | 1 mm | Pre-wired | | PNP | E2E-X1B1 | E2E-X1B2 |
| | | | | | NPN | E2E-X1C1 | E2E-X1C2 |
| | | | M8 connector | | PNP | E2E-X1B1-M5 | E2E-X1B2-M5 |
| | | | | | NPN | E2E-X1C1-M5 | E2E-X1C2-M5 |
| dia 5.4 mm | | | Pre-wired | | PNP | E2E-C1B1 | E2E-C1B2 |
| | | | | | NPN | E2E-C1C1 | E2E-C1C2 |

## Specifications

| Item | | 4 dia. | M5 | 5.4 dia. |
|---|---|---|---|---|
| | | E2E-CR8C□/B□ | E2E-X1C□/B□ | E2E-C1C□/B□ |
| Sensing distance | | 0.8 mm ±15% | 1 mm ±15% | |
| Response frequency*1 | | 3 kHz | | |
| Power supply voltage (operating voltage) | | 12 to 24 VDC (10 to 30 VDC), ripple (p-p): 10% max. | | |
| Protective circuit | | Power supply reverse polarity protection, surge suppressor | | |
| Ambient temperature | | Operating/Storage: –25 °C to 70 °C (with no icing or condensation) | | |
| Vibration resistance | | 10 to 55 Hz, 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions | | |
| Shock resistance | | 500 m/s$^2$ 10 times each in X, Y, and Z directions | | |
| Degree of protection | | IEC 60529 IP67 | | |
| Material | Case | Stainless steel (SUS303) | Brass-nickel plated | |
| | Sensing surface | Heat-resistant ABS | | |

*1 The response speed is an average value. Measurement conditions are as follows: standard sensing object, a distance of twice the standard sensing object, and a set distance of half the sensing distance.




# Cylindrical inductive sensor in brass and stainless steel housing

The modular E2A family of inductive sensors is designed and tested for extra long life with maximum quality consistency in manufacturing. The modular design provides the basis for an unmatched portfolio flexibility.

- Standard (single) or extended (double) sensing distance
- IP67 and IP69k for highest protection in wet environments
- Continuously high quality level through specialized manufacturing process
- DC 3-wire (NO, NC), DC 4-wire (NO+NC) and DC 2-wire models
- Wide portfolio range through modular concept

## Ordering information

(Exemplary for pre-wired. For connector versions, different cable materials and lengths or special connectors, please refer to complete datasheet.)

| Size | Shape | Sensing distance | Thread length (overall length) | Output configuration | Operation mode NO | Operation mode NC | Operation mode NO + NC |
|---|---|---|---|---|---|---|---|
| M8 | Shielded | 2.0 mm | 27 (40) *1 | PNP *2 | E2A-S08KS02-WP-B1 2M | E2A-S08KS02-WP-B2 2M | |
| | Non-shielded | 4.0 mm | 27 (40) *1 | PNP *2 | E2A-S08KN04-WP-B1 2M | E2A-S08KN04-WP-B2 2M | |
| M12 | Shielded | 4.0 mm | 34 (50) *1 | PNP *2 | E2A-M12KS04-WP-B1 2M | E2A-M12KS04-WP-B2 2M | E2A-M12KS04-WP-B3 2M |
| | Non-shielded | 8.0 mm | 34 (50) *1 | PNP *2 | E2A-M12KN08-WP-B1 2M | E2A-M12KN08-WP-B2 2M | E2A-M12KN08-WP-B3 2M |
| M18 | Shielded | 8.0 mm | 39 (59) *1 | PNP *2 | E2A-M18KS08-WP-B1 2M | E2A-M18KS08-WP-B2 2M | E2A-M18KS08-WP-B3 2M |
| | Non-shielded | 16.0 mm | 39 (59) *1 | PNP *2 | E2A-M18KN16-WP-B1 2M | E2A-M18KN16-WP-B2 2M | E2A-M18KN16-WP-B3 2M |
| M30 | Shielded | 15.0 mm | 44 (64) *1 | PNP *2 | E2A-M30KS15-WP-B1 2M | E2A-M30KS15-WP-B2 2M | E2A-M30KS15-WP-B3 2M |
| | Non-shielded | 20.0 mm | 44 (64) *1 | PNP *2 | E2A-M30KN20-WP-B1 2M | E2A-M30KN20-WP-B2 2M | E2A-M30KN20-WP-B3 2M |

*1 Longer housing models are available.
*2 NPN models are also available.

## Model number legend

(please contact your OMRON representative for all available combinations)

E2A□-□□□□□-□-□□-□□
1 2 3 4 5 6 7 8 9 10 11 12

**Example:** E2A-M12LS04-M1-B1 Standard, M12, long barrel, shielded, Sn=4 mm, M12 connector, PNP-NO
E2A-S08KN04-WP-B1 5M Standard, M8 stainless steel, short barrel, non-shielded, Sn=4 mm, pre-wired PVC cable, PNP-NO, cable length=5 m

**1. Basic name**
E2A

**2. Sensing technology**
Blank: Standard double distance
3: Extended (triple) distance
U: for mobile machines (vehicles)
X: for explosive enviroments

**3. Housing shape and material**
M: Cylindrical, metric threaded, brass
S: Cylindrical, metric threaded, stainless steel

**4. Housing size**
08: 8 mm
12: 12 mm
18: 18 mm
30: 30 mm

**5. Barrel length**
K: Standard length
L: Long body

**6. Shield**
S: Shielded
N: Non-shielded

**7. Sensing distance**
Numeral: Sensing distance: e.g. 02=2 mm, 16=16 mm

**8. Kind of connection**
WP: pre-wired, PVC, dia 4mm (standard)
WS: pre-wired, PVC, dia 6mm
WR: pre-wired, PVC, robotic cable, dia 4mm
WA: pre-wired, PUR/PVC (PUR jacket), dia 4mm
WB: pre-wired, PUR/PVC (PUR jacket), dia 6mm

M1: M12 connector (4 pin) [1]
M3: M8 connector (4 pin)
M5: M8 connector (3 pin)

M1J pre-wired with M12 cable end connector (4 pin)
M3J pre-wired with M8 cable end connector (4 pin)
M5J pre-wired with M8 cable end connector (3 pin)

**9. Power source and output**
B: DC, 3-wire, PNP open collector
C: DC, 3-wire, NPN open collector
D: DC, 2-wire
E: DC, 3-wire, NPN voltage output
F: DC, 3-wire, PNP voltage output

**10. Operation mode**
1: Normally open (NO)
2: Normally closed (NC)
3: Antivalent (NO+NC)

**11. Specials (e.g., cable material, oscillating frequency)**

**12. Cable length**
Blank: Connector type
Numeral: Cable length

1. In case of DC 2-wire models the M12 connector identifier is '-M1G'

## Specifications

| Type | | M8 | M12 | M18 | M30 |
|---|---|---|---|---|---|
| Item | | E2A-S08 | E2A-M12 | E2A-M18 | E2A-M30 |
| Sensing distance | | 2 mm ±10% | 4 mm ±10% | 8 mm±10% | 15 mm±10% |
| Response frequency | | 1,500 Hz | 1,000 Hz | 500 Hz | 250 Hz |
| Power supply voltage (operating voltage) | | 12 to 24 VDC. Ripple (p-p): 10% max. (10 to 32 VDC) | | | |
| Protective circuit | | Power source circuit reverse polarity protection, Surge suppressor, Short-circuit protection | Output reverse polarity protection, Power source circuit reverse polarity protection, Surge suppressor, Short-circuit protection | | |
| Ambient temperature | | Operating: -40 °C to 70 °C, Storage: -40 °C to 85 °C (with no icing or condensation) | | | |
| Vibration resistance | | 10 to 55 Hz, 1.5-mm double amplitude for 2 hours each in X, Y and Z directions | | | |
| Shock resistance | | 500 $m/s^2$, 10 times each in X, Y and Z directions | 1,000 $m/s^2$, 10 times each in X, Y and Z directions | | |
| Standard and listings (Degree of protection) | | IP67 after IEC 60529<br>IP69k after DIN 40050<br>EMC after EN60947-5-2<br>UL (CSA) E196555 | | | |
| Material | Case | Stainless steel | Brass-nickel plated or stainless steel | | |
| | Sensing surface | PBT | | | |

# Cylindrical inductive sensor in compact plastic housing

The general purpose E2F family features a full body plastic housing for high water and light chemical resistance.

- High quality full body plastic housing for high waterproof requirements
- Light chemical resistance

CE

## Ordering information

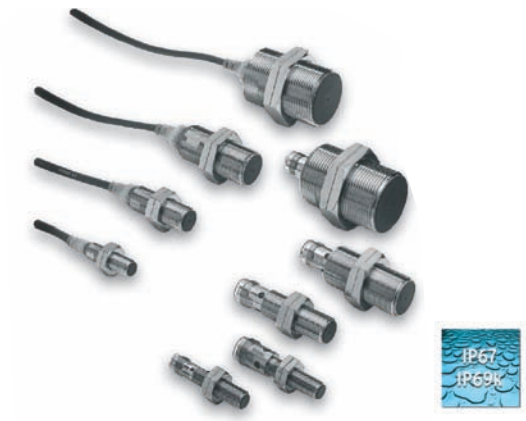
| Size | Shape | Sensing distance | Output specifications | Operating status | |
|---|---|---|---|---|---|
| | | | | NO | NC |
| M8 | Shielded | 1.5 mm | NPN | E2F-X1R5E1 | E2F-X1R5E2 |
| M12 | | 2 mm | NPN | E2F-X2E1*1 | E2F-X2E2*1 |
| M18 | | 5 mm | NPN | E2F-X5E1*1 | E2F-X5E2*1 |
| M30 | | 10 mm | NPN | E2F-X10E1*1 | E2F-X10E2*1 |

*1 A different frequency type is available. (E2F-X□□5; e.g.E2F-X5E15)

## Specifications

| Item | | E2F-X1R5E□ | E2F-X2E□ | E2F-X5E□ | E2F-X10E□ |
|---|---|---|---|---|---|
| Sensing distance | | 1.5 mm ±10% | 2 mm ±10% | 5 mm ±10% | 10 mm ±10% |
| Response frequency*1 | | 2 kHz | 1.5 kHz | 600 Hz | 400 Hz |
| Power supply voltage (operating voltage) | | 12 to 24 VDC (10 to 30 VDC), ripple (p-p): 10% max. | | | |
| Protective circuits | | Reverse connection protection, load short-circuit protection, surge absorber | | | |
| Ambient temperature | | Operating/Storage: -25 °C to 70 °C (with no icing or condensation) | | | |
| Vibration resistance | | 10 to 55 Hz, 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions | | | |
| Shock resistance | | Destruction: 1,000 $m/s^2$ for 10 times each in X, Y, and Z directions | | | |
| Degree of protection | | IEC IP67 | | | |
| Material | Case | Polyarylate | | | |
| | Sensing surface | | | | |

*1 The response frequencies are average values measured on condition that the distance between each sensing object is twice as large as the size of the sensing object and the sensing distance set is half of the maximum sensing distance.




# Long (triple) distance inductive sensor

The E2A3 family features an optimised sensing performance to achieve triple sensing distance for flush mounting requirements. The E2A3 is based on the modular concept of the E2A family.

- Triple distance for demanding sensing requirements and enhanced sensor protection
- IP67 and IP69k

CE

## Ordering information

| Diameter | Thread length | Type | Sensing distance | Connection | Output | Operation mode: NO | Operation mode: NC |
|---|---|---|---|---|---|---|---|
| M8 | 27 (40) mm | Shielded | 3.0mm | Pre-wired | PNP | E2A3-S08KS03-WP-B1 2M | E2A3-S08KS03-WP-B2 2M |
| | | | | | NPN | E2A3-S08KS03-WP-C1 2M | E2A3-S08KS03-WP-C2 2M |
| | 27 (44) mm | | | M12 Connector | PNP | E2A3-S08KS03-M1-B1 | E2A3-S08KS03-M1-B2 |
| | | | | | NPN | E2A3-S08KS03-M1-C1 | E2A3-S08KS03-M1-C2 |
| | 27 (40) mm | | | M8 Connector (3-pin) | PNP | E2A3-S08KS03-M5-B1 | E2A3-S08KS03-M5-B2 |
| | | | | | NPN | E2A3-S08KS03-M5-C1 | E2A3-S08KS03-M5-C2 |
| M12 | 34 (50) mm | Shielded | 6.0 mm | Pre-wired | PNP | E2A3-M12KS06-WP-B1 2M | E2A3-M12KS06-WP-B2 2M |
| | | | | | NPN | E2A3-M12KS06-WP-C1 2M | E2A3-M12KS06-WP-C2 2M |
| | 34 (49) mm | | | M12 Connector | PNP | E2A3-M12KS06-M1-B1 | E2A3-M12KS06-M1-B2 |
| | | | | | NPN | E2A3-M12KS06-M1-C1 | E2A3-M12KS06-M1-C2 |
| M18 | 39 (60) mm | Shielded | 11.0 mm | Pre-wired | PNP | E2A3-M18KS11-WP-B1 2M | E2A3-M18KS11-WP-B2 2M |
| | | | | | NPN | E2A3-M18KS11-WP-C1 2M | E2A3-M18KS11-WP-C2 2M |
| | 39 (54) mm | | | M12 Connector | PNP | E2A3-M18KS11-M1-B1 | E2A3-M18KS11-M1-B2 |
| | | | | | NPN | E2A3-M18KS11-M1-C1 | E2A3-M18KS11-M1-C2 |
| M30 | 44 (65) mm | Shielded | 20.0 mm | Pre-wired | PNP | E2A3-M30KS20-WP-B1 2M | E2A3-M30KS20-WP-B2 2M |
| | | | | | NPN | E2A3-M30KS20-WP-C1 2M | E2A3-M30KS20-WP-C2 2M |
| | 44 (59) mm | | | M12 Connector | PNP | E2A3-M30KS20-M1-B1 | E2A3-M30KS20-M1-B2 |
| | | | | | NPN | E2A3-M30KS20-M1-C1 | E2A3-M30KS20-M1-C2 |

## Specifications

| Item | | M8 | M12 | M18 | M30 |
|---|---|---|---|---|---|
| | | E2A3-S08KS03-□□-B□<br>E2A3-S08KS03-□□-C□ | E2A3-M12KS06-□□-B□<br>E2A3-M12KS06-□□-C□ | E2A3-M18KS11-□□-B□<br>E2A3-M18KS11-□□-C□ | E2A3-M30KS20-□□-B□<br>E2A3-M30KS20-□□-C□ |
| Sensing distance | | 3 mm ±10% | 6 mm ±10% | 11 mm ±10% | 20 mm ±10% |
| Response frequency *1 | | 700 Hz | 350 Hz | 250 Hz | 80 Hz |
| Power supply voltage (operating voltage) | | 12 to 24 VDC. Ripple (p-p): 10% max. (10 to 32 VDC) | | | |
| Protection circuit | | Power source circuit reverse polarity protection, Surge suppressor, Short-circuit protection | Output reverse polarity protection, Power source circuit reverse polarity protection, Surge suppressor, Short-circuit protection | | |
| Ambient temperature | | Operating: -25 °C to 70 °C, Storage: -25 °C to 70 °C | | | |
| Vibration resistance | | 10 to 55 Hz, 1.5 mm double amplitude for 2 hours each in X, Y, and Z directions | | | |
| Shock resistance | | 500 $m/s^2$, 10 times each in X, Y, and Z directions | 1,000 $m/s^2$, 10 times each in X, Y and Z directions | | |
| Standards and listings | | IP67 after IEC 60529<br>IP69K after DIN 40050<br>EMC after EN60947-5-2<br>UL (CSA) E196555 *2 | | | |
| Material | Case | Stainless steel*3 | Brass-nickel plated | | |
| | Sensing surface | PBT | | | |

*1 The response frequency is an average value. Measurement conditions are as follows: standard sensing object, a distance of twice the standard sensing object length between sensing objects, and a set distance of half the sensing distance.
*2 UL (CSA) [E196555]: Use class 2 circuit only.
*3 Material specifications for stainless steel housing case: 1.4305 (W.-No.), SUS303 (AISI), 2346 (SS).

# Miniature square inductive sensor

The E2S family features miniature block style plastic housings for demanding mounting conditions.

- Miniature housing with long sensing ranges
- Front and side facing sensing surfaces
- Simple mounting with one screw
- IP67

CE

## Ordering information

### DC 2-wire models

| Sensing surface | Shape | Size in mm (HxWxD) | Sensing distance | Operating status | |
|---|---|---|---|---|---|
| | | | | NO | NC |
| Front face | Unshielded | 19x6x6 | 1.6 mm | E2S-W11 | E2S-W12 |
| End face | | | | E2S-Q11 | E2S-Q12 |
| Front face | | 23x8x8 | 2.5 mm | E2S-W21 | E2S-W22 |
| End face | | | | E2S-Q21 | E2S-Q22 |

### DC 3-wire models

| Sensing surface | Shape | Size in mm (HxWxD) | Sensing distance | Output specifications | Operating status | |
|---|---|---|---|---|---|---|
| | | | | | NO | NC |
| Front face | Unshielded | 19x6x6 | 1.6 mm | NPN | E2S-W13 | E2S-W14 |
| End face | | | | | E2S-Q13 | E2S-Q14 |
| Front face | | 27x8x8 | 2.5 mm | | E2S-W23 | E2S-W24 |
| End face | | | | | E2S-Q23 | E2S-Q24 |
| Front face | | 19x6x6 | 1.6 mm | PNP | E2S-W15 | E2S-W16 |
| End face | | | | | E2S-Q15 | E2S-Q16 |
| Front face | | 23x8x8 | 2.5 mm | | E2S-W25 | E2S-W26 |
| End face | | | | | E2S-Q25 | E2S-Q26 |

## Specifications

### DC 2-wire models

| Item | E2S-W11 E2S-W12 | E2S-Q11 E2S-Q12 | E2S-W21 E2S-W22 | E2S-Q21 E2S-Q22 |
|---|---|---|---|---|
| Sensing surface | Front face | End face | Front face | End face |
| Sensing distance | 1.6 mm ±10% | | 2.5 mm ±15% | |
| Response frequency | 1 kHz min. | | | |
| Rated supply voltage (operating voltage) | 12 to 24 VDC (10 to 30 VDC), ripple (p-p): 10% max. | | | |
| Operating status (with sensing object approaching) | □□1 models: NO<br>□□2 models: NC | | | |

### DC 3-wire models

| Item | E2S-W13 E2S-W14 | E2S-Q13 E2S-Q14 | E2S-W23 E2S-W24 | E2S-Q23 E2S-Q24 | E2S-W15 E2S-W16 | E2S-Q15 E2S-Q16 | E2S-W25 E2S-W26 | E2S-Q25 E2S-Q26 |
|---|---|---|---|---|---|---|---|---|
| Sensing surface | Front face | End face | Front face | End face | Front face | End face | Front face | End face |
| Sensing distance | 1.6 mm ±10% | | 2.5 mm ±15% | | 1.6 mm ±10% | | 2.5 mm ±15% | |
| Response frequency | 1 kHz min. | | | | | | | |
| Rated supply voltage (operating voltage) | 12 to 24 VDC (10 to 30 VDC), ripple (p-p): 10% max. | | | | | | | |
| Protective circuit | Reverse polarity connection and surge absorber | | | | | | | |
| Ambient temperature | Operating: -25 °C to 70 °C, Storage: -40 °C to 85 °C (with no icing or condensation) | | | | | | | |
| Vibration resistance | 10 to 55 Hz, 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions | | | | | | | |
| Shock resistance | Destruction: 500 m/s2 for 3 times each in X, Y, and Z directions | | | | | | | |
| Degree of protection | IEC60529 IP67 | | | | | | | |
| Material Case | Polyarylate | | | | | | | |

# Compact square (flat shape) inductive sensor

The TL-W family offers a wide range of block style inductive sensors featuring different housing sizes for all standard applications.

- Front and side facing surface
- IP67
- DC 2-wire and DC 3-wire models

CE

## Ordering information

### DC 2-wire models

| Shape | Sensing distance | Output and operating status | |
|---|---|---|---|
| | | NO | NC |
| Non-Shielded | 5 mm | TL-W5MD1*1 | TL-W5MD2*1 |

*1 Models with different response frequency are available. These model numbers take the form TL-W5MD□5 (e.g., TL-W5MD15)

### DC 3-wire models

| Shape | Size in mm (HxWxD) | Sensing distance | Output specifications | Output and operating status | | | |
|---|---|---|---|---|---|---|---|
| | | | | PNP-NO | PNP-NC | NPN-NO | NPN-NC |
| Non-Shielded | 25x8x5 | 1.5 mm | DC 3-wire | TL-W1R5MB1 | --- | TL-W1R5MC1*1 | --- |
| | 22x8x6 | 3 mm | | TL-W3MB1 | TL-W3MB2 | TL-W3MC1*1 | TL-W3MC2 |
| | 31x18x10 | 5 mm | | TL-W5MB1 | TL-W5MB2 | TL-W5MC1*1 | TL-W5MC2 |
| | 53x40x23 | 20 mm | | --- | --- | TL-W20ME1*1 | TL-W20ME2*1 |
| Shielded | 31x18x10 | 5 mm | DC 3-wire | TL-W5F1 | TL-W5F2 | TL-W5E1 | TL-W5E2 |

*1 Models with different response frequency are available. These model numbers take the form TL-W5MD□5 (e.g., TL-W5MD15)

## Specifications

| Item | | TL-W5MD□ | TL-W1R5M□1 | TL-W3M□□ | TL-W5M□□ | TL-W5E□/F□ | TL-W20ME□ |
|---|---|---|---|---|---|---|---|
| Sensing distance | | 5 mm ±10% | 1.5 mm ±10% | 3 mm ±10% | 5 mm ±10% | | 20 mm ±10% |
| Response frequency | | 0.5 kHz | 1 kHz min. | 600 Hz min. | 500 Hz min. | 300 Hz min. | 40 Hz min. |
| Power supply voltage (operating voltage) | | 12 to 24 VDC (10 to 30 VDC) ripple (p-p): 10% max. | | | | 10 to 30 VDC with a ripple (p-p) of 20% max. | 12 to 24 VDC (10 to 30 VDC) ripple (p-p): 10% max. |
| Ambient temperature | | Operating/Storage: -25 °C to 70 °C (with no icing or condensation) | | | | | |
| Vibration resistance | | 10 to 55 Hz, 1.5 mm double amplitude for 2 hours each in X, Y, and Z directions | | | | | |
| Shock resistance | | Destruction: 500 m/s$^2$ for 3 times each in X, Y, and Z directions | | | | | Destruction: 500 m/s2 for 10 times each in X, Y, and Z directions |
| Degree of protection | | IEC60529 IP67 | | | | | |
| Material | Case | Heat-resistant ABS resin | | | | Diecast aluminum | Heat-resistant ABS resin |
| | Sensing surface | Heat-resistant ABS resin | | | | | |

# Compact square (thin shape) inductive sensor

The TL-T features a 12 mm thin housing for space saving direct wall mounting.

- 12 mm thin housing
- Direct side wall mounting for bracket-less installation

CE

## Ordering information

### DC 3-wire models

| Mounting | Sensing distance | Connection | Output configuration | Operation status mode NO | Operation status mode NC |
|---|---|---|---|---|---|
| Shielded | 2.0 mm | Pre-wired | NPN | TL-T2E1-E | TL-T2E2-E |
| | | | PNP | TL-T2F1-E | TL-T2F2-E |
| | | M8 connector (3-pin) | NPN | TL-T2E1-M5-E | TL-T2E2-M5-E |
| | | | PNP | TL-T2F1-M5-E | TL-T2F2-M5-E |
| Non-shielded | 4.0 mm | Pre-wired | NPN | TL-T4ME1-E | TL-T4ME2-E |
| | | | PNP | TL-T4MF1-E | TL-T4MF2-E |
| | | M8 connector (3-pin) | NPN | TL-T4ME1-M5-E | TL-T4ME2-M5-E |
| | | | PNP | TL-T4MF1-M5-E | TL-T4MF2-M5-E |

### DC 4-wire models (NO + NC)

| Mounting | Sensing distance | Connection | Output configuration | Operation status mode antivalent (NO + NC) |
|---|---|---|---|---|
| Shielded | 2.0 mm | Pre-wired | NPN | TL-T2E3-E |
| | | | PNP | TL-T2F3-E |
| Non-shielded | 4.0 mm | Pre-wired | NPN | TL-T4ME3-E |
| | | | PNP | TL-T4MF3-E |

## Specifications

| Item | | Shielded | Non-shielded |
|---|---|---|---|
| | | TL-T2 | TL-T4 |
| Sensing distance | | 2 mm ±10% | 4 mm ±10% |
| Response frequency *1 | | 3000 Hz | 1500 Hz |
| Power supply voltage (operating voltage) | | 24 VDC. Ripple (p-p): 10% max. (10 to 35 VDC) | |
| Protective circuit | | Output reverse polarity protection, power source circuit reverse polarity protection, surge suppressor, short-circuit protection | |
| Ambient temperature | | Operating/Storage: -25 °C to 70 °C | |
| Vibration resistance | | 0 to 55 Hz with 30 min. dwell time at resonance frequency or 55 Hz each in X, Y, and Z directions<br>55 to 2000 Hz, 150 $m/s^2$, double amplitude for 2 hours each in X, Y, and Z directions | |
| Shock resistance | | 300 $m/s^2$ 6 times each in X, Y, and Z directions | |
| Degree of protection | | in accordance with IEC 60529:<br>Pre-wired models: IP67<br>M8 Connector models: IP65 | |
| Material | Case | PBT | |
| | Cable | PVC | |
| Size in mm | | 26Hx40Wx12D | |

*1 The response frequency is an average value. Measurement conditions are as follows: standard target, a distance of twice the standard target distance between targets, and a setting distance of half the sensing distance.

# Long distance square inductive sensor

The E2Q family of long distance sensors features two housing styles. The compact sized E2Q4 with M12 connector and the E2Q2 with the same housing dimensions as standard type electromechanical limit switches and terminal connection for simple wiring connections.

- Sensing distance of up to 40 mm
- Active face direction changeable
- 10 to 60 VDC supply voltage
- Optionally weld-field-immune or AC voltage models

## Ordering information

| Shape | Sensing distance | Connection | Active face | Output | | |
|---|---|---|---|---|---|---|
| | | | | | NO | NO + NC |
| Shielded | 20 mm | Terminals | Changeable | NPN | E2Q2-N20E1-H | E2Q2-N20E3-□ |
| | | | | PNP | E2Q2-N20F1-H | E2Q2-N20F3-□ |
| Non-shielded | 30 mm | | | NPN | | E2Q2-N30ME3-□ |
| | | | | PNP | | E2Q2-N30MF3-□ |
| Non-shielded | 40 mm | | | NPN | | E2Q2-N40ME3-□ |
| | | | | PNP | | E2Q2-N40MF3-□ |

## Specifications

| Item | | Shielded | Non-shielded | |
|---|---|---|---|---|
| | | E2Q2-N20□□-□ | E2Q2-N30□□-□ | E2Q2-N40□□-□ |
| Sensing distance | | 20 mm ±10% | 30 mm ±10% | 40 mm ±10% |
| Response frequency | | 150 Hz | 100 Hz | 30 Hz |
| Power supply voltage (operating voltage) | | 10 to 60 VDC | | |
| Protective circuit | | Reverse polarity, output short circuit | | |
| Ambient temperature | | Operating: -25 °C to 70 °C | | |
| Vibration resistance | | 10 to 55 Hz, 1 mm amplitude according IEC 60068-2-6 | | |
| Shock resistance | | Approx. 30 G for 11 ms according to IEC 60068-2-27 | | |
| Degree of protection | | IEC 60529 IP 67 | | |
| Material | Case terminal base | PBT<br>Al<br>PBT (...-H type) | | |
| | Sensing face | PBT | | |
| Size in mm | | 118Hx40Wx40D | | |

# Long distance square inductive proximity sensor

- Compact size for long distance requirements
- M12 Plug-in connection
- Active face positioning: Y-axis 15°, X-axis 90° increments

## Ordering information

| Shape | Sensing distance | Connection | Active face | Operating status | | |
|---|---|---|---|---|---|---|
| | | | | | NO | NO + NC |
| Shielded | 20 mm | Plug-in connector | Changable | NPN | E2Q4-N20E1-M1 | E2Q4-N20E3-M1 |
| | | | | PNP | E2Q4-N20F1-M1 | E2Q4-N20F3-M1 |
| Non-shielded | 30 mm | | | NPN | E2Q4-N30ME1-M1 | E2Q4-N30ME3-M1 |
| | | | | PNP | E2Q4-N30MF1-M1 | E2Q4-N30MF3-M1 |
| Non-shielded | 40 mm | | | NPN | | E2Q4-N40ME3-M1 |
| | | | | PNP | | E2Q4-N40MF3-M1 |

## Specifications

| Item | | Shielded | Non-shielded | |
|---|---|---|---|---|
| | | E2Q4-N20□□-M1 | E2Q4-N30M□□-M1 | E2Q4-N40M□3-M1 |
| Sensing distance $S_n$ | | 20 mm ± 10% | 30 mm ± 10% | 40 mm ± 10% |
| Switching frequency | | 150 Hz | | |
| Power supply voltage (operating voltage | | 10 to 30 VDC | | |
| Protective circuit | | Reverse polarity, output short circuit | | |
| Ambient temperature | | Operating: -25 °C to 70 °C | | |
| Vibration resistance | | 10 to 55 Hz, 1 mm amplitude according IEC 60068-2-6 | | |
| Shock resistance | | Approx. 30 G for 11 ms according to IEC 60068-2-27 | | |
| Degree of protection | | IEC 60529 IP 67 | | |
| Material | Case | PBT | | |
| | Sensing face | PBT | | |
| Size in mm | | 67Hx40Wx40D | | |


# Cylindrical inductive sensor for mobile usage

Designed and tested to keep your machines moving.

- IP69k tested and certified for highest water resistance
- e1 type approval (according to automotive directive 95/54/EC)
- EMC noise tested up to 100 V/m (ISO 11452-2)
- Cable breakage protection

CE

## Ordering information

| Size | Length | Type | Sensing distance | Connection | Output configuration | Operation mode NO |
|---|---|---|---|---|---|---|
| M12 | 34 (50) | Shielded | 4.0 mm | Pre-wired | PNP | E2AU-M12KS04-WP-B1 2M |
| | 56 (72) | | | | PNP | E2AU-M12LS04-WP-B1 2M |
| | 34 (48) | | | M12 connector | PNP | E2AU-M12KS04-M1-B1 |
| | 56 (70) | | | | PNP | E2AU-M12LS04-M1-B1 |
| M18 | 39 (59) | Shielded | 8.0 mm | Pre-wired | PNP | E2AU-M18KS08-WP-B1 2M |
| | 61 (81) | | | | PNP | E2AU-M18LS08-WP-B1 2M |
| | 39 (53) | | | M12 connector | PNP | E2AU-M18KS08-M1-B1 |
| | 61 (75) | | | | PNP | E2AU-M18LS08-M1-B1 |
| M30 | 44 (64) | Shielded | 15.0 mm | Pre-wired | PNP | E2AU-M30KS15-WP-B1 2M |
| | 66 (86) | | | | PNP | E2AU-M30LS15-WP-B1 2M |
| | 44 (58) | | | M12 connector | PNP | E2AU-M30KS15-M1-B1 |
| | 66 (80) | | | | PNP | E2AU-M30LS15-M1-B1 |

## Specifications

| Item | | M12 | M18 | M30 |
|---|---|---|---|---|
| | | E2AU-M12□S04-□□-B1 | E2AU-M18□S08-□□-B1 | E2AU-M30□S15-□□-B1 |
| Sensing distance | | 4 mm ±10% | 8 mm ±10% | 15 mm ±10% |
| Response frequency*1 | | 1,000 Hz | 500 Hz | 250 Hz |
| Power supply voltage (operating voltage) | | 12 to 24 VDC. Ripple (p-p): 10% max.(10 to 32 VDC) | | |
| Protective circuit | | Output reverse polarity protection, power source circuit reverse polarity protection, surge suppressor, short-circuit protection | | |
| Ambient temperature | | Operating: -40 °C to 70 °C, Storage: -40 °C to 85 °C (with no icing or condensation) | | |
| Vibration resistance | | 10 to 55 Hz, 1.5 mm double amplitude for 2 hours each in X, Y and Z directions | | |
| Shock resistance | | 1,000 m/s$^2$, 10 times each in X, Y and Z directions | | |
| Degree of protection | | IP67 after IEC 60529<br>IP69k after DIN 40050 | | |
| Standard and listings | | EMC after EN60947-5-2<br>UL (CSA) E196555 *2<br>EMC after 95/94/EC<br>EMC after ISO11452-2 | | |
| Material | Case | Brass-nickel plated | | |
| | Sensing surface | PBT | | |

*1 The response frequency is an average value. Measurement conditions are as follows: standard target, a distance of twice the standard target distance between targets, and a setting distance of half the sensing distance.
*2 UL (CSA) [E196555]: Use class 2 circuit only.

## Cylindrical inductive sensor for explosive environments

The high-reliability and robustness of the E2A family is now also available for explosive environments. The protective structure of the E2A family (based on EN50014 and EN50281-1-1/2) allows the ATEX certification group II category 3D (94/9/EC appendix VIII) typically for explosive areas zone 22 with non-leading dust.

- Protective connector cover to avoid disconnection under power
- Certified ATEX group II category 3D (94/9/EC appendix VIII)
- Rugged housing construction based on EN50014 and EN50281-1-1/2

CE

### Ordering information

**DC 3-wire models (NO + NC: DC 4-wire) *1**

| Size | | Sensing distance | Connection | Body material | Thread length (overall length) | Output configuration | Operation mode NO | Operation mode NC | Operation mode NO + NC |
|---|---|---|---|---|---|---|---|---|---|
| M12 | Shielded | 4.0 mm | M12 connector | Brass*2 | 34 (48) | PNP | E2AX-M12KS04-M1-B1 | E2AX-M12KS04-M1-B2 | E2AX-M12KS04-M1-B3 |
| | | | | | | NPN | E2AX-M12KS04-M1-C1 | E2AX-M12KS04-M1-C2 | E2AX-M12KS04-M1-C3 |
| | | | | | 56 (70) | PNP | E2AX-M12LS04-M1-B1 | E2AX-M12LS04-M1-B2 | E2AX-M12LS04-M1-B3 |
| | | | | | | NPN | E2AX-M12LS04-M1-C1 | E2AX-M12LS04-M1-C2 | E2AX-M12LS04-M1-C3 |
| | Non-shielded | 8.0 mm | M12 connector | Brass*2 | 34 (48) | PNP | E2AX-M12KN08-M1-B1 | E2AX-M12KN08-M1-B2 | E2AX-M12KN08-M1-B3 |
| | | | | | | NPN | E2AX-M12KN08-M1-C1 | E2AX-M12KN08-M1-C2 | E2AX-M12KS08-M1-C3 |
| | | | | | 56 (70) | PNP | E2AX-M12LN08-M1-B1 | E2AX-M12LN08-M1-B2 | E2AX-M12LS08-M1-B3 |
| | | | | | | NPN | E2AX-M12LN08-M1-C1 | E2AX-M12LN08-M1-C2 | E2AX-M12LS08-M1-C3 |
| M18 | Shielded | 8.0 mm | M12 connector | Brass*2 | 39 (53) | PNP | E2AX-M18KS08-M1-B1 | E2AX-M18KS08-M1-B2 | E2AX-M18KS08-M1-B3 |
| | | | | | | NPN | E2AX-M18KS08-M1-C1 | E2AX-M18KS08-M1-C2 | E2AX-M18KS08-M1-C3 |
| | | | | | 61 (75) | PNP | E2AX-M18LS08-M1-B1 | E2AX-M18LS08-M1-B2 | E2AX-M18LS08-M1-B3 |
| | | | | | | NPN | E2AX-M18LS08-M1-C1 | E2AX-M18LS08-M1-C2 | E2AX-M18LS08-M1-C3 |
| | Non-shielded | 16.0 mm | M12 connector | Brass*2 | 39 (53) | PNP | E2AX-M18KN16-M1-B1 | E2AX-M18KN16-M1-B2 | E2AX-M18KN16-M1-B3 |
| | | | | | | NPN | E2AX-M18KN16-M1-C1 | E2AX-M18KN16-M1-C2 | E2AX-M18KS16-M1-C3 |
| | | | | | 61 (75) | PNP | E2AX-M18LN16-M1-B1 | E2AX-M18LN16-M1-B2 | E2AX-M18LS16-M1-B3 |
| | | | | | | NPN | E2AX-M18LN16-M1-C1 | E2AX-M18LN16-M1-C2 | E2AX-M18LS16-M1-C3 |
| M30 | Shielded | 15.0 mm | M12 connector | Brass*2 | 44 (58) | PNP | E2AX-M30KS15-M1-B1 | E2AX-M30KS15-M1-B2 | E2AX-M30KS15-M1-B3 |
| | | | | | | NPN | E2AX-M30KS15-M1-C1 | E2AX-M30KS15-M1-C2 | E2AX-M30KS15-M1-C3 |
| | | | | | 66 (80) | PNP | E2AX-M30LS15-M1-B1 | E2AX-M30LS15-M1-B2 | E2AX-M30LS15-M1-B3 |
| | | | | | | NPN | E2AX-M30LS15-M1-C1 | E2AX-M30LS15-M1-C2 | E2AX-M30LS15-M1-C3 |
| | Non-shielded | 20.0 mm | M12 connector | Brass*2 | 44 (58) *3 | PNP | E2AX-M30KN20-M1-B1 | E2AX-M30KN20-M1-B2 | E2AX-M30KN20-M1-B3 |
| | | | | | | NPN | E2AX-M30KN20-M1-C1 | E2AX-M30KN20-M1-C2 | E2AX-M30KN20-M1-C3 |
| | | 30.0 mm | | | 66 (80) | PNP | E2AX-M30LN30-M1-B1 | E2AX-M30LN30-M1-B2 | E2AX-M30LN30-M1-B3 |
| | | | | | | NPN | E2AX-M30LN30-M1-C1 | E2AX-M30LN30-M1-C2 | E2AX-M30LN30-M1-C3 |

*1 Please contact your OMRON representative for DC 2-wire models.
*2 Stainless steel models are also available. Please contact your OMRON representative.
*3 M30 non-shielded models with double sensing distance and short barrels cannot be mounted due to the necessary separation distance from the surrounding metal. Standard sensing models are thus available.

## Specifications

| Size | | M12 | | M18 | | M30 | | |
|---|---|---|---|---|---|---|---|---|
| Type | | Shielded | Non-shielded | Shielded | Non-shielded | Shielded | Non-shielded | Non-shielded |
| Item | | E2AX-M12 □S04-□□-B□<br>E2AX-M12 □S04-□□-C□<br>E2AX-S12 □S04-□□-B□<br>E2AX-S12 □S04-□□-C□ | E2AX-M12 □N08-□□-B□<br>E2AX-M12 □N08-□□-C□<br>E2AX-S12 □N08-□□-B□<br>E2AX-S12 □N08-□□-C□ | E2AX-M18 □S08-M1-B□<br>E2AX-M18 □S08-M1-C□<br>E2AX-S18 □S08-M1-B□<br>E2AX-S18 □S08-M1-C□ | E2AX-M18 □N16-M1-B□<br>E2AX-M18 □N16-M1-C□<br>E2AX-S18 □N16-M1-B□<br>E2AX-S18 □N16-M1-C□ | E2AX-M30 □S15-M1-B□<br>E2AX-M30 □S15-M1-C□<br>E2AX-S30 □S15-M1-B□<br>E2AX-S30 □S15-M1-C□ | E2AX-M30 KN20-M1-B□<br>E2AX-M30 KN20-M1-C□<br>E2AX-S30 KN20-M1-B□<br>E2AX-S30 KN20-M1-C□ | E2AX-M30 LN30-M1-B□<br>E2AX-M30 LN30-M1-C□<br>E2AX-S30 LN30-M1-B□<br>E2AX-S30 LN30-M1-C□ |
| Sensing distance | | 4 mm ±10% | 8 mm ±10% | 8 mm ±10% | 16 mm ±10% | 15 mm ±10% | 20 mm ±10% | 30 mm ±10% |
| Response frequency *1 | | 1,000 Hz | 800 Hz | 500 Hz | 400 Hz | 250 Hz | 100 Hz | 100 Hz |
| Power supply voltage (operating voltage range) | | 12 to 24 VDC. Ripple (p-p): 10% max.<br>(10 to 32 VDC) | | | | | | |
| Protection circuit | | Output reverse polarity protection, power source circuit reverse polarity protection, surge suppressor, short-circuit protection | | | | | | |
| Ambient air temperature | | Operating: -40 °C to 70 °C, Storage: -40 °C to 85 °C (with no icing or condensation) | | | | | | |
| Vibration resistance | | 10 to 55 Hz, 1.5 mm double amplitude for 2 hours each in X, Y and Z directions | | | | | | |
| Shock resistance | | 1,000 $m/s^2$, 10 times each in X, Y and Z directions | | | | | | |
| Standard and listings | | IP65<br>EMC after EN60947-5-2<br>UL (CSA) E196555 *2<br>ATEX after EN50014<br>EN50281-1-1/2 | | | | | | |
| Material | Case | Brass-nickel plated or stainless steel | | | | | | |
| | Sensing surface | PBT | | | | | | |
| | Clamping nut | Brass-nickel plated for brass models stainless steel for steel models | | | | | | |

*1 The response frequency is an average value. Measurement conditions are as follows: standard target, a distance of twice the standard target distance between targets, and a setting distance of half the sensing distance.

*2 UL (CSA) [E196555]: Use class 2 circuit only


# Anti-microbial inductive sensor in cylindrical plastic housing

The E2F-D features a FDA approved anti-microbial housing reducing the risk of food contamination.

- Anti-microbial housing material reducing bacteria growth
- IP67 and IP69k for highest water resistance
- Tested detergent resistance

CE

## Ordering information

| Size | Shape | Sensing distance | Output specifications | Operating status | |
|---|---|---|---|---|---|
| | | | | NO | NC |
| M12 | non-shielded | 4 mm | NPN | E2F-DX4E1 | E2F-DX4E2 |
| | | | PNP | E2F-DX4F1 | E2F-DX4F2 |
| M18 | | 8 mm | NPN | E2F-DX8E1 | E2F-DX8E2 |
| | | | PNP | E2F-DX8F1 | E2F-DX8F2 |

## Specifications

| Item | E2F-DX4□ | E2F-DX8□ |
|---|---|---|
| Sensing distance | 4 mm ±10% | 8 mm ±10% |
| Response frequency | 1 kHz | 500 Hz |
| Power supply voltage | 10 to 35 VDC | |
| Ambient temperature | Operating/Storage: -25 °C to 70 °C (with no icing or condensation) | |
| Vibration resistance | 10 to 55 Hz, 1.5 mm double amplitude for 2 hours each in X, Y, and Z directions | |
| Degree of protection | IP67, IP69k | |
| Material | PBT with anti-microbial SAN additive based on silver ions | |

# Increased switching frequency inductive sensor

The E2EL family features an increased response frequency for high-speed applications such as counting applications.

- Max 5 kHz, switching frequency
- M8 or dia 6.5 mm housing
- Brass or stainless steel housing

CE

## Ordering information

Exemplary for pre-wired types. Please refer to complete datasheet for connector versions.

**Brass housing**

| Size | Length | Shape | Sensing distance | Operating status | | | |
|---|---|---|---|---|---|---|---|
| | | | | NPN / NO | NPN / NC | PNP / NO | PNP / NC |
| Ø 6,5 | 30 mm | Shielded | 1,5 mm | E2EL-C1R5E1 2M | E2EL-C1R5E2 2M | E2EL-C1R5F1 2M | E2EL-C1R5F2 2M |
| | 32 mm | Non-shielded | 2,0 mm | E2EL-C2ME1 2M | E2EL-C2ME2 2M | E2EL-C2MF1 2M | E2EL-C2MF2 2M |
| | 45 mm | Shielded | 1,5 mm | E2EL-C1R5E1-L 2M | E2EL-C1R5E2-L 2M | E2EL-C1R5F1-L 2M | E2EL-C1R5F2-L 2M |
| | 47 mm | Non-shielded | 2,0 mm | E2EL-C2ME1-L 2M | E2EL-C2ME2-L 2M | E2EL-C2MF1-L 2M | E2EL-C2MF2-L 2M |
| M8 | 30 mm | Shielded | 1,5 mm | E2EL-X1R5E1 2M | E2EL-X1R5E2 2M | E2EL-X1R5F1 2M | E2EL-X1R5F2 2M |
| | 32 mm | Non-shielded | 2,0 mm | E2EL-X2ME1 2M | E2EL-X2ME2 2M | E2EL-X2MF1 2M | E2EL-X2MF2 2M |
| | 45 mm | Shielded | 1,5 mm | E2EL-X1R5E1-L 2M | E2EL-X1R5E2-L 2M | E2EL-X1R5F1-L 2M | E2EL-X1R5F2-L 2M |
| | 47 mm | Non-shielded | 2,0 mm | E2EL-X2ME1-L 2M | E2EL-X2ME2-L 2M | E2EL-X2MF1-L 2M | E2EL-X2MF2-L 2M |

**Stainless steel housing**

| Size | Length | Mounting | Sensing distance | Operating status | | | |
|---|---|---|---|---|---|---|---|
| | | | | NPN / NO | NPN / NC | PNP / NO | PNP / NC |
| Ø 6,5 | 30 mm | Shielded | 2,0 mm | E2EL-C2E1-DS 2M | E2EL-C2E2-DS 2M | E2EL-C2F1-DS 2M | E2EL-C2F2-DS 2M |
| | 45 mm | Shielded | 2,0 mm | E2EL-C2E1-DSL 2M | E2EL-C2E2-DSL 2M | E2EL-C2F1-DSL 2M | E2EL-C2F2-DSL 2M |
| M8 | 30 mm | Shielded | 2,0 mm | E2EL-X2E1-DS 2M | E2EL-X2E2-DS 2M | E2EL-X2F1-DS 2M | E2EL-X2F2-DS 2M |
| | 45 mm | Shielded | 2,0 mm | E2EL-X2E1-DSL 2M | E2EL-X2E2-DSL 2M | E2EL-X2F1-DSL 2M | E2EL-X2F2-DSL 2M |

## Specifications

| Type | | Ø 6,5 | | M8 | |
|---|---|---|---|---|---|
| Response frequency | | 5,0 kHz | | | |
| Power supply voltage (operating voltage) | | 24 VDC | | | |
| Protective circuit | | Reverse polarity, output short-circuit | | | |
| Operating voltage | | 10 to 35 VDC | | | |
| Mounting | | Shielded | Non-shielded | Shielded | Non-shielded |
| Operating distance | | 1,5 mm | 2,0 mm | 1,5 mm | 2,0 mm |
| Ambient temperature | | Operating: -25 °C to 70 °C | | | |
| Vibration resistance | | Destruction: 10 to 70 Hz, 1,5 mm double amplitude for 1 hour each in X, Y and Z directions | | | |
| Shock resistance | | Destruction: 300 m/s² (approx. 30 G) for 6 times each in X, Y and Z directions | | | |
| Enclosure rating | | IP 67 (EN 60947-1) | | | |
| Material | Case | Brass, stainless steel 1.4305/AIS/303 | | | |
| | Sensing face | PBT | | | |

## Spatter resistant inductive sensors

The E2EQ family features a PTFE coated brass housing preventing the attachment of sputters in welding applications.

- PTFE coated brass housing
- DC 2-wire models

CE

### Ordering information

| Size | Shape | Sensing distance | Output specifications | Operating status | Model |
|---|---|---|---|---|---|
| M12 | Shielded | 4 mm | DC 2-wire | NO | E2EQ-X4X1 |
| M18 | | 8 mm | | | E2EQ-X8X1 |
| M30 | | 15 mm | | | E2EQ-X15X1 |

### Specifications

| Item | | E2EQ-X4X1<br>E2EQ-X4X1-M1J | E2EQ-X8X1<br>E2EQ-X8X1-M1J | E2EQ-X15X1<br>E2EQ-X15X1-M1J |
|---|---|---|---|---|
| Sensing distance | | 4 mm ±10% | 8 mm ±10% | 15 mm ±10% |
| Response frequency*1 | | 1 kHz | 0.5 kHz | 0.25 kHz |
| Power supply voltage (operating voltage) | | 12 - 24 VDC (10 to 30 VDC), ripple (p-p) 10% max. | | |
| Protective circuits | | Surge absorber, load short-circuit protection | | |
| Ambient temperature | | Operating: -25 °C to 70 °C, Storage: -40 °C to 85 °C (with no icing or condensation) | | |
| Shock resistance | | Destruction: 1,000 $m/s^2$ for 10 times each in X, Y, and Z directions | | |
| Degree of protection | | IP67 (IEC 60529) | | |
| Material | Case | Teflon resin coating (brass base) | | |
| | Sensing surface | PTFE resin | | |

*1 The response frequencies for DC switching are average values.

# Inductive sensor line for AC power supply

The E2E-□Y and E2F-□Y models offer the same functionality and protection as the standard E2E (brass housing) and E2F (plastic housing) families but can be connected to an AC power supply.

- 24-240 VAC direct switching
- IP67
- Brass or plastic housing

CE

## Ordering information

### AC 2-wire / Pre-wired models

| Size | | Sensing distance | Operation mode | Metal housing | | Plastic housing |
|---|---|---|---|---|---|---|
| | | | | Pre-wired | Connector | Pre-wired |
| Shielded | M8 | 1.5 mm | NO | E2E-X1R5Y1 | | E2F-X1R5Y1 |
| | | | NC | E2E-X1R5Y2 | | E2F-X1R5Y2 |
| | M12 | 2 mm | NO | E2E-X2Y1 | E2E-X2Y1-M1 | E2F-X2Y1 |
| | | | NC | E2E-X2Y2 | E2E-X2Y2-M1 | E2F-X2Y2 |
| | M18 | 5 mm | NO | E2E-X5Y1 | E2E-X5Y1-M1 | E2F-X5Y1 |
| | | | NC | E2E-X5Y2 | E2E-X5Y2-M1 | E2F-X5Y2 |
| | M30 | 10 mm | NO | E2E-X10Y1 | E2E-X10Y1-M1 | E2F-X10Y1 |
| | | | NC | E2E-X10Y2 | E2E-X10Y2-M1 | E2F-X10Y2 |
| Unshielded | M8 | 2 mm | NO | E2E-X2MY1 | | |
| | | | NC | E2E-X2MY2 | | |
| | M12 | 5 mm | NO | E2E-X5MY1 | E2E-X5MY1-M1 | |
| | | | NC | E2E-X5MY2 | E2E-X5MY2-M1 | |
| | M18 | 10 mm | NO | E2E-X10MY1 | E2E-X10MY1-M1 | |
| | | | NC | E2E-X10MY2 | E2E-X10MY2-M1 | |
| | M30 | 18 mm | NO | E2E-X18MY1 | E2E-X18MY1-M1 | |
| | | | NC | E2E-X18MY2 | E2E-X18MY2-M1 | |

## Specifications (exemplary)

### Metal housing (E2E)

| Size | | M8 | | M12 | | M18 | | M30 | |
|---|---|---|---|---|---|---|---|---|---|
| Type | | Shielded | Unshielded | Shielded | Unshielded | Shielded | Unshielded | Shielded | Unshielded |
| Item | | E2E-X1R5Y□ | E2E-X2MY□ | E2E-X2Y□ | E2E-X5MY□ | E2E-X5Y□ | E2E-X10MY□ | E2E-X10Y□ | E2E-X18MY□ |
| Sensing distance | | 1.5 mm ±10% | 2 mm ±10% | 2 mm ±10% | 5 mm ±10% | 5 mm ±10% | 10 mm ±10% | 10 mm ±10% | 18 mm ±10% |
| Response speed | | 25 Hz | | | | | | | |
| Power supply voltage (operating voltage range) *1 | | 24 to 240 VAC, 50/60 Hz (20 to 264 VAC) | | | | | | | |
| Operation mode (with sensing object approaching) | | Y1 Models: NO<br>Y2 Models: NC<br>For details, refer to *Timing charts*. | | | | | | | |
| Ambient temperature *1 *2 | | Operating/Storage: -25 °C to 70 °C (with no icing or condensation) | | Operating/Storage: -40 °C to 85 °C (with no icing or condensation) | | | | | |
| Vibration resistance | | 10 to 55 Hz, 1.5 mm double amplitude for 2 hours each in X, Y, and Z directions | | | | | | | |
| Shock resistance | | 500 m/s$^2$ 10 times each in X, Y, and Z directions | | 1,000 m/s$^2$ 10 times each in X, Y, and Z directions | | | | | |
| Degree of protection | | IEC 60529 IP67 (Pre-wired models: JEM standard IP67g (waterproof, oil-proof)) | | | | | | | |
| Connection method | | Pre-wired models (standard length 2 m), connector models | | | | | | | |
| Material | Case | Stainless steel (SUS303) | | Brass-nickel plated | | | | | |
| | Sensing surface | PBT (polybutylene terephthalate) | | | | | | | |
| | Clamping nuts | Brass-nickel plated | | | | | | | |
| | Toothed washer | Iron-zinc plated | | | | | | | |

*1 When supplying 24 VAC to any of the above models, make sure that the operating ambient temperature range is over –25 °C.
*2 When using an M18- or M30-sized E2E within an ambient temperature of 70 °C to 85 °C, make sure that the E2E has a control output of 5 to 200 mA max.

# Aluminium and cast iron chip immune inductive sensor

The E2EZ family features a specialized sensing method providing reliable metal object detection even when covered with small chips of Aluminium or cast iron (e.g. in metal cutting applications).

- Aluminium and Cast Iron chip immune
- DC 2-wire or DC 3-wire

CE

## Ordering information

| Size | Shape | Sensing distance | Output specifications | Operating status | |
|---|---|---|---|---|---|
| | | | | NO | NC |
| M12 | Shielded | 2 mm | DC 2-wire | E2EZ-X2D1-N | E2EZ-X2D2-N |
| M18 | | 4 mm | DC 3-wire NPN | E2EZ-X4C1 | --- |
| | | | DC 2-wire | E2EZ-X4D1-N | E2EZ-X4D2-N |
| M30 | | 6 mm | DC 3-wire NPN | E2EZ-X8C1 | --- |
| | | | DC 2-wire | E2EZ-X8D1-N | E2EZ-X8D2-N |

## Specifications

| Item | | E2EZ-X4C1 | E2EZ-X8C1 | E2EZ-X2 | E2EZ-X4D□-N<br>E2EZ-X4D□-M1J<br>E2EZ-X4D□-M1GJ | E2EZ-X8D□-N<br>E2EZ-X8D□-M1J<br>E2EZ-X8D□-M1GJ |
|---|---|---|---|---|---|---|
| Sensing distance | | 4 mm ±10% | 8 mm ±10% | 2 mm ±10% | 4 mm ±10% | 8 mm ±10% |
| Response frequency*1 | | 12 Hz | 8 Hz | 200 Hz | 100 Hz | 30 Hz |
| Power supply voltage (operating voltage) | | C models: 12 to 24 VDC, ripple (p-p) : 10% max., (10 to 30 VDC) | | 12 to 24 VDC (10 to 30 VDC) ripple (p-p): 10% max. | | |
| Protective circuits | | C models: Reverse connection protection, load short-circuit protection, surge absorber | | Surge absorber, short-circuit protection | | |
| Ambient temperature | | Operating / Storage: 0 °C to 50 °C (with no icing or condensation) | | | | |
| Vibration resistance | | 10 to 55 Hz, 1.5 mm double amplitude for 2 hours each in X, Y, and Z directions | | | | |
| Shock resistance | | Destruction: 1,000 $m/s^2$ for 10 times each in X, Y, and Z directions | | | | |
| Degree of protection | | IEC60529 IP67 | | | | |
| Material | Case | Brass<br>Sensing face: Heat-resistant ABS resin | | | | |
| | Screw | Brass<br>Mounting nut: Steel | | | | |

*1 The response frequencies for DC switching are average values measured on condition that the distance between each sensing object is twice as large as the size of the sensing object and the sensing distance set is half of the maximum sensing distance.

## Chemical resistant inductive sensor

The E2FQ features a full-body PTFE housing for chemical resistance (e.g. cleaning agents used in the food industry or semiconductor industry).

- Full body PTFE housing for chemical resistance
- DC 2-wire

CE

### Ordering information

| Size | Shape | Sensing distance | DC 3-wire models | | DC 2-wire models |
|---|---|---|---|---|---|
| | | | PNP (NO) | NPN (NO) | NO |
| M12 | Shielded | 2 mm | E2FQ-X2F1 | E2FQ-X2E1 | E2FQ-X2D1 |
| M18 | | 5 mm | E2FQ-X5F1 | E2FQ-X5E1 | E2FQ-X5D1 |
| M30 | | 10 mm | E2FQ-X10F1 | E2FQ-X10E1 | E2FQ-X10D1 |

### Specifications

| Item | E2FQ-X2□ | E2FQ-X5□ | E2FQ-X10□ |
|---|---|---|---|
| Sensing distance | 2 mm ±10% | 5 mm ±10% | 10 mm ±10% |
| Response frequency*1 | E1, F1 models: 1.5 kHz<br>D1 models: 800 Hz | E1, F1 models: 600 Hz,<br>D1 models: 500 Hz | E1, F1 models: 400 Hz,<br>D1 models: 300 Hz |
| Power supply voltage (Operating voltage) | E1, F1 models: 12 to 24 VDC, ripple (p-p) : 10% max., (10 to 30 VDC)<br>D1 models: 12 to 24 VDC, ripple (p-p) : 20% max., (10 to 36 VDC) | | |
| Protective circuit | E1, F1 models: Protection for reverse polarity, load short circuit, surge voltage | | |
| Ambient temperature | Operating/Storage: -25 °C to 70 °C (with no icing or condensation) | | |
| Vibration resistance | Destruction: 10 to 55 Hz, 1.5 mm double amplitude for 2 hours each in X, Y, and Z directions | | |
| Shock resistance | Destruction: 500 $m/s^2$ for 10 times each in X, Y, and Z directions | Destruction: 1,000 $m/s^2$ for 10 times each in X, Y, and Z directions | |
| Degree of protection | IEC60529 IP67 | | |
| Material | PTFE | | |

*1 The response frequencies for DC switching are average values measured on condition that the distance between each sensing object is twice as large as the size of the sensing object and the sensing distance set is half of the maximum sensing distance.

## Oil resistant inductive sensor family

The standard E2E family offers tested oil resistance on commonly used oils in the automotive industry for reliable long-life operation in automotive assembly lines.

- DC 3-wire and DC 2-wire models
- M8, M12, M18 and M30 standard sizes
- IP67g (water and oil resistance)

CE

### Ordering information

| Size | | Sensing distance | Self-diagnostic output function | Model | |
|---|---|---|---|---|---|
| | | | | NO | NC |
| M12 | Shielded | 3 mm | Yes | E2E-X3D1S*1 | --- |
| M18 | | 7 mm | | E2E-X7D1S *1 | --- |
| M30 | | 10 mm | | E2E-X10D1S *1 | --- |
| M12 | Unshielded | 8 mm | | E2E-X8MD1S *1 | --- |
| M18 | | 14 mm | | E2E-X14MD1S *1 | --- |
| M30 | | 20 mm | | E2E-X20MD1S *1 | --- |
| M8 | Shielded | 2 mm | No | E2E-X2D1-N *2 *3 | E2E-X2D2-N *3 |
| M12 | | 3 mm | | E2E-X3D1-N *1 *2 *3 | E2E-X3D2-N *3 |
| M18 | | 7 mm | | E2E-X7D1-N *1 *2 *3 | E2E-X7D2-N *3 |
| M30 | | 10 mm | | E2E-X10D1-N *1 *2 *3 | E2E-X10D2-N |
| M8 | Unshielded | 4 mm | | E2E-X4MD1 *2 *3 | E2E-X4MD2 |
| M12 | | 8 mm | | E2E-X8MD1 *1 *2 *3 | E2E-X8MD2 |
| M18 | | 14 mm | | E2E-X14MD1 *1 *2 *3 | E2E-X14MD2 |
| M30 | | 20 mm | | E2E-X20MD1 *1 *2 *3 | E2E-X20MD2 |

*1 In addition to the above models, E2E-X□□15 models (e.g., E2E-X3D15-N), which are different in frequency from the above models, are available.
*2 E2E models with a robotics cable are available as well. The model number of a model with a robotics cable has the suffix '-R' (e.g., E2E-X3D1-R).
*3 Cables with a length of 5 m are also available. Specify the cable length at the end of the model number (e.g., E2E-X3D1-N 5M).

### Specifications

| Item | | M8 | | M12 | | M18 | | M30 | |
|---|---|---|---|---|---|---|---|---|---|
| | | E2E-X2D□ | E2E-X4MD□ | E2E-X3D□ | E2E-X8MD□ | E2E-X7D□ | E2E-X14MD□ | E2E-X10D□ | E2E-X20MD□ |
| Sensing distance | | 2 mm ±10% | 4 mm ±10% | 3 mm ±10% | 8 mm ±10% | 7 mm ±10% | 14 mm ±10% | 10 mm ±10% | 20 mm ±10% |
| Response frequency *1 | | 1.5 kHz | 1.0 kHz | 1.0 kHz | 0.8 kHz | 0.5 kHz | 0.4 kHz | 0.4 kHz | 0.1 kHz |
| Power supply voltage (operating voltage) | | 12 to 24 VDC (10 to 30 VDC), ripple (p-p): 10% max. | | | | | | | |
| Protective circuit | | Surge suppressor, output load short-circuit protection (for control and diagnostic output) | | | | | | | |
| Ambient temperature | | Operating: -25 °C to 70 °C, Storage: -40 °C to 85 °C (with no icing or condensation) | | | | | | | |
| Vibration resistance | | 10 to 55 Hz, 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions | | | | | | | |
| Shock resistance | | 500 m/s$^2$ 10 times each in X, Y, and Z directions | | 1,000 m/s$^2$ 10 times each in X, Y, and Z directions | | | | | |
| Degree of protection | | IEC 60529 IP67 (Pre-wired models, pre-wired connector models: JEM standard IP67g (waterproof and oil-proof)) | | | | | | | |
| Material | Case | Stainless steel (SUS303) | | Brass-nickel plated | | | | | |
| | Sensing surface | PBT (polybutylene terephthalate) | | | | | | | |

*1 The response speed is an average value. Measurement conditions are as follows: standard sensing object, a distance of twice the standard sensing object, and a set distance of half the sensing distance.

# High precision positioning inductive proximity sensor

The separate amplifier inductive sensor family E2C-EDA offers high precision distance positioning and detection. The teach-in function allows simple installation, and with the window function (2 outputs) production tolerance checks can easily be set up and modified.

- 1 µm repeat accuracy
- Precision distance teaching
- Window function (2 outputs) for production tolerance checks

CE

## Ordering information

### Sensor heads

| Type | Appearance | Size in mm (HxWxD) | Sensing distance | Repeat accuracy | Model |
|---|---|---|---|---|---|
| Shielded | Cylindrical  | 3 dia.×18 | 0.6 mm | 1 µm | E2C-EDR6-F |
| | | 5.4 dia.×18 | 1 mm | 1 µm | E2C-ED01-□ |
| | | 8 dia.×22 | 2 mm | 2 µm | E2C-ED02-□ |
| | Screw  | M10×22 | 2 mm | 2 µm | E2C-EM02-□ |
| | Flat  | 30×14×4.8 | 5 mm | 2 µm | E2C-EV05-□ |
| Unshielded | Screw  | M18×46.3 | 7 mm | 5 µm | E2C-EM07M-□ |
| Heat-resistant | Screw  | M12×22 | 2 mm | 2 µm | E2C-EM02H |

### Amplifier units with cables

| Item | Functions | NPN output | PNP output |
|---|---|---|---|
| Twin-output models | Area output, open circuit detection, differential operation | E2C-EDA11 | E2C-EDA41 |
| External-input models | Remote setting, differential operation | E2C-EDA21 | E2C-EDA51 |

### Amplifier units with connectors

| Item | Functions | NPN output | PNP output |
|---|---|---|---|
| Twin-output models | Area output, open circuit detection, differential operation | E2C-EDA6 | E2C-EDA8 |
| External-input models | Remote setting, differential operation | E2C-EDA7 | E2C-EDA9 |

## Specifications

### Sensor heads

| Item | | | E2C-EDR6-F | E2C-ED01(-□) | E2C-ED02(-□) | E2C-EM02-□) | E2C-EM07(-□) | E2C-EV05(-□) | E2C-EM02H |
|---|---|---|---|---|---|---|---|---|---|
| | | | 3 dia.×18 mm | 5.4 dia.×18 mm | 8 dia.×22 mm | M10×22 mm | M18×46.3 mm | 30×14×4.8 mm | M12×22 mm |
| Sensing distance | | | 0.6 mm | 1 mm | 2 mm | | 7 mm | 5 mm | 2 mm |
| Ambient temperature *1 | | | | | | | | | |
| | operating | | -10 °C to 60 °C (with no icing or condensation) | | | | | | -10 °C to 200 °C *2 |
| | storage | | -10 °C to 60 °C (with no icing or condensation) | -20 °C to 70 °C (with no icing or condensation) | | | | | |
| Vibration resistance | | | Destruction: 10 to 55 Hz, 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions | | | | | | |
| Shock resistance | | | Destruction: 500 m/s$^2$ for 3 times each in X, Y, and Z directions | | | | | | |
| Degree of protection | | | IEC60529 IP67 | | | | | | IEC60529 IP60 *3 |
| Material | | | | | | | | | |
| | Sensor Head | Case | Brass | Stainless steel | Brass | | | Zinc | Brass |
| | | Sensing surface | Heat-resistant ABS | | | | | | PEEK |

*1 A sudden temperature rise even within the rated temperature range may degrade characteristics.
*2 For the Sensor Head only without the preamplifier ( 10 to 60° C). With no icing or condensation.
*3 Do not operate in areas exposed to water vapor because the enclosure is not waterproof.

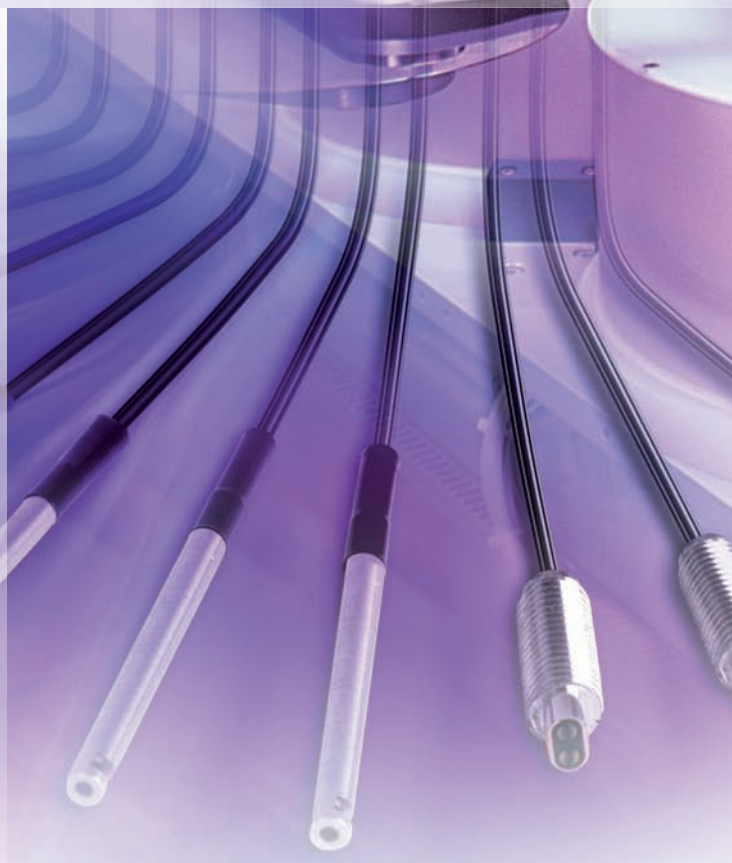
# Fibre optic amplifiers

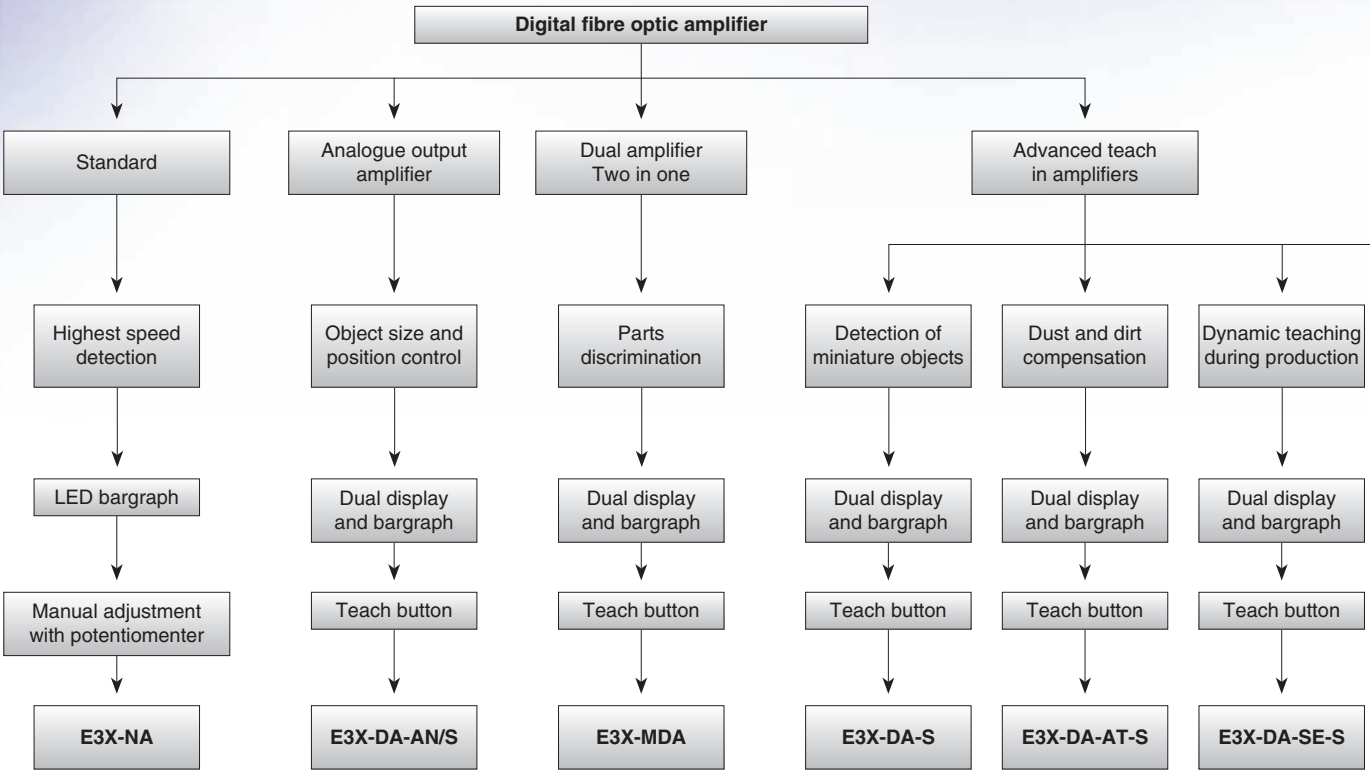
## E3X-DA-S – the new best-in-class fibre optic amplifiers

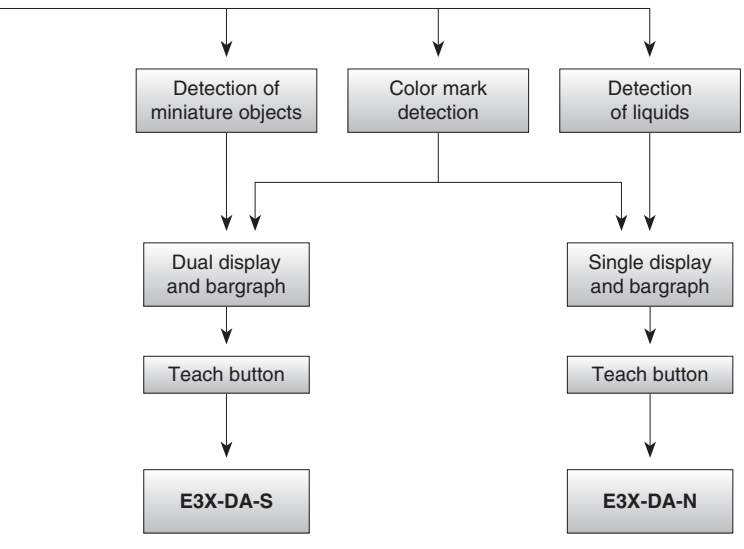
### The best solution package for powerful digital amplifiers and fibre sensors

The E3X-DA-S fibre amplifier platform is representing the best combination in terms of functionality and cost efficiency. Unique features like powertuning or Active Threshold Control guarantee best sensing performance and highest reliability. Easy one button teaching allows sensor setup within seconds. In case of tiny installation conditions, the E3X-MDA double channel amplifier is not only helping you to save space, but also costs – buy 1 get 2!

- Powertuning for best sensing performance
- Wiring cost saving
- Long-term operating stability by APC, 4 Element LED or Active Threshold Control
- User-friendly operation and easy set up
- Longer sensing distances
- Comprehensive fibre optic portfolio
- European manufacturing know-how and production





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# Selection table

| Category | | Basic line - cost effective | Industrial line - manual adjustor | High end - one for all | High end - 2 in 1 |
|---|---|---|---|---|---|
| | |  |  |  |  |
| Model | | E3X-DA-N | E3X-NA | E3X-DA-S | E3X-MDA |
| Sensing adjustment | Teach button | ■ | | ■ | ■ |
| | Manual adjustment | | ■ | | |
| Special features | Power tuning | | | ■ | ■ |
| | Auto power control APC | ■ | | ■ | ■ |
| | Active threshold ATC | | | | |
| Network connectivity | Communication | | | | |
| | Module E3X-DRT21 | ■ | | | |
| | Communication | | | | |
| | Module E3X-DRT21-S | | | ■ | ■ |
| Communication with mobile console | | E3X-MC11 / -SV2 | | E3X-MC11 / -SV2 | E3X-MC11 / -SV2 |
| Display | Digital single (S) / dual (D) display | S | | D | D |
| | LED bargraph | □ | ■ | □ | □ |
| Light sources types | Red LED | ■ | ■ | ■ | ■ |
| | Green LED | ■ | ■ | ■ | |
| | Blue LED | ■ | | ■ | |
| | Infrared | ■ | | | |
| Voltage range | | 12 VDC - 24 VDC | 12 VDC - 24 VDC | 12 VDC - 24 VDC | 12 VDC - 24 VDC |
| Power consumption | (at 24 VDC, without load) | <40 mA | <35 mA | <45 mA | <45 mA |
| Control output / input | PNP | ■ | ■ | ■ | ■ |
| | NPN | ■ | ■ | ■ | ■ |
| | Twin output | ■ | | ■ | ■ / 2 Chn. |
| | Alarm / error output | | | | |
| | Analogue output | | | | |
| | Monitor output 1 V - 5 V | ■ | | | |
| | Remote input | | | ■ | |
| Mode selection | Dark on / Light on | ■ | ■ / switch | ■ | ■ |
| Response time (min.) | | 250 µs | 20 µs | 48 µs | 130 µs |
| Connection | Cable type (prewired) | ■ | ■ | ■ | ■ |
| | Connector type | ■ | ■ | ■ | ■ |
| Enclosure rating | | IP50 / IP66 | IP50 / IP60 | IP50 | IP50 |
| Ambient temperature | | -25 °C - 55 °C | -25 °C - 55 °C | -25 °C - 55 °C | -25 °C - 55 °C |
| Housing material | Case | PBT | PBT | PBT | PBT |
| | Cover | PC / PES | PC / PES | PC | PC |
| ROHS conformity | | □ (in prep.) | □ (in prep.) | □ (in prep.) | □ (in prep.) |
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| Category | | High end - teach and go | High end - active threshold | High end - analogue output |
|---|---|---|---|---|
| | |  |  |  |
| Model | | E3X-DA-SE-S | E3X-DA-AT-S | E3X-DA-AN-S |
| Sensing adjustment | Teach button | ■ | ■ | ■ |
| | Manual adjustment | | | |
| Special features | Power tuning | ■ | ■ | ■ |
| | Auto power control APC | ■ | ■ | ■ |
| | Active threshold ATC | | ■ | |
| Network connectivity | Communication | | | |
| | Module E3X-DRT21 | | | |
| | Communication | | | |
| | Module E3X-DRT21-S | □ | □ | □ |
| Communication with mobile console | | E3X-MC11 / -SV2 | E3X-MC11 / -SV2 | |
| Display | Digital single (S) / dual (D) display | D | D | D |
| | LED bargraph | □ | □ | □ |
| Light sources types | Red LED | ■ | ■ | ■ |
| | Green LED | | | |
| | Blue LED | | | |
| | Infrared | | | |
| Voltage range | | 12 VDC - 24 VDC | 12 VDC - 24 VDC | 12 VDC - 24 VDC |
| Power consumption | (at 24 VDC, without load) | <40 mA | <45 mA | <45 mA |
| Control output / input | PNP | ■ | ■ | ■ Control output |
| | NPN | ■ | ■ | ■ Control output |
| | Twin output | | | ■ |
| | Alarm / error output | | ■ Error output | |
| | Analogue output | | ■ | ■ Analogue Output |
| | Monitor output 1 V - 5 V | | | |
| | Remote input | | | |
| Mode selection | Dark on / Light on | ■ | ■ | |
| Response time (min.) | | 1 ms | 80 µs | 80 µs |
| Connection | Cable type (prewired) | ■ | ■ | ■ |
| | Connector type | ■ | ■ | |
| Enclosure rating | | IP50 | IP50 | IP50 |
| Ambient temperature | | -25 °C - 55 °C | -25 °C - 55 °C | -25 °C - 55 °C |
| Housing material | Case | PBT | PBT | PBT |
| | Cover | PC | PC | PC |
| ROHS conformity | | □ (in prep.) | □ (in prep.) | □ (in prep.) |
| Page | | 79 | 80 | 81 |

■ Standard □ Available No / not available

# Selection table

| | General purpose | | | | | |
|---|---|---|---|---|---|---|
| **Category** | **Standard** | **Long distance** | | | | |
| **Type name** | E32-DC200<br>E32-TC200 | E32-D16 | E32-D11L<br>E32-T11L | E32-D22L<br>E32-T22L | E32-D12R<br>E32-T12R | E32-ED11R<br>E32-ET11R |
| **Ambient operating temperature** | -40 °C - 70 °C | | | | | |
| **IP rating** | IP67 | IP40 | IP67 | | | |
| **Ambient humidity** | 38% - 85% | | | | | |
| **Fiber material / coating** | Plastic / PE | Plastic / PVC | | | | |
| **Min. bending radius / mm** | 25 | 4 | 25 | 10 | 1 | 1 |
| **Freecut (Y/N)** | Y | | | | | |
| **Max. sensing distance [mm] diffuse- / through beam type** | 500/1,000 | 1,000 | 650/1,700 | 210/540 | 300/700 | 300/700 |
| **D = Diffuse type<br>T = Through beam type<br>R = Retro reflective** | D/T | D | D/T | D/T | D/T | D/T |

| | General purpose | | | | | |
|---|---|---|---|---|---|---|
| **Category** | **Flexible / R-type** | | | | | |
| **Type name** | E32-T1□R | E32-D1□R | E32-T2□R | E32-ET□R | E32-ED□R | E32-D2□R |
| **Ambient operating temperature** | -40 °C - 70 °C | | | | | |
| **IP rating** | IP67 | | | | | |
| **Ambient humidity** | 38% - 85% | | | | | |
| **Fiber material / coating** | Plastic / PVC | | Plastic / PE | | | |
| **Min. bending radius / mm** | 1 | | | | | |
| **Freecut (Y/N)** | Y | | | | | |
| **Max. sensing distance [mm] diffuse- / through beam type** | 4,000 (+ E39-F1) | 300 | 160 | 3,000<br>Area sensor<br>(High res. mode) | 100 | 50 |
| **D = Diffuse type<br>T = Through beam type<br>R = Retro reflective** | T | D | T | | D | |

| | Special function fibers | | | | | |
|---|---|---|---|---|---|---|
| **Category** | **Wafer mapping** | **Small spot** | | | **Ultracompact ultrafine sleeve** | **Coaxial small spot** |
| **Type name** | E32-A03<br>E32-A04 | E32-D32 +<br>E39-F3A | E32-EC41 +<br>E39F3B | E32-EC31+<br>E39-EF51 | E32-T223R | E32-EC31 + EF51<br>E32-EC31 +<br>E39F3C<br>E32-EC41 +<br>E39F3B |
| **Ambient operating temperature** | -40 °C - 70 °C | | | | | |
| **IP rating** | IP50 | | | | | |
| **Ambient humidity** | 38% - 85% | | | | | |
| **Fiber material / coating** | Plastic / PE | | | | Plastic / PVC PO *3 | Plastic / PE |
| **Min. bending radius / mm** | 1/10 | 25 | | | 1 | 25 |
| **Freecut (Y/N)** | Y | | N | Y | | |
| **Max. sensing distance [mm] diffuse- / through beam type** | 1,150/460 | 6 - 15 | spot dia.: 0,2 mm at 17 mm sensing distance | spot dia.: 0,5 mm at 17 mm sensing distance | 160 | |
| **D = Diffuse type<br>T = Through beam type<br>R = Retro reflective** | T | D | | | D/T | D |

| | Special function fibers | | | | | |
|---|---|---|---|---|---|---|
| **Category** | **Narow vision field (fine beam)** | **Area sensing** | | | | |
| **Type name** | E32-T22S<br>E32-T24S | E32-ED36-1/-2 | E32-D36P1 | E32-T16 | E32-T16W[R] | E32-ET16WR-1,<br>E32-ET16WR-2 |
| **Ambient operating temperature** | -40 °C - 70 °C | -15 °C - 70 °C | -40 °C - 70 °C | | -25 °C - 55 °C | |
| **IP rating** | IP67 | IP67 / IP65 | IP50 | IP67 | IP50 | IP54 |
| **Ambient humidity** | 38% - 85% | | | | | |
| **Fiber material / coating** | Plastic / PVC | Plastic / PE | | | Plastic / PVC | Plastic / PE |
| **Min. bending radius / mm** | 10 | 25 | 4 | 25 | 10 [1] | 1 |
| **Freecut (Y/N)** | Y | | | | | |
| **Max. sensing distance [mm] diffuse- / through beam type** | 2,500/1,750 | 10<br>Sensing area:<br>10 mm | 250 | 3,700 | 1,700 | 2,400 / 2,200 |
| **D = Diffuse type<br>T = Through beam type<br>R = Retro reflective** | T | D | | T | | |

| | Special function fibers | | | | | |
|---|---|---|---|---|---|---|
| Category | Retro reflective | | Limited refelctive | | | |
| Type name | E32-R21 | E32-R16 | E32-L25L | E32-L24L | E32-L24S | E32-L16 |
| Ambient operating temperature | -40 °C - 70 °C | -25 °C - 55 °C | -40 °C - 105 °C *1 | | - | - |
| IP rating | IP67 | IP66 | IP50 | IP50 | IP40 | |
| Ambient humidity | 38% - 85% | | | | | |
| Fiber material / coating | Plastic / PE | | | | | |
| Min. bending radius / mm | 10 | 25 | 10 | | | 25 |
| Freecut (Y/N) | Y | | | | | |
| Max. sensing distance [mm] diffuse- / through beam type | 250 | 1,500 | 9 | 6 | 4 | 15 |
| D = Diffuse type T = Through beam type R = Retro reflective | R | | D | | | |

| | Special function fibers | | | | | |
|---|---|---|---|---|---|---|
| Category | Limited reflective | Liquid level det. | | | | |
| Type name | E32-L86 | E32-A01 | E32-ED36-1 / -2 | E32-A02 | E32-D82F | E32-L25T |
| Ambient operating temperature | -40 °C - 200 °C *2 | -40 °C - 70 °C | -15 °C - 70 °C | -40 °C - 70 °C | -40 °C - 200 °C *1 | -40 °C - 70 °C |
| IP rating | IP40 | IP50 | IP67 | IP50 | IP68 | IP50 |
| Ambient humidity | 38% - 85% | | | | | |
| Fiber material / coating | Glass / SUS | Plastic / FR *4 | Plastic / PE | Plastic / FR *4 | Plastic / PTFE cover | Plastic / PE |
| Min. bending radius / mm | 25 | 4 | 25 | 4 | 40 | 10 |
| Freecut (Y/N) | N | Y | | | | |
| Max. sensing distance [mm] diffuse- / through beam type | 10 | - | - | - | - | - |
| D = Diffuse type T = Through beam type R = Retro reflective | D | | | | | |

| | Special shape | | | | | |
|---|---|---|---|---|---|---|
| Category | Side view | | | | | |
| Type name | E32-T14LR | E32-D14LR | E32-ETS14R | E32-D25YR | E32-D14L | E32-D15Y |
| Ambient operating temperature | -40 °C - 70 °C | | | | | |
| IP rating | IP67 | | | | | |
| Ambient humidity | 38% - 85% | | | | | |
| Fiber material / coating | Plastic / PE | | | | | |
| Min. bending radius / mm | 1 | | | | 25 | |
| Freecut (Y/N) | Y | | | | | |
| Max. sensing distance [mm] diffuse- / through beam type | 700 | 80 | 360 | 14 | 200 | 170 |
| D = Diffuse type T = Through beam type R = Retro reflective | T | D | T | D | | |

| | Special shape | | | | Special environment | |
|---|---|---|---|---|---|---|
| Category | Square heads | | | | Heat resistant | |
| Type name | E32-ETS20R | E32-T15XR | E32-D25XR | E32-ETS10R | E32-T5□ | E32-D5□ |
| Ambient operating temperature | -40 °C - 70 °C | | | | -40 °C - 150 °C *1 | |
| IP rating | IP67 | | | | | |
| Ambient humidity | 38% - 85% | | | | | |
| Fiber material / coating | Plastic / PE | | | | Plastic / FR | |
| Min. bending radius / mm | 1 | | | | 353 | |
| Freecut (Y/N) | Y | | | | | |
| Max. sensing distance [mm] diffuse- / through beam type | 250 | 700 | 50 | 720 | 1,000 | 400 |
| D = Diffuse type T = Through beam type R = Retro reflective | T | | D | T | | D |

*1. For continuous operation between -40 °C to 130 °C.
*2. Max. temperature resisitivity depends on location - refer to dimension diagrams for details
*3. PO= = Polyolefine
*4. FR = Fluororesin

**Note:** - Achievable sensing distances are according to E3X-DA-S Fiber Optic Amplifiers and can vary if using other types.

| | Special environment | | | | | |
|---|---|---|---|---|---|---|
| **Category** | Heat resistant | | | | | |
| **Type name** | E32-T8□R-S | E32-D8□R-S | E32-T84S-S | E32-T6□-S | E32-D6□-S | E32-D73-S |
| **Ambient operating temperature** | -40 °C - 200 °C *1 | | | -60 °C - 350 °C *1 | | -40 °C - 400 °C *2 |
| **IP rating** | IP67 | | | | | |
| **Ambient humidity** | 38% - 85% | | | | | |
| **Fiber material / coating** | Glass / FR | | Glass / SUS spiral | | | |
| **Min. bending radius / mm** | 10 | | 25 | | | |
| **Freecut (Y/N)** | N | | | | | |
| **Max. sensing distance [mm] diffuse- / through beam type** | 360 | 150 | 1,750 | 4,000 | 150 | 100 |
| **D = Diffuse type T = Through beam type R = Retro reflective** | T | D | T | | D | |

| | Special environment | | | | | |
|---|---|---|---|---|---|---|
| **Category** | Fluorine coating / U-type | | Vacuum resistant | | Robotic break resistant / B-type | |
| **Type name** | E32-D11U | E32-T11U | E32-T51V | E32-T84SV | E32-D11<br>E32-T11 | E32-D21<br>E32-T21 |
| **Ambient operating temperature** | -40 °C - 70 °C | | -25 °C - 120 °C | -25 °C - 200 °C | -40 °C - 70 °C | |
| **IP rating** | IP67 | IP67 | | | IP67 | |
| **Ambient humidity** | 38% - 85% | | | | | |
| **Fiber material / coating** | Glass / FR *4 | | | Glass / SUS spiral | Plastic / PVC | |
| **Min. bending radius / mm** | 4 | 4 | 30 | 25 | 4 | 4 |
| **Freecut (Y/N)** | Y | Y | N | | Y | |
| **Max. sensing distance [mm] diffuse- / through beam type** | 300 | 900 | 260 | 630 | 300/900 | 50/240 |
| **D = Diffuse type T = Through beam type R = Retro reflective** | D | T | | | D/T | |

*1. For continuous operation between -40 °C to 130 °C.
*2. Max. temperature resisitivity depends on location - refer to dimension diagrams for details
*3. PO= = Polyolefine
*4. FR = Fluororesin

**Note: -** Achievable sensing distances are according to E3X-DA-S Fiber Optic Amplifiers and can vary if using other types.

# Digital fibre amplifier with remote teaching for a reasonable price

E3X-DA-N is your best choice for basic entry into our digital fibre amplifier line-up. APC function, network connectivity via DeviceNet or CompoBus/S and remote control over mobile consule (group teaching) are convincing arguments for purchasing this cost effective amplifier.

- Simple teaching for one or multiple amplifiers using the same settings
- Digital displays show light incident levels, percentage and analog levels
- Optical communication between amps. for copy / paste + storage of settings
- Group mounting of up to 16 sensors avoiding mutual interferences
- Versatile models in the line-up for specific applications

CE

## Ordering information

### Prewired

| Item | Control output | Size in mm (HxWxD) | Model | |
|---|---|---|---|---|
| | | | NPN output | PNP output |
| Standard models | ON/OFF output | 31,5x64,3x10 | E3X-DA11-N | E3X-DA41-N |
| Monitor-output models | •ON/OFF output<br>•Monitor output | | E3X-DA21-N | E3X-DA51-N |
| Mark-detecting models (Blue LED) | ON/OFF output | | E3X-DAB11-N | E3X-DAB41-N |
| Mark-detecting models (Green LED) | | | E3X-DAG11-N | E3X-DAG41-N |
| Infrared models | | | E3X-DAH11-N | E3X-DAH41-N |
| Differential output type | | | E3X-DA11D | --- |
| Water-resistant models | | 33x81.5x12 | E3X-DA11V | E3X-DA41V |
| Twin-output models | | 31,5x64,3x10 | E3X-DA11TW | E3X-DA41TW |

### Connector type

| Item | Applicable connector (order separately) | | Control output | Model | |
|---|---|---|---|---|---|
| | | | | NPN output | PNP output |
| Standard models | Master | E3X-CN11 | ON / OFF output | E3X-DA6 | E3X-DA8 |
| | Slave | E3X-CN12 | | | |
| Monitor-output models | Master | E3X-CN21 | •ON / OFF output<br>•Monitor-output | E3X-DA7 | E3X-DA9 |
| | Slave | E3X-CN22 | | | |
| Mark-detecting models (Blue LED) | Master | E3X-CN11 | ON / OFF output | E3X-DAB6 | E3X-DAB8 |
| | Slave | E3X-CN12 | | | |
| Mark-detecting models (Green LED) | Master | E3X-CN11 | | E3X-DAG6 | E3X-DAG8 |
| | Slave | E3X-CN12 | | | |
| Infrared models | Master | E3X-CN11 | | E3X-DAH6 | E3X-DAH8 |
| | Slave | E3X-CN12 | | | |
| Differential output type | Master | E3X-CN11 | | E3X-DA6D | --- |
| | Slave | E3X-CN12 | | | |
| Water-resistant models (M8 Connector) | XS3F-M421-40□-A<br>XS3F-M422-40□-A | | | E3X-DA14V | E3X-DA44V |
| Twin-output models | Master | E3X-CN21 | | E3X-DA6TW | E3X-DA8TW |
| | Slave | E3X-CN22 | | | |

### Amplifier units connectors (order separately)

**Note:** Stickers for connectors are included as accessories.

| Item | Cable length | No. of conductors | Model |
|---|---|---|---|
| Master connector | 2 m | 3 | E3X-CN11 |
| | | 4 | E3X-CN21 |
| Slave connector | | 1 | E3X-CN12 |
| | | 2 | E3X-CN22 |

### Mobile console (order separately)

| Model | Remarks |
|---|---|
| (Set form)<br>E3X-MC11 | Mobile console with head, cable, and AC adapter provided as accessories. Power supply provided by chargeable battery |
| E3X-MC11-C1 | Mobile console |
| E3X-MC11-H1 | Head |
| E39-Z12-1 | Cable (1.5 m) |

## Specifications

### Prewired

| Type | | | Standard models | Monitor-output models | Mark-detecting models | | Infrared models | Water-resistant models | Twin-output models |
|---|---|---|---|---|---|---|---|---|---|
| | Model | NPN output | E3X-DA11-N | E3X-DA21-N | E3X-DAB11-N | E3X-DAG11-N | E3X-DAH11-N | E3X-DA11V | E3X-DA11TW |
| Item | | PNP output | E3X-DA41-N | E3X-DA51-N | E3X-DAB41-N | E3X-DAG41-N | E3X-DAH41-N | E3X-DA41V | E3X-DA41TW |
| Light source (wave length) | | | Red LED (660 nm) | | Blue LED (470 nm) | Green LED (525 nm) | Infrared LED (870 nm) | Red LED (660 nm) | |
| Power supply voltage | | | 12 to 24 VDC ±10%, ripple (p-p) : 10% max. | | | | | | |
| Power consumption | | | Normal operation < 40 mA / < 30 mA ECO mode | | | | | | |

| Type | | | Standard models | Monitor-output models | Mark-detecting models | | Infrared models | Water-resistant models | Twin-output models |
|---|---|---|---|---|---|---|---|---|---|
| | Model | NPN output | E3X-DA11-N | E3X-DA21-N | E3X-DAB11-N | E3X-DAG11-N | E3X-DAH11-N | E3X-DA11V | E3X-DA11TW |
| Item | | PNP output | E3X-DA41-N | E3X-DA51-N | E3X-DAB41-N | E3X-DAG41-N | E3X-DAH41-N | E3X-DA41V | E3X-DA41TW |
| Control output | ON / OFF output | | Load current 50 mA (residual voltage NPN/PNP: 1 V max. each) Open collector output type (depends on the NPN/PNP output format) Light-ON/Dark-ON, switch selectable | | | | | | |
| | Monitor output | | --- | 1 to 5 VDC, load 10 k min. | --- | | | | |
| Protective circuits | | | Reverse polarity protection, output short-circuit protection, mutual interference prevention (possible for up to 10 amplifiers) | | | | | | |
| Response time | Super-high-speed mode | | 0.25 ms for operation and reset respectively | | | | | | 0.5 ms *1 |
| | Standard mode | | Operation / reset: 1 ms each | | | | | | 2 ms *1 |
| | Super-long-distance mode | | 4 ms for operation and reset respectively | | | | | | 7 ms *1 |
| Sensitivity setting | | | Teaching or manual method | | | | | | |
| Functions | Timer functions | | OFF delay 0 to 200 ms (1 to 20: 1 ms increments, 20 to 200 ms: 5 ms increments), when the mobile control is used, select either OFF delay, ON delay or one shot. | | | | | | |
| | Automatic power control (APC) | | Fiber-optic current digital control | | --- | | | Fiber-optic current digital control | |
| | Zero reset | | Yes (negative indication possible) | | | | | | |
| | Initial reset | | Yes (setting conditions initialized) | | | | | | |
| | Monitor focus | | --- | Setting of upper / lower limit values | --- | | | | |
| Indicator lamp | | | Operation indicator (orange), 7-segment digital incident level display (red), 7-segment digital incident level percent display (red), incident level & threshold value double-bar display (green, red), 7-segment digital threshold value display (red) | | | | | | |
| Ambient temperature | | | Operating: Groups of 1 to 3 amplifiers: -25 to +55°C, groups of 4 to 11 amplifiers: -25 to +50°C, Groups of 12 to 16 amplifiers: -25 to +45°C Storage: -30 to +70°C (with no icing and condensation) | | | | | | |
| Ambient humidity | | | Operating / Storage: 35% to 85% RH (with no condensation) | | | | | | |
| Degree of protection | | | IEC 60529 IP50 (with Protective Cover attached) | | | | | IEC 60529 IP66 *2 | IEC 60529 IP *2 |
| Connection method | | | Prewired models (standard length: 2 m) | | | | | | |
| Accessories | | | Instruction manual | | | | | | |

*1 Operation and reset respectively
*2 With protective cover attached

## Digital fiber amplifier

- Differential output digital fiber amplifier (E3X-DA11D/E3X-DA6D)

### Through-beam model

| | | Sensing distance (mm) (Values in parentheses: When using the E39-F1 lens unit) | | | | | | Standard object (mm) *1 Minimum sensing object *2 (Opaque object) default |
|---|---|---|---|---|---|---|---|---|
| Sensitivity switching | | HIGH | | | LOW | | | |
| 11 steps can be set | | 1 | 2 | 3-11 | 1 | 2 | 3-11 | |
| Fiber type | Response time | 270 or 570µs | 0.5 or 1 ms | 1 to 200 ms or 2 to 400 ms | 270 or 570µs | 0.5 or 1 ms | 1 to 200 ms or 2 to 400 ms | |
| E32-ET11R | | 240 (1680) | 280 (1960) | 370 (2590) | 140(980) | 180(1260) | 240 (1680) | 1 mm dia. (0.01 mm dia.) |
| E32-ET21R | | 50 | 60 | 80 | 30 | 40 | 50 | |
| E32-T16WR | | 580 | 690 | 910 | 350 | 450 | 580 | (0.3 mm dia.)*3 |
| E32-T16PR | | 380 | 450 | 600 | 230 | 290 | 380 | (0.2 mm dia.) |

*1 Standard object (mm) / Sensing object is operating Minimum sensing object (resp. time is set to 3-11)
*2 Value applied when the response time is set to 3-11.
*3 Digital value is 1000.

Refer to the E3X-DA-N for the note of the fiber unit.

### Reflective model

| | | Sensing distance (mm) / white paper | | | | | | Standard object (mm) *1 Minimum sensing object *2 (Opaque object) default |
|---|---|---|---|---|---|---|---|---|
| Sensitivity switching | | HIGH | | | LOW | | | |
| 11 steps can be set | | 1 | 2 | 3-11 | 1 | 2 | 3-11 | |
| Fiber type | Response time | 270 or 570µs | 0.5 or 1 ms | 1 to 200 ms or 2 to 400 ms | 270 or 570µs | 0.5 or 1 ms | 1 to 200 ms or 2 to 400 ms | |
| E32-ED11R | | 80 | 90 | 120 | 45 | 60 | 80 | 150x150 (0.01 mm dia.) |
| E32-ED21R | | 13 | 15 | 20 | 7 | 10 | 13 | 25x25 (0.01 mm dia.) |

*1 The sensing object is operating.
*2 Value applied when the response time is set to 3-11. The value can be detected if the temperature varies within the operating ambient temperature.

**Note:** Refer to E3X-DA-N for the note of the fiber unit.

# Cost effective fibre optic amplifier with bar graph display

E3X-NA belongs to the most cost-effective fibre optical amplifiers with manual adjustment and LED bar graph display. Group alignment of max. 16 sensors with mutual interference suppression and useful functional models prove high performance for a very reasonable price.

- Easy adjustment with potentiometer
- Short response time of only 20 µs
- Very cost-effective basic-line amplifier
- Mutual interference suppression
- Water-resistant models and green or red light types are available

CE

## Ordering information

### Pre-wired

| Item | Control output | Model | |
|---|---|---|---|
| | | NPN output | PNP output |
| Standard models | ON / OFF output | E3X-NA11 | E3X-NA41 |
| High-speed detection models | | E3X-NA11F | E3X-NA41F |
| Mark-detecting models | | E3X-NAG11 | E3X-NAG41 |
| Water-resistant models | | E3X-NA11V | E3X-NA41V |

### Connector type

| Item | Applicable connector (order separately) | | Control output | Model | |
|---|---|---|---|---|---|
| | | | | NPN output | PNP output |
| Standard models | Master | E3X-CN11 | ON/OFF output | E3X-NA6 | E3X-NA8 |
| | Slave | E3X-CN12 | | | |
| Water-resistant models (M8 connector) | XS3F-M421-40□-A<br>XS3F-M422-40□-A | | | E3X-NA14V | E3X-NA44V |

## Specifications

| | | | Pre-wired | | | | Connector type | |
|---|---|---|---|---|---|---|---|---|
| Type | | | Standard models | High-speed detection models | Mark-detecting models | Water-resistant models | Standard models | Water-resistant models (M8 connector) |
| | Model | NPN output | E3X-NA11 | E3X-NA11F | E3X-NAG11 | E3X-NA11V | E3X-NA6 | E3X-NA14V |
| Item | | PNP output | E3X-NA41 | E3X-NA41F | E3X-NAG41 | E3X-NA41V | E3X-NA8 | E3X-NA44V |
| Light source (wave length) | | | Red LED (680 nm) | | Green LED (520 nm) | Red LED (680 nm) | | |
| Power supply voltage | | | 12 to 24 VDC ±10%, ripple (p-p): 10% max. | | | | | |
| Current consumption | | | 35 mA max. | 35 mA max. (at power supply voltage 24 VDC) | 35 mA max. | | | |
| Control output | | | Load current 50 mA (residual voltage 1 V max. each) Open collector output type (depends on the NPN / PNP output format) Light-ON / Dark-ON switch selectable | | | | | |
| Response time | | | Operation or reset: 200 µs max.*1 | Operating: 20 µs max. Reset: 30 µs max. | 200 µs max. for operation and reset respectively*1 | | | |
| Sensitivity adjustment | | | 8-turn endless adjuster (with indicator) | | | | | |
| Protective circuits | | | Reverse polarity protection, output short-circuit protection, mutual interference prevention (optically synchronized) | Reverse polarity protection, output short-circuit protection | Reverse polarity protection, output short-circuit protection, mutual interference prevention (optically synchronized) | | | |
| Timer function | | | OFF-delay timer: 40 ms (fixed) | | | | | |
| Ambient illuminance | | | Incandescent lamp: 10,000 lux max. Sunlight: 20,000 lux max. | | | | | |
| Ambient temperature | | | Operating: Groups of 1 to 3 amplifiers: -25 to +55°C, Groups of 4 to 11 amplifiers: -25 to +50°C, Groups of 12 to 16 amplifiers: -25 to +45°C Storage: -30 to +70°C (with no icing and condensation) | | | | | |
| Ambient humidity | | | Operating / Storage: 35% to 85% RH (with no condensation) | | | | | |
| Insulation resistance | | | 20 MΩ min. at 500 VDC | | | | | |
| Dielectric strength | | | 1,000 VAC at 50/60 Hz for 1 minute | | | | | 500 VAC at 50/60 Hz for 1 minute |
| Vibration resistance | | | 10 to 55 Hz with a 1.5 mm double amplitude for 2 hrs each in X, Y and Z directions | | | | | |
| Shock resistance | | | Destruction: 500 m/s$^2$ for 3 times each in X, Y, and Z directions | | | | | |
| Protective structure | | | IEC 60529 IP50 (with protective cover attached) | | | IEC 60529 IP66 (with protective cover attached) | IEC 60529 IP50 (with protective cover attached) | IEC 60529 IP66 (with protective cover attached) |

| | | | Pre-wired | | | | Connector type | |
|---|---|---|---|---|---|---|---|---|
| Type | | | Standard models | High-speed detection models | Mark-detecting models | Water-resistant models | Standard models | Water-resistant models (M8 connector) |
| | Model | NPN output | E3X-NA11 | E3X-NA11F | E3X-NAG11 | E3X-NA11V | E3X-NA6 | E3X-NA14V |
| Item | | PNP output | E3X-NA41 | E3X-NA41F | E3X-NAG41 | E3X-NA41V | E3X-NA8 | E3X-NA44V |
| Connection method | | | Pre-wired models (standard length: 2 m) | | | | Connector type | M8 connector |
| Weight (Packed state) | | | Approx. 100 g | | | Approx. 110 g | Approx. 55 g | 65 g |
| Material | | Case | PBT (polybutylene terephthalate) | | | | | |
| | | Cover | Polycarbonate | | | Polyethersulfone (PES) | Polycarbonate | Polyethersulfone (PES) |
| Accessories | | | Instruction manual | | | | | |
| Size in mm | | | 64,3Hx31,5Wx10D | | | 81,5Hx33Wx12D | 64,3Hx31,5Wx10D | 81,5Hx33Wx12D |

*1 If 8 or more Units are installed side-by-side, the response time will be 350 s max.

### Amplifier unit connectors

| Item | Model | E3X-CN11 | E3X-CN12 |
|---|---|---|---|
| Rated current | | 2.5 A | |
| Rated voltage | | 50 V | |
| Contact resistance | | 20 mΩ max. (20 mVDC max., 100 mA max.)<br>[By connection with amplifier unit and connection with adjacent connector (except conductor resistance of cable)] | |
| No. of insertions | | 50 times (By connection with amplifier unit and connection with adjacent connector) | |
| Material | Housing | PBT (polybutylene terephthalate) | |
| | Contacts | Phosphor bronze / gold-plated nickel | |
| Weight (packed state) | | Approx. 55 g | Approx. 25 g |

# High accuracy double display digital fibre amplifier

Superior digital fibre optic amplifier allowing easy user setting with power tuning. Two large displays are in favour of excellent visibility even from a distance. A convincing range of advanced and useful functions help you solve almost every sensing task.

- User-friendly power-tuning function allows easy sensor settings
- High resolution for long sensing distances and accurate settings
- Short response time of only 50 µs for fast sensing processes
- 4 element LED and auto power control for high and long-term stability
- Mutual interference suppression for simultaneous sensor operations

CE

## Ordering information

### Amplifier units with cables

| Item | | Functions | Model | |
|---|---|---|---|---|
| | | | NPN output | PNP output |
| Standard models | | --- | E3X-DA11-S | E3X-DA41-S |
| Mark-detecting models | Green LED | --- | E3X-DAG11-S | E3X-DAG41-S |
| | Blue LED | --- | E3X-DAB11-S | E3X-DAB41-S |
| | Infrared LED | --- | E3X-DAH11-S | E3X-DAH41-S |
| Advanced models | Twin-output models | Area output, self-diagnosis, differential operation | E3X-DA11TW-S | E3X-DA41TW-S |
| | External-input models | Remote setting, counter, differential operation | E3X-DA11RM-S | E3X-DA41RM-S |

### Amplifier units with connectors

| Item | | Functions | Model | |
|---|---|---|---|---|
| | | | NPN output | PNP output |
| Standard models | | --- | E3X-DA6-S | E3X-DA8-S |
| Mark-detecting models | Green LED | --- | E3X-DAG6-S | E3X-DAG8-S |
| | Blue LED | --- | E3X-DAB6-S | E3X-DAB8-S |
| Advanced models | Twin-output models | Area output, self-diagnosis, differential operation | E3X-DA6TW-S | E3X-DA8TW-S |
| | External-input models | Remote setting, counter, differential operation | E3X-DA6RM-S | E3X-DA8RM-S |

### Amplifier unit connectors (order separately)

| Item | Cable length | No. of conductors | Model |
|---|---|---|---|
| Master connector | 2 m | 3 | E3X-CN11 |
| | | 4 | E3X-CN21 |
| Slave connector | | 1 | E3X-CN12 |
| | | 2 | E3X-CN22 |

### Combining amplifier units and connectors

Amplifier units and connectors are sold separately. Refer to the following tables when placing an order.

| Amplifier unit | | | | Applicable connector (order separately) | |
|---|---|---|---|---|---|
| Model | NPN output | PNP output | | Master connector | Slave connector |
| Standard models | E3X-DA6-S | E3X-DA8-S | + | E3X-CN11 (3-wire) | E3X-CN12 (1-wire) |
| Mark-detecting models | E3X-DAG6-S | E3X-DAG8-S | | | |
| | E3X-DAB6-S | E3X-DAB8-S | | | |
| Advanced models | E3X-DA6TW-S | E3X-DA8TW-S | | E3X-CN21 (4-wire) | E3X-CN22 (2-wire) |
| | E3X-DA6RM-S | E3X-DA8RM-S | | | |

### When using 5 amplifier units

| | | |
|---|---|---|
| Amplifier units (5 Units) | + | 1 Master connector + 4 Slave connectors |

## Specifications

### Amplifier units with cables

| | | Type | Standard models | Mark-detecting models | | | Advanced, twin-output models | Advanced, external-input models |
|---|---|---|---|---|---|---|---|---|
| Model | | NPN output | E3X-DA11-S | E3X-DAG11-S | E3X-DAB11-S | E3X-DAH11-S | E3X-DA11TW-S | E3X-DA11RM-S |
| Item | | PNP output | E3X-DA41-S | E3X-DAG41-S | E3X-DAB41-S | E3X-DAH41-S | E3X-DA41TW-S | E3X-DA41RM-S |
| Light source (wavelength) | | | Red LED (650 nm) | Green LED (525 nm) | Blue LED (470 nm) | Infrared LED | Red LED (650 nm) | |
| Supply voltage | | | 12 to 24 VDC ±10%, ripple (p-p) 10% max. | | | | | |
| Power consumption | | | 960 mW max. (current consumption: 40 mA max. at power supply voltage of 24 VDC) | | | | 1,080 mW max. (current consumption: 45 mA max. at power supply voltage of 24 VDC) | |
| Control output | | | Load power supply voltage: 26.4 VDC; NPN / PNP open collector; load current: 50 mA max.; residual voltage: 1 V max. | | | | | |
| Circuit protection | | | Reverse polarity for power supply connection, output short-circuit | | | | | |
| Response time | Super-high-speed mode | NPN | 48 µs for operation and 50 µs for reset | | | | 80 µs for operation and reset respectively | 48 µs for operation and 50 µs for reset[*1] |
| | | PNP | 53 µs for operation and 55 µs for reset | | | | | 53 µs for operation and 55 µs for reset[*1] |
| | Standard mode | | 1 ms for operation and reset respectively | | | | | |
| | High-resolution mode | | 4 ms for operation and reset respectively | | | | | |
| Sensitivity setting | | | Teaching or manual method | | | | | |
| Functions | Power tuning | | Light emission power and reception gain, digital control method | | | | | |
| | Differential detection | | --- | | | | Switchable between single edge and double edge detection mode<br>Single edge: Can be set to 250 µs, 500 µs, 1 ms, 10 ms, or 100 ms.<br>Double edge: Can be set to 500 µs, 1 ms, 2 ms, 20 ms, or 200 ms. | |
| | Timer function | | Select from OFF-delay, ON-delay, or one-shot timer.<br>1 ms to 5 s (1 to 20 ms set in 1-ms increments, 20 to 200 ms set in 10-ms increments, 200 ms to 1 s set in 100-ms increments, and 1 to 5 s set in 1 s-increments) | | | | | |
| | Automatic power control (APC) | | High-speed control method for emission current | | | | | |
| | Zero-reset | | Display can be reset to zero when required (negative values can be displayed). | | | | | |
| | Initial reset | | Settings can be returned to defaults as required. | | | | | |
| | Mutual interference prevention | | Possible for up to 10 Units[*2, *3] | | | | | |
| | Counter | | --- | | | | | Switchable between up counter and down counter.<br>Set count:<br>0 to 9,999,999 |
| | I/O settings | | --- | | | | Output setting (Select from channel 2 output, area output, or self-diagnosis.) | External input setting (Select from teaching, power tuning, zero reset, light OFF, or counter reset.) |
| Display | | | Operation indicator (orange), Power tuning indicator (orange) | | | | Operation indicator for channel 1 (orange), Operation indicator for channel 2 (orange) | Operation indicator (orange), Power Tuning indicator (orange) |
| Digital display | | | Select from the following: Incident level + threshold, incident level percentage + threshold, incident light peak level + no incident light bottom level, minimum incident light peak level + maximum no incident light bottom level, long bar display, incident level + peak hold, incident level + channel | | | | | Select from same displays as given at the left or a counter display. |
| Size in mm | | | 70Hx32Wx10D | | | | | |

*1 When counter is enabled: 80 µs for operation and reset respectively.
*2 Communications are disabled if the detection mode is selected during super-high-speed mode, and the communications functions for mutual interference prevention and the mobile console will not function.
*3 Mutual interference prevention can be used for only up to 6 units if power tuning is enabled.

# 2- in -1 digital double-head advanced photoelectric amplifier

E3X-MDA is the innovative consequence incorporating 2 digital fibre amplifiers in one slim-line housing. Many sensing applications require a signal to detect the presence of the object and another to check some part of that object which has been realized by this fibre optic amplifier.

- Two digital amplifiers in one slime-line housing
- Short response time of 130 µs
- Power tune function for easy and accurate setting
- Parallel display of light intensity and switch point value
- Twin output models - on / off or area (between two values)

CE

## Ordering information

**Amplifier units with cables**

| Item | Functions | Model | |
|---|---|---|---|
| | | NPN output | PNP output |
| 2-channel models | AND / OR output | E3X-MDA11 | E3X-MDA41 |

**Amplifier units with connectors**

| Item | Functions | Model | |
|---|---|---|---|
| | | NPN output | PNP output |
| 2-channel models | AND / OR output | E3X-MDA6 | E3X-MDA8 |

**Amplifier unit connectors (order separately)**

| Item | Cable length | No. of conductors | Model |
|---|---|---|---|
| Master connector | 2 m | 3 | E3X-CN11 |
| | | 4 | E3X-CN21 |
| Slave connector | | 1 | E3X-CN12 |
| | | 2 | E3X-CN22 |

**Combining amplifier units and connectors**

Amplifier units and connectors are sold separately. Refer to the following tables when placing an order.

| Amplifier unit | | |
|---|---|---|
| Model | NPN output | PNP output |
| 2-channel models | E3X-MDA6 | E3X-MDA8 |

| Applicable connector (order separately) | |
|---|---|
| Master connector | Slave connector |
| E3X-CN21 (4-wire) | E3X-CN22 (2-wire) |

**When using 5 amplifier units**

| | | |
|---|---|---|
| Amplifier units (5 units) | + | 1 Master connector + 4 Slave connectors |

## Specifications

| | | Type | 2-channel models | |
|---|---|---|---|---|
| Model | | NPN output | E3X-MDA11 | E3X-MDA6 |
| Item | | PNP output | E3X-MDA41 | E3X-MDA8 |
| Light source (wavelength) | | | Red LED (650 nm) | |
| Supply voltage | | | 12 to 24 VDC ±10%, ripple (p-p) 10% max. | |
| Power consumption | | | 1,080 mW max.<br>(current consumption: 45 mA max. at power supply voltage of 24 VDC) | |
| Control output | | | Load power supply voltage: 26.4 VDC; open collector;<br>load current: 50 mA max.; residual voltage: 1 V max. | |
| Circuit protection | | | Reverse polarity for power supply connection, output short-circuit | |
| Response time | Super-high-speed mode | NPN | 130 µs[*1] for operation and reset respectively | |
| | | PNP | | |
| | Standard mode | | 1 ms for operation and reset respectively | |
| | High-resolution mode | | 4 ms for operation and reset respectively | |
| Sensitivity setting | | | Teaching or manual method | |
| Functions | Power tuning | | Light emission power and reception gain, digital control method | |
| | Timer function | | Select from OFF-delay, ON-delay, or one-shot timer.<br>1 ms to 5 s (1 to 20 ms set in 1-ms increments, 20 to 200 ms set in 10-ms increments,<br>200 ms to 1 s set in 100-ms increments, and 1 to 5 s set in 1 s-increments) | |
| | Automatic power control (APC) | | High-speed control method for emission current | |
| | Zero-reset | | Display can be reset to zero when required (negative values can be displayed). | |
| | Initial reset | | Settings can be returned to defaults as required. | |
| | Mutual interference prevention | | Possible for up to 9 Units (18 channels)[*2, *3] | |
| | I/O settings | | Output setting (select from channel 2 output, AND, OR, leading edge sync, falling edge sync, or differential output) | |

| | | Type | 2-channel models | |
|---|---|---|---|---|
| Model | | NPN output | E3X-MDA11 | E3X-MDA6 |
| Item | | PNP output | E3X-MDA41 | E3X-MDA8 |
| Display | | | Operation indicator for channel 1 (orange), Operation indicator for channel 2 (orange) | |
| Digital display | | | Select from the following: Incident level for channel 1 + incident level for channel 2, Incident level + threshold, incident level percentage + threshold, incident light peak level + no incident light bottom level, minimum incident light peak level + maximum no incident light bottom level, long bar display, incident level + peak hold, incident level + channel | |
| Display orientation | | | Switching between normal/reversed display is possible. | |
| Ambient illumination (receiver side) | | | Incandescent lamp: 10,000 lux max.<br>Sunlight: 20,000 lux max. | |
| Insulation resistance | | | 20 MΩ min. (at 500 VDC) | |
| Dielectric strength | | | 1,000 VAC at 50/60 Hz for 1 minute | |
| Vibration resistance (destruction) | | | 10 to 55 Hz with a 1.5-mm double amplitude for 2 hrs each in X, Y and Z directions | |
| Shock resistance (destruction) | | | 500 $m/s^2$, for 3 times each in X, Y and Z directions | |
| Enclosure rating | | | IEC 60529 IP50 (with Protective Cover attached) | |
| Connection method | | | Prewired cable | Standard connector |
| Weight (packed state) | | | Approx. 100 g | Approx. 55 g |
| Materials | Case | | Polybutylene terephthalate (PBT) | |
| | Cover | | Polycarbonate (PC) | |
| Accessories | | | Instruction sheet | |
| Size in mm | | | 70Hx32Wx10D | |

*1 When differential output is selected for the output setting, the second channel output is 200 μs for operation and reset respectively.
*2 Communications are disabled if the detection mode is selected during super-high-speed mode, and the communications functions for mutual interference prevention and the mobile console will not function.
*3 Mutual interference prevention can be used for up to 5 units (10 channels) if power tuning is enabled.

# Digital fibre optic amplifier with easy teach & go functionality

E3X-DA-SE-S is the right answer for a simple one key setting of an advanced fibre optical amplifier incorporating almost all the same beneficial features as its big brother 'E3X-DA-S'.

- Easy operation with one key teaching or manually
- Digital double display for incident level and threshold
- High-resolution 12 bit A/D converter (4000 resolution)
- Mutual interference protection for alignment of 10 fibre amplifiers
- Low power consumption - 10 amplifiers only need 0.4 A current supply

CE

## Ordering information

| Type | Model | |
|---|---|---|
| | NPN output | PNP output |
| Pre-wired models | E3X-DA11SE-S | E3X-DA41SE-S |
| Connector models | E3X-DA6SE-S | E3X-DA8SE-S |

## Specifications

| Type | Model | Digital fiber sensor | |
|---|---|---|---|
| | NPN output | E3X-DA11SE-S | E3X-DA6SE-S |
| Item | PNP output | E3X-DA41SE-S | E3X-DA8SE-S |
| Light source (wave length) | | Red LED (650 nm) | |
| Power supply voltage | | 12 to 24 VDC ±10%, ripple (p-p): 10% max. | |
| Power consumption | | 960 mW max. (Power supply: 24 V, current consumption: 40 mA max.) | |
| Control output | | Load power supply: 26.4 VDC max., open-collector output, Load current: 50 mA max. (residual voltage: 1 V max.) | |
| Protective circuits | | Power supply reverse polarity protection, output short-circuit protection | |
| Response time | | Operate or reset: 1 ms | |
| Sensitivity setting | | Teaching or manual adjustment | |
| Functions | Auto power control | High-speed control method for emission current | |
| | Mutual interference prevention | Optical communications sync, possible for up to 10 Units | |
| Indicators | | Operation indicator (orange) | |
| Digital displays | | Twin digital displays (incident level + threshold) | |
| Size in mm | | 70Hx32Wx10D | |

**Note:** Basic performance is the same as the E3X-DA-S Series. Refer to the E3X-DA-S Datasheet (E336) for details.

# Digital fibre amplifier with active threshold for dust and dirt compensation

The active threshold E3X-DA-AT-S digital fibre amplifier ignores a certain level of dirt or pollution and makes readjustments of thresholds unnecessary. Combined with APC function you can always be assured of stable sensing characteristics.

- Active threshold control for high stability
- High resolution 12 bit A/D converter (res. = 4.000)
- APC compensation for LED derating
- Short response time of only 80 µs (super-high-speed mode)
- Alarm output for maintenance warning

CE

## Ordering information

### Digital fiber sensor

| Type | Functions | Model | |
|---|---|---|---|
| | | NPN output | PNP output |
| Pre-wired models | ATC<br>ATC error output<br>Alarm output | E3X-DA11AT-S | E3X-DA41AT-S |
| Connector models | | E3X-DA6AT-S | E3X-DA8AT-S |

### Seperate digital amplifier laser sensors

| Type | Functions |
|---|---|
| Pre-wired models | ATC<br>ATC error output<br>Alarm output |
| Connector models | |

## Specifications

| Type | Model | Digital fiber sensor | |
|---|---|---|---|
| | NPN output | E3X-DA11AT-S | E3X-DA6AT-S |
| Item | PNP output | E3X-DA41AT-S | E3X-DA8AT-S |
| Response time | Super-high-speed mode | Operate or Reset: 80 µs | |
| | High-speed mode | Operate or reset: 250 µs | |
| | Standard mode | Operate or reset: 1 ms | |
| | High-resolution mode | Operate or reset: 4 ms | |
| Functions | ATC | Active threshold control (used for output 1) | |
| | I/O settings | The signal that is output can be selected (used for output 2): ATC error output | |
| | Startup operation | The operation when power is turned ON can be selected: No operation, PT, or PT + ATC | |
| Size in mm | | 70Hx 32Wx 10D | |

**Note:** Basic performance is the same as the advanced twin-output sensors. Refer to E3C-LDA datasheet (E338) and E3X-DA-S datasheet (E336) for details. Only differences from the advanced twin-output sensors have been given above.

# Fibre optic amplifier with analog output and short response time

E3X-DA-AN-S is the perfect solution provider in terms of position-detection of objects. A high speed output with only 80 µs response time, low temperature drift and high repeat accuracy are in favour of an excellent sensing characteristic.

- Analog output with high stability and accuracy
- Power tuning for easy setting
- Dual digital display for level and threshold indication
- High-speed mode with 80 µs response time
- APC for compensation of LED derating

CE

## Ordering information

**Digital fiber amplifier**

| Type | Functions | Model | |
|---|---|---|---|
| | | NPN output | PNP output |
| Pre-wired models | Analog output | E3X-DA11AN-S | E3X-DA41AN-S |

**Photoelectric sensor with separate digital amplifier (laser-type)**

| Type | Functions | Model | |
|---|---|---|---|
| | | NPN output | PNP output |
| Pre-wired models | Analog output | E3C-LDA11AN | E3C-LDA41AN |

## Specifications

| Type | Model | Digital fiber amplifier |
|---|---|---|
| | NPN output | E3X-DA11AN-S |
| Item | PNP output | E3X-DA41AN-S |
| Analog output | Control output | Voltage output 1 to 5 VDC (with connected load of 10 kΩ min.) |
| | Repeat accuracy | Super-high-speed mode: 1.5% F.S.<br>High-speed mode: 1.5% F.S.<br>Standard mode: 1% F.S.<br>High-resolution mode: 0.75% F.S. |
| | Temperature characteristics | 0.3% F.S./°C |
| Response time | Super-high-speed mode | Operate or reset: 80 µs |
| | High-speed mode | Operate or reset: 250 µs |
| | Standard mode | Operate or reset: 1 ms |
| | High-resolution mode | Operate or reset: 4 ms |
| Size in mm | | 70Hx32Wx10D |

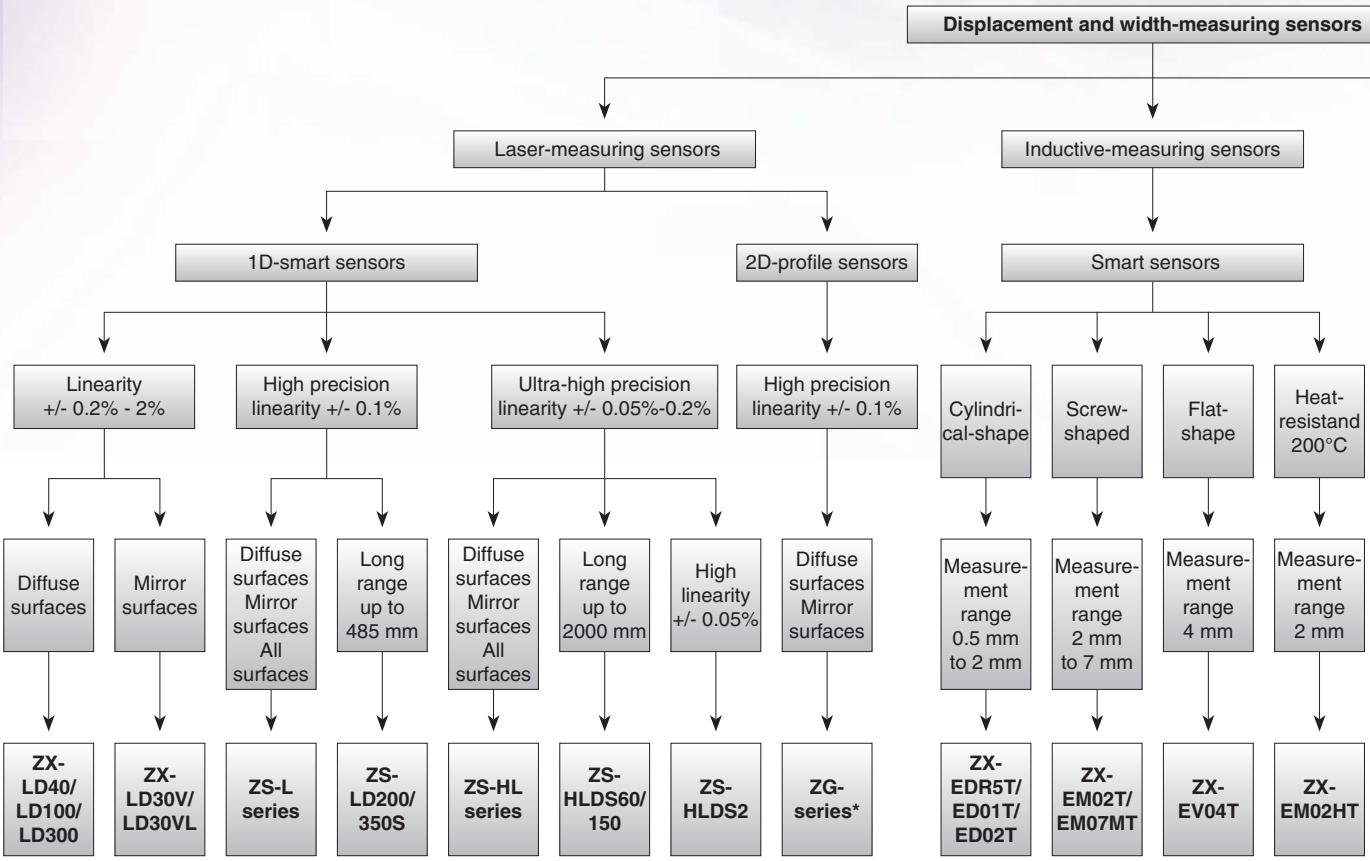
**Note:** - The power tuning function cannot be used in super-high-speed mode.
- Other performance items and functions are the same as those of general-purpose models.
For details, refer to the data sheet for the E3X-DA-S (Cat. No. E336) and the E3L-LDA (Cat. No. E338).

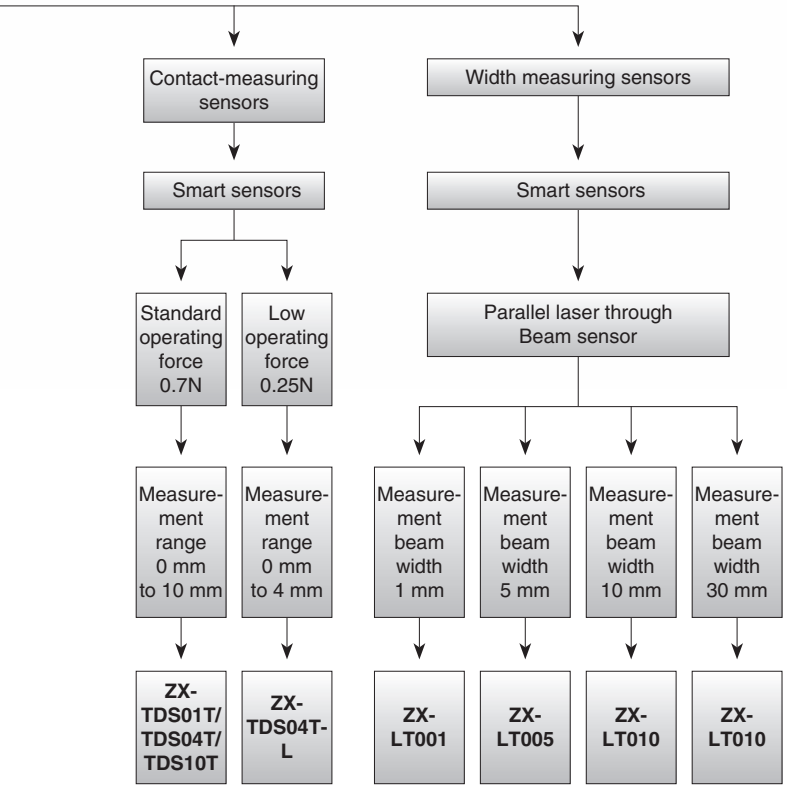
## ZS-L laser displacement sensor

### More flexibility through scalability

The ZS-L laser displacement sensors is a smart, modular and scalable family that offers a platform approach to solve the most challenging tasks in measurements. Aided by Omron C-MOS technology, the ZS-L measures at sub-micron accuracy in a fraction of a millisecond virtually any texture. The ZS-L series comes with a sensor controller, a data storage unit and a multi-controller that coordinates up to 9 units. Hence enabling accurate measurements of material thickness, evenness and warpage.

- Accurate and fast – 0.4 um at less than 110 us sampling time
- One sensor fits all – stable measurement of virtually any material structure such as glass, foil or rubber
- Powerful – can measure accurately thickness, warpage and evenness thanks to its multi-unit controller
- Smart – data storage unit for traceability and data logging
- Easy to use – built-in user interface and powerful yet friendly PC configuration tool






# Table of contents

# Selection table

| | | 1D smart laser measuring sensors | | |
|---|---|---|---|---|
| | |  |  |  |
| Selection criteria | Model | ZX-LD | ZS-L | ZS-HL |
| | Measurement range Z Min. | ±2 mm | ±1 mm | ±0.5 mm |
| | Max. | ±200 mm | ±135 mm | ±500 mm |
| | Measurement range X Min. | | | |
| | Max. | | | |
| | Center distance Min. | 30 mm | 6.3 mm | 10 mm |
| | Max. | 300 mm | 350 mm | 1,500 mm |
| | *1 Resolution Z | 0.25 µm | 0.25 µm | 0.1 µm |
| | *1 Resolution X | | | |
| | *1 Linearity (± % of full scale) | 0.2% | 0.1 % | 0.05% |
| | Response time | 150 µs | 110 µs | 110 µs |
| | Spot beam | ■ | ■ | ■ |
| | Line beam | ■ | ■ | ■ |
| | IP-rating head | IP50 | IP67 | IP64 - IP67 |
| | IP-rating controler | IP40 | IP40 | IP40 |
| | Ambient oper. temperature | 0 - 50 °C | 0 - 50 °C | 0 - 50 °C |
| | Number of connectable sensors | 5 | 9 | |
| Features | Thickness measurement | ■ | ■ | ■ |
| | Excentricity | ■ | ■ | ■ |
| | Step | ■ | ■ | ■ |
| | Height | ■ | ■ | ■ |
| | Distance | ■ | ■ | ■ |
| | Evenness | ■ | ■ | ■ |
| | Warpage | | ■ | ■ |
| | Edge | | | |
| | Position | | | |
| | Width | | | |
| | Peak | ■ | ■ | ■ |
| | Peak to peak | ■ | ■ | ■ |
| | Bottom | ■ | ■ | ■ |
| | Self-trigger | ■ | ■ | ■ |
| | Multi-point-calculation | | ■ | ■ |
| | Mutual interference prevention | ■ | ■ | ■ |
| | Signal scaling | ■ | ■ | ■ |
| | PC-software | ■ | ■ | ■ |
| | Plug & play technology | ■ | ■ | ■ |
| Application | Diffuse reflection | ■ | ■ | ■ |
| | Optical method (reflection) | Diffuse / Regular | | |
| | Mirror | ■ | ■ | ■ |
| | Glass | | ■ | ■ |
| | Metal | | ■ | ■ |
| | Plastic | ■ | ■ | ■ |
| | Black rubber | | ■ | ■ |
| | Liquid | | ■ | ■ |
| Supply voltage | 12 - 24 VDC | ■ | | |
| | 21.6 - 26.4 VDC | | ■ | ■ |
| Control I/O | 4 - 20 mA | ■ | ■ | ■ |
| | 1 - 5 VDC | ■ | | |
| | ±5 VDC | | | |
| | ±4 VDC | ■ | | |
| | ±10 VDC | | ■ | ■ |
| | Judgement output High/Pass/Low | ■ | ■ | ■ |
| | Trigger | ■ | ■ | ■ |
| Commu-nication | RS-232C | ■ | ■ | ■ |
| | USB2.0 | | ■ | ■ |
| | Page | 86 | 88 | Please contact your OMRON representative |

| | | Inductive measuring sensors | Contact measuring sensors | Width measuring sensors |
|---|---|---|---|---|
| | |  |  |  |
| Selection criteria | Model | ZX-E | ZX-T | ZX-LT |
| | Measurement range Z Min. | 0.5 mm | 1 mm | 1 mm |
| | Max. | 7 mm | 10 mm | 30 mm |
| | Measurement range X Min. | | | |
| | Max. | | | |
| | Center distance Min. | | | |
| | Max. | | | |
| | *1 Resolution Z | 1 µm | 0.1 µm | 4 µm |
| | *1 Resolution X | | | |
| | *1 Linearity (± % of full scale) | 0.5% | 0.3% | 1% |
| | Response time | 150 µs | 1 ms | 150 µs |
| | Spot beam | | | |
| | Line beam | | | ■ |
| | IP-rating head | IP67 | IP67 | IP40 |
| | IP-rating controler | IP40 | IP40 | IP40 |
| | Ambient oper. temperature | 0 - 50 °C | 0 - 50 °C | 0 - 50 °C |
| | Number of connectable sensors | 5 | 7 | 5 |
| Features | Thickness measurement | ■ | ■ | ■ |
| | Excentricity | ■ | ■ | ■ |
| | Step | ■ | ■ | ■ |
| | Height | ■ | ■ | ■ |
| | Distance | ■ | ■ | |
| | Evenness | ■ | ■ | |
| | Warpage | ■ | ■ | |
| | Edge | | | ■ |
| | Position | | | ■ |
| | Width | | | ■ |
| | Peak | ■ | ■ | ■ |
| | Peak to peak | ■ | ■ | ■ |
| | Bottom | ■ | ■ | ■ |
| | Self-trigger | ■ | ■ | ■ |
| | Multi-point-calculation | ■ | ■ | ■ |
| | Mutual interference prevention | ■ | | ■ |
| | Signal scaling | ■ | ■ | ■ |
| | PC-software | ■ | ■ | ■ |
| | Plug & play technology | ■ | ■ | ■ |
| Application | Diffuse reflection | | | |
| | Optical method (reflection) | | | |
| | Mirror | | ■ | ■ |
| | Glass | | ■ | ■ |
| | Metal | ■ | ■ | ■ |
| | Plastic | | ■ | ■ |
| | Black rubber | | ■ | ■ |
| | Liquid | | | |
| Supply voltage | 12 - 24 VDC | ■ | ■ | ■ |
| | 21.6 - 26.4 VDC | | | |
| Control I/O | 4 - 20 mA | ■ | ■ | ■ |
| | 1 - 5 VDC | ■ | ■ | ■ |
| | ±5 VDC | ■ | ■ | ■ |
| | ±4 VDC | ■ | ■ | ■ |
| | ±10 VDC | | | |
| | Judgement output High/Pass/Low | ■ | ■ | ■ |
| | Trigger | ■ | ■ | ■ |
| Commu-nication | RS-232C | ■ | ■ | ■ |
| | USB2.0 | ■ | | |
| | Page | 90 | 92 | 95 |

■ Standard  □ No / not available

## Smart, fast and accurate laser measurement sensor

Smart ZX-L offers plug & measure technology for applications where high resolution and fast response time is required. A wide range of interchangeable sensor heads provides greater flexibility in solving most demanding applications.

- Small and light sensor heads for easy integration
- High speed response time of 150 µs
- Easy sensor head replacement
- Scalability through a modular platform concept
- Multipoint measurement with up to 5 sensors

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## Ordering information

### Sensor head (reflection type)

| Optical method | Beam shape | Sensing distance | Resolution *1 | Size in mm (HxWxD) | Model |
|---|---|---|---|---|---|
| Diffuse-reflective | Spot beam | 40 ± 10 mm | 2 µm | 39x33x17 | ZX-LD40 |
| | | 100 ± 40 mm | 16 µm | | ZX-LD100 |
| | | 300 ± 200 mm | 300 µm | | ZX-LD300 |
| | Line beam | 40 ± 10 mm | 2 µm | | ZX-LD40L |
| | | 100 ± 40 mm | 16 µm | | ZX-LD100L |
| | | 300 ± 200 mm | 300 µm | | ZX-LD300L |
| Regular reflection type | Spot beam | 30 ± 2 mm | 0.25 µm | 45x55x25 | ZX-LD30V |
| | Line beam | | | | ZX-LD30VL |

*1 At average count of 4,096 times

### Amplifier units

| Power supply | Output specifications | Model |
|---|---|---|
| DC | NPN output | ZX-LDA11-N |
| | PNP output | ZX-LDA41-N |

**Note:** Compatible with sensor head connection.

## Specifications

### Sensor head (reflection type)

| Item Model | ZX-LD40 | ZX-LD100 | ZX-LD300 | ZX-LD30V | ZX-LD40L | ZX-LD100L | ZX-LD300L | ZX-LD30VL |
|---|---|---|---|---|---|---|---|---|
| Optical method | Diffuse reflection | | | Regular reflection | Diffuse reflection | | | Regular reflection |
| Light source (wave length) | Visible-light semiconductor laser (wavelength 650 nm, 1 mW or less, Class 2) | | | | | | | |
| Measurement center distance | 40 mm | 100 mm | 300 mm | 30 mm | 40 mm | 100 mm | 300 mm | 30 mm |
| Measurement range | ±10 mm | ±40 mm | ±200 mm | ±2 mm | ±10 mm | ±40 mm | ±200 mm | ±2 mm |
| Beam shape | Spot | | | | Line | | | |
| Beam diameter *1 | 50 mm dia. | 100 mm dia. | 300 mm dia. | 75 mm dia. | 75 m x 2mm | 150 µm x 2 mm | 450 µm x 2 mm | 100 µm x 1.8 mm |
| Resolution*2 | 2 µm | 16 µm | 300 µm | 0.25 µm | 2 µm | 16 µm | 300 m | 0.25 µm |
| Linearity*3 | ±0.2% F.S. (entire range) | ±0.2% F.S. (80 to 121 mm) | ±2% F.S. (200 to 401 mm) | ±0.2% F.S. (entire range) | ±0.2% F.S. (32 to 49 mm) | ±0.2% F.S. (80 to 121 mm) | ±2% F.S. (200 to 401 mm) | ±0.2% F.S. (entire range) |
| Protective structure | IEC 60529 IP50 | | | IEC Standard IP40 | IEC 60529 IP50 | | | IEC Standard IP40 |

*1 Beam diameter: This is the value of the measurement center distance (actual value), and is defined at $1/e^2$ (13.5%) of the central light intensity. If there is stray light outside, the defined area and the area around the object has a higher reflectance than the object,

*2 Resolution: Indicates the amount of fluctuation (±3 ) in the linear output when connected to the ZX-LDA. (The measured value when the average count of the ZX-LDA is set to 4,096 and our standard object (white ceramic) is used for the central distance.) This indicates the repeatability precision when the work is in a static state, and does indicate the distance precision. The resolution performance may not be satisfactory in a strong electromagnetic field.

*3 Linearity: This indicates the error with respect to the ideal straight line of the displacement output when measuring our standard object.

**Note:** When an object has a high reflectance, detection errors are possible outside the measurement range.

### Amplifier units

| Item Model | ZX-LDA11-N | ZX-LDA41-N |
|---|---|---|
| Measurement period | 150 s | |
| Possible average count settings *1 | 1/2/4/8/16/32/64/128/256/512/1,024/2,048/4,096 times | |
| Temperature drift | When reflective head is connected: 0.01% F.S./°C, when transmissive head is connected: 0.1% F.S./°C | |
| Linear output *2 | 4 to 20 mA/F.S., maximum load resistance of 300 ±4 V (±5 V, 1 to 5 V *3), output impedance of 100 Ω | |
| Decision output (HIGH/PASS/LOW: 3 outputs) *1 | NPN open collector output, 30 VDC 50 mA max., residual voltage 1.2 V or less | PNP open collector output, 30 V DC 50 mA max., residual voltage 2 V or less |
| Laser OFF input / zero reset input / timing input / reset | When ON: supply voltage 1.5 V or less, when OFF: open circuit (maximum leakage current 0.1 mA or less) | When ON: supply voltage 1.5 V or less, when OFF: open circuit (maximum leakage current 0.1 mA or less) |
| Functions | Measurement value display, setting value and incident level and resolution display, scaling, display reverse, display off mode, ECO mode, change number of display digits, sample hold, peak hold, bottom hold, peak to peak hold, self peak hold, self-bottom hold, intensity mode, zero reset, initial reset, on-delay timer, off-delay timer, one-shot timer, differential, sensitivity selection, keeping clamp change, threshold value settings, positioning teaching, two-point teaching, automatic teaching, hiss width variable, timing input, reset input, monitor focus, (A-B) operation, (A+B) operation *4, mutual interference *4; laser degradation detection zero reset memory, function lock | |
| Indicator lamp | Operation indicator lamp: high (orange), pass (green), low (yellow), 7-segment digital main display (red), 7-segment digital sub-display (yellow), laser ON (green), zero reset (green), enable display (green) | |
| Power supply voltage | 12 to 24 VDC ±10%, ripple (p-p) : 10% max. | |
| Current consumption | 200 mA or less (when sensor is connected) | |

*1 The response speed of linear output (when the sensitivity is fixed) is calculated as (measurement period) x (average count setting + 1).
The response speed of decision output (when the sensitivity is fixed) is calculated as (measurement period) x (average count setting + 1).
*2 Current/voltage can be switched using the switch on the bottom of the amplifier unit.
*3 Can be set with the monitor focus function.
*4 Computing unit is required.

# The scalable high precision laser measurement sensor

Smart ZS-L sensor offers superb dynamic sensing range for all surfaces from black rubber to glass and mirror surfaces by simply scaling it to your needs.

- High dynamic sensing range for all surfaces
- High resolution of 0.25 µm
- Modular and scalable platform concept for up to 9 sensors
- Easy to use, install and maintain for all user levels
- Fast response time of 110 µs

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## Features

### The scalable platform for more flexibility

- Connect and expand up to 9 controllers
- Connect multi-calculation controller for advanced calculations like evenness or flatness
- Connect data storage module for process-data logging
- Connect PC software for easy system set up and signal monitoring
- Sensor head with 2D-CMOS technology with high dynamic sensing range for measuring black rubber, plastic, shiny, glass and mirror surfaces
- Advanced application settings
- Easy reconfiguration and teaching

### Measurement tools:

- Hight measurement
- Step measurement
- Thickness measurement
- Flatness measurement
- Average measurement
- Excentricity
- Warpage / Evenness

## Ordering information

### Sensor heads

| Optical system | Sensing distance | Beam diameter | Resolution*1 | Size in mm (HxWxD) | Model |
|---|---|---|---|---|---|
| Diffuse reflection | 50 ± 5 mm | 900 x 60 µm | 0.8 µm | 65mmx65mmx35mm | ZS-LD50 |
| | 80 ± 15 mm | 900 x 60 µm | 2 µm | | ZS-LD80 |
| | 130 ± 15 mm | 600 x 70 µm | 3 µm | | ZS-LD130 |
| | 200 ± 50 mm | 900 x 100 µm | 5 µm | | ZS-LD200 |
| | 350 ± 135 mm | dia. 240 µm | 20 µm | | ZS-LD350S |
| Regular reflection | 20 ± 1 mm | 900 x 25 µm | 0.25 µm | | ZS-LD20T |
| | 40 ± 2.5 mm | 2,000 x 35 µm | 0.4 µm | | ZS-LD40T |

*1 This is the peak-to-peak displacement conversion value in the displacement output at the measuring center distance in high-precision mode when the number of samples to average is set to 128 and the measuring mode is set to the high-resolution mode. The standard workpiece is white aluminum ceramics in diffuse reflection mode and glass in the regular reflection mode.

### Sensor controllers

| Supply voltage | Control outputs | Model |
|---|---|---|
| 24 VDC | NPN outputs | ZS-LDC11 |
| | PNP outputs | ZS-LDC41 |

### Data storage units

| Supply voltage | Control outputs | Model |
|---|---|---|
| 24 VDC | NPN outputs | ZS-DSU11 |
| | PNP outputs | ZS-DSU41 |

### Multi controllers

| Supply voltage | Control outputs | Model |
|---|---|---|
| 24 VDC | NPN outputs | ZS-MDC11 |
| | PNP outputs | ZS-MDC41 |

## Specifications

### Sensor heads

| Item / Model | ZS-LD20T | | ZS-LD40T | | ZS-LD50 | | ZS-LD80 | | ZS-LD130 | | ZS-LD200 | | ZS-LD350S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Applicable controllers | ZS-LDC Series | | | | | | | | | | | | |
| Optical system | Regular reflection | Diffuse reflection | Regular reflection | Diffuse reflection | Diffuse reflection | Regular reflection | Diffuse reflection | Regular reflection | Regular reflection | Diffuse reflection | Diffuse reflection | Regular reflection | Diffuse reflection |
| Measuring center distance | 20 mm | 6.3 mm | 40 mm | 30 mm | 50 mm | 47 mm | 80 mm | 78 mm | 130 mm | 130 mm | 200 mm | 200 mm | 350 mm |
| Measuring range | ±1 mm | ±1 mm | ±2.5 mm | ±2 mm | ±5 mm | ±4 mm | ±15 mm | ±14 mm | ±15 mm | ±12 mm | ±50 mm | ±48 mm | ±135 mm |
| Light source | Visible semiconductor laser (wavelength: 650 nm, 1 mW max., Class 2) | | | | | | | | | | | | |
| Beam diameter | 900 x 25 µm | | 2,000 x 35 µm | | 900 x 60 µm | | 900 x 60 µm | | 600 x 70 µm | | 900 x 100 µm | | dia. 240 µm |
| Linearity | ±0.1% F.S. | | | | | | | | ±0.25% F.S. | | ±0.1% F.S. | ±0.25% F.S. | ±0.1% F.S. |
| Resolution | 0.25 µm | | 0.4 µm | | 0.8 µm | | 2 µm | | 3 µm | | 5 µm | | 20 µm |
| Temperature characteristic | 0.04% F.S./°C | | 0.02% F.S./°C | | 0.02% F.S./°C | | 0.01% F.S./°C | | 0.02% F.S./°C | | 0.02% F.S./°C | | 0.04% F.S./°C |
| Sampling cycle | 110 µs | | | | | | | | | | | | |
| Degree of protection | Cable length 0.5 m: IP66, cable length 2 m: IP67 | | | | | | | | | | | | |

### Sensor controllers

| Item | | | ZS-LDC11 | ZS-LDC41 |
|---|---|---|---|---|
| No. of samples to average | | | 1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048, or 4096 | |
| Number of mounted sensors | | | 1 per sensor controller | |
| External interface | Connection method | | Serial I/O: connector, Other: pre-wired (standard cable length: 2 m) | |
| | Serial I/O | USB 2.0 | 1 port, full speed (12 Mbps), MINI-B | |
| | | RS-232C | 1 port, 115,200 bps max. | |
| | Outputs | Judgement outputs | 3 outputs: HIGH, PASS, and LOW<br>NPN open-collector, 30 VDC, 50 mA max.,<br>residual voltage: 1.2 V max. | 3 outputs: HIGH, PASS, and LOW<br>PNP open-collector, 50 mA max.,<br>residual voltage: 1.2 V max. |
| | | Linear outputs | Selectable from 2 types of output, voltage or current (selected by slide switch on base).<br>Voltage output: −10 to 10 V, output impedance: 40 .<br>Current output: 4 to 20 mA, maximum load resistance: 300 . | |
| | Inputs | Laser OFF, ZERO reset timing, RESET | ON: Short-circuited with 0V terminal or 1.5 V or less<br>OFF: Open (leakage current: 0.1 mA max.) | ON: Short-circuited to supply voltage or within 1.5 V of supply voltage<br>OFF: Open (leakage current: 0.1 mA max.) |
| Functions | | | Display: Measured value, threshold value, voltage/current, received light amount, and resolution<br>Sensing: Mode, gain, measurement object, head installation<br>Filter: Smooth, average, and differentiation<br>Outputs: Scaling, various hold values, and zero reset<br>I/O settings: Linear (focus/correction), judgements (hysteresis and timer), non-measurement, and bank (switching and clear)<br>System: Save, initialization, measurement information display, communications settings, key lock, language, and data load | |
| Status indicators | | | HIGH (orange), PASS (green), LOW (orange), LDON (green), ZERO (orange), and ENABLE (green) | |
| Segment display | | Main display | 8-segment red LED, 6 digits | |
| | | Sub-display | 8-segment green LED, 6 digits | |
| LCD | | | 16 digits x 2 rows, Color of characters: green, Resolution per character: 5 x 8 pixel matrix | |
| Setting inputs | | Setting keys | Direction keys (UP, DOWN, LEFT, and RIGHT), SET key, ESC key, MENU key, and function keys (1 to 4) | |
| | | Slide switch | Threshold switch (2 states: High/Low), mode switch (3 states: FUN, TEACH, and RUN) | |
| Power supply voltage | | | 21.6 V to 26.4 VDC (including ripple) | |

# Smart inductive measurement sensor

ZX-E offers the best solution for the accurate measurement of metallic objects. It is highly recommended in harsh environments such as automotive and metal working machines.

- High resolution of 1 µm
- High-speed response time of 150 µs
- Easy sensor head replacement
- Modular platform concept for different sensing technologies
- Easy linearity adjustment for any metal

CE

## Ordering information

### Sensor heads

| Shape | Dimensions | Sensing distance | Accuracy *1 | Model |
|---|---|---|---|---|
| Cylindrical | 3 dia. x 18 mm | 0.5 mm | 1 µm | ZX-EDR5T |
| | 5.4 dia. x 18 mm | 1 mm | | ZX-ED01T *2 |
| | 8 dia. x 22 mm | 2 mm | | ZX-ED02T *2 |
| Screw-shaped | M10 x 22 mm | 2 mm | | ZX-EM02T *2 |
| | M18 x 46.3 mm | 7 mm | | ZX-EM07MT *2 |
| Flat | 30 x 14 x 4.8 mm | 4 mm | | ZX-EV04T |
| Heat-resistant, cylindrical | M12 x 22 mm | 2 mm | | ZX-EM02HT |

*1 For an average count of 4,096.
*2 Models with protective spiral tubes are also available. Add a suffix of "-S" to the above model numbers when ordering. (Example: ZX-ED01T-S)

### Amplifier units

| Power supply | Output type | Model |
|---|---|---|
| DC | NPN | ZX-EDA11 |
| | PNP | ZX-EDA41 |

**Note:** Compatible connection with the sensor head.

## Specifications

### Sensor heads

| Model | ZX-EDR5T | ZX-ED01T | ZX-ED02T/EM02T | ZX-EM07MT | ZX-EV04T | ZX-EM02HT |
|---|---|---|---|---|---|---|
| Measurement range | 0 to 0.5 mm | 0 to 1 mm | 0 to 2 mm | 0 to 7 mm | 0 to 4 mm | 0 to 2 mm |
| Sensing object | Magnetic metals (Measurement ranges and linearities are different for non-magnetic metals. Refer to Engineering Data on B-67.) | | | | | |
| Standard reference object | 18×18×3 mm | | 30×30×3 mm | 60×60×3 mm | | 45x45x3 mm |
| | Material: ferrous (S50C) | | | | | |
| Accuracy *1 | 1 µm | | | | | |
| Linearity *2 | ±0.5% F.S. | | | | | ±1% F.S. |
| Linear output range | Same as measurement range. | | | | | |
| Shock resistance (destruction) | 500 m/s2, 3 times each in X, Y, and Z directions | | | | | |
| Degree of protection (Sensor head) | IEC60529, IP65 | IEC60529, IP67 | | | | IEC60529, IP60 |

*1 Accuracy: The resolution is the deviation (±3σ) in the linear output when connected to the ZX-EDA amplifier unit. The above values indicate the deviations observed 30 minutes after the power is turned ON.
(The resolution is measured with OMRON's standard reference object at 1/2 of the measurement range with the ZX-EDA set for the maximum average count of 4,096 per period.)
The resolution is given at the repeat accuracy for a stationary workpiece, and is not an indication of the distance accuracy. The resolution may be adversely affected under strong electromagnetic fields.
*2 Linearity: The linearity is given as the error in an ideal straight line displacement output when measuring the standard reference object. The linearity and measurement values vary with the object being measured.

### Amplifier units

| Model | ZX-EDA11 | ZX-EDA41 |
|---|---|---|
| Measurement period | 150 µs | |
| Possible average count settings[*1] | 1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1,024, 2,048, or 4,096 | |
| Linear output[*2] | Current output:4 to 20 mA/F.S., max. load resistance: 300 Ω<br>Voltage output: ±4 V (±5 V, 1 to 5 V [*3]), Output impedance: 100 Ω | |
| Judgement outputs (3 outputs: HIGH/PASS/LOW) | NPN open-collector outputs, 30 VDC, 50 mA max.<br>Residual voltage: 1.2 V max. | PNP open-collector outputs, 30 VDC, 50 mA max.<br>Residual voltage: 2 V max. |
| Zero reset input, timing input, reset input, judgement output hold input | ON: Short-circuited with 0-V terminal or 1.5 V or less<br>OFF: Open (leakage current: 0.1 mA max.) | ON: Supply voltage short-circuited or supply voltage within 1.5 V<br>OFF: Open (leakage current: 0.1 mA max.) |
| Function | • Measurement value display - set value / output value / resolution display<br>• Linearity adjustment (materials selection) scaling<br>• Display reverse - display OFF mode - ECO mode<br>• Number of display digit changes - sample hold - peak hold<br>• Bottom hold, peak-to-peak hold - self-peak hold - self-bottom hold<br>• Average hold - delay hold - zero reset<br>• Initial reset - linearity initialization - ON-delay timer<br>• OFF-delay timer - one-shot timer - previous value comparison<br>• Non-measurement setting - direct threshold value setting - position teaching<br>• Automatic teaching - hysteresis width setting - timing inputs<br>• Reset input - judgement output hold input - monitor focus<br>• Linear output correction - (A-B) calculations[*4] - (A+B) calculations[*4]<br>• K-(A+B) calculation[*4] - mutual interference prevention[*4]<br>• Sensor disconnection detection - zero reset memory - zero reset indicator<br>• Key lock | |
| Indications | Judgement indicators: High (orange), pass (green), low (yellow), 7-segment main digital display (red), 7-segment sub-digital display (yellow), power ON (green), zero reset (green), enable (green) | |
| Voltage influence (including sensor) | 0.5% F.S. of linear output value at ±20% of power supply voltage | |
| Power supply voltage | 12 to 24 VDC ±10%, ripple (p-p): 10% max. | |

[*1] The response speed of the linear output is calculated as the measurement period × (average count setting + 1) (with fixed sensitivity).
The response speed of the judgement outputs is calculated as the measurement period × (average count setting + 1) (with fixed sensitivity).
[*2] The output can be switched between a current output and voltage output using a switch on the bottom of the amplifier unit.
[*3] Setting is possible via the monitor focus function.
[*4] A calculating unit (ZX-CAL or ZX-CAL2) is required.

## Smart contact measurement sensor

ZX-T is ideal for applications where the target object may contain oil deposits or other micro-structures. In this case contact measurement is the most reliable way.

- Modular platform concept for different sensing technologies
- Air-retracting types for automated inspection
- Multipoint measurement with up to 8 sensors
- Pressing force alarm prevents malfunction
- Strong ball bearing structure assures long life time

CE

## Ordering information

### Sensor heads

| Size | Type | Sensing distance | Resolution (See note.) | Model |
|---|---|---|---|---|
| 6 dia. | Short type | 1 mm | 0.1 µm | ZX-TDS01T |
| | Standard type | 4 mm | | ZX-TDS04T |
| | Low-load type | | | ZX-TDS04T-L |
| 8 dia. | Standard type | 10 mm | 0.4 µm | ZX-TDS10T |
| | Ultra-low-load type | | | ZX-TDS10T-L |
| | Air lift type | | | ZX-TDS10T-V |
| | Air lift / air push type | | | ZX-TDS10T-VL |

**Note:** The resolution refers to the minimum value that can be read when a ZX-TDA□1 amplifier unit is connected.

### Amplifier units

| Power supply | Output type | Model |
|---|---|---|
| DC | NPN | ZX-TDA11 |
| | PNP | ZX-TDA41 |

## Specifications

### Sensor heads

| Item | | ZX-TDS01T | ZX-TDS04T | ZX-TDS04T-L | ZX-TDS10T | ZX-TDS10T-V | ZX-TDS10T-L | ZX-TDS10T-VL |
|---|---|---|---|---|---|---|---|---|
| Vacuum retract (VR) and air push (AP) compatible | | | | | No | VR | No | VR / AP |
| Measurement range | | 1 mm | 4 mm | | 10 mm | | | |
| Maximum actuator travel distance | | Approx. 1.5 mm | Approx. 5 mm | | 10.5 mm | | | |
| Resolution*1 | | 0.1 µm | | | 0.4 µm | | | |
| Linearity*2 | | ±0.3% F.S. | | | ±0.5% FS | | | |
| Operating force *3 | | Approx. 0.7 N | | Approx. 0.25 N | Approx. 0.7 N | Approx. 0.6 N | Approx. 0.065 N | 0.09 to 1.41N |
| Air pressure | Vacuum retrating | | | | - | -0.55 to 0.70 (bar) | - | -0.05 to 0.22 (bar) |
| | Air push | | | | | - | | 0.125 to 2 (bar) |
| Degree of protection | Sensor head | IEC60529, IP67 | | IEC60529, IP54 | IP65 | | IP50 | |
| | Preamplifier | | | | IP40 | | | |
| Mechanical durability | | 10,000,000 operations min. | | | | | | |
| Ambient temperature | | Operating: 0°C to 50°C (with no icing or condensation), Storage: -15°C to 60°C (with no icing or condensation) | | | Operating: 0 to 50°C (with no icing or condensation) Storage: -10 to 60°C (with no icing or condensation) | | | |
| Ambient humidity | | Operating and storage: 35% to 85% (with no icing or condensation) | | | | | | |
| Temperature characteristic*4 | Sensor head | 0.03% F.S./°C | | | ±0.01% FS/°C | | | |
| | Preamplifier | 0.01% F.S./°C | | | ±0.01% FS/°C | | | |
| Vibration resistance | | | | | 0.35 mm single amplitude at 10 to 55 Hz for 50 min each in the X, Y, and Z directions | | | |
| Shock resistance | | | | | 150 m/S2<br>3 times each in 6 directions (up/down, left/right, and forward/backward) | | | |
| Connection method | | | | | Prewired connector (2 m from the sensor head to the preamplifier, 0.2 m from the preamplifier to the connector) | | | |
| Weight (packed state) | | Approx. 100 g | | | | | | |
| Materials | Sensor head | Stainless steel | | | | | | |
| | Rubber sleeve | | | | Viton | | None | |
| | Preamplifier | Polycarbonate | | | | | | |
| | Mounting brackets | Stainless steel | | | | | | |
| Accessories | | Instruction manual, preamplifier mounting brackets (ZX-XBT1) | | | Instruction manual, preamplifier mounting brackets (ZX-XBT1), Right-angle adapter *5 | | | |

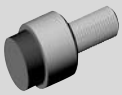
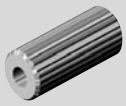
*1 The resolution is given as the minimum value that can be read when a ZX-TDA□1 amplifier unit is connected. This value is taken 15 minutes after turning ON the power with the average number of operations set to 256.
*2 The linearity is given as the error in an ideal straight line displacement output.
*3 These figures are representative values that apply for the measurement mid-point, and are for when the provided actuator is used, with the actuator moving downwards. If the actuator moves horizontally or upwards, the operating force will be reduced. Also, if an actuator other than the standard one is used, the operating force will vary with the weight of the actuator itself.
*4 These figures are representative values that apply for the mid-point of the measurement range.
*5 The ZX-TDS10□ comes with a right-angle adapter.

### Amplifier units

| Item | ZX-TDA11 | ZX-TDA41 |
|---|---|---|
| **Measurement period** | 1 ms | |
| **Possible average count settings** *1 | 1, 16, 32, 64, 128, 256, 512, or 1,024 | |
| **Linear output** *2 | Current output: 4 to 20 mA/F.S., Max. load resistance: 300 Ω<br>Voltage output: ±4 V (±5 V, 1 to 5 V*3), Output impedance: 100 Ω | |
| **Judgement outputs (3 outputs: HIGH/PASS/LOW)** | NPN open-collector outputs, 30 VDC, 30 mA max.<br>Residual voltage: 1.2 V max. | PNP open-collector outputs, 30 VDC, 30 mA max.<br>Residual voltage: 2 V max. |
| **Zero reset input, timing input, reset input, judgement output hold input** | ON: Short-circuited with 0-V terminal or 1.5 V or less<br>OFF: Open (leakage current: 0.1 mA max.) | ON: Supply voltage short-circuited or supply voltage of 1.5 V or less<br>OFF: Open (leakage current: 0.1 mA max.) |
| **Function** | • Measurement value display - present value/set value/output value display<br>• Display reverse - ECO mode - number of display digit changes<br>• Sample hold - peak hold - bottom hold, peak-to-peak hold<br>• Self-peak hold - self-bottom hold - zero reset<br>• Initial reset - direct threshold value setting - position teaching<br>• Hysteresis width setting - timing inputs - reset input<br>• Judgement output hold input - monitor focus - (A-B) calculations*4<br>• (A+B) calculations (See note 4.) - sensor disconnection detection<br>• Zero reset memory - function lock - non-measurement setting<br>• Clamp value setting - scale inversion - zero reset indicator<br>• Span adjustment - warming-up display - pressing force alarm | |
| **Indicators** | Judgement indicators: High (orange), pass (green), low (yellow), 7-segment main digital display (red), 7-segment sub-digital display (yellow), power ON (green), zero reset (green), enable (green) | |
| **Power supply voltage** | 12 to 24 VDC ±10%, Ripple (p-p): 10% max. | |
| **Current consumption** | 140 mA max. (with Sensor connected), For 24-VDC power supply voltage: 140 mA max. (with Sensor connected) | |
| **Ambient temperature** | Operating and storage: 0 to 50°C (with no icing or condensation) | |
| **Temperature characteristic** | 0.03% F.S./°C | |
| **Connection method** | Prewired (standard cable length: 2 m) | |
| **Weight (packed state)** | Approx. 350 g | |
| **Materials** | Case: PBT (polybutylene terephthalate), Cover: Polycarbonate | |

*1 The response speed of the linear output is calculated as the measurement period × (average count setting + 1).
The response speed of the judgement outputs is calculated as the measurement period × (average count setting + 1).
*2 The output can be switched between a current output and voltage output using a switch on the bottom of the amplifier unit.
*3 Setting is possible via the monitor focus function.
*4 A calculating unit (ZX-CAL2) is required.

**Options (actuators)**

| Model | | Type (material) | Screw section | Appearance | Application | Applicable sensor (see note.) |
|---|---|---|---|---|---|---|
| | | | | | | ZX-TDS□T |
| D5SN- | TB1 | Ball type (steel) | Female screw M2.5 x 0.45 |  | Measuring ordinary flat surfaces (standard actuator supplied with the ZX-TDS series) | ○ |
| | TB2 | Ball type ( carbide steel) | Female screw M2.5 x 0.45 |  | Measurements where abrasion resistance is critical<br>Measured objects: carbide (HR90) or lower. | ○ |
| | TB3 | Ball type (ruby) | Female screw M2.5 x 0.45 |  | Measurements where abrasion resistance is critical<br>Measured objects: carbide (HR90) or higher. | ○ |
| | TN1 | Needle type (carbide steel) | Male screw M2.5 x 0.45 |  | Measuring the bottom of grooves and holes | △ |
| | TF1 | Flat (carbide steel) | Male screw M2.5 x 0.45 |  | Measuring spherical objects | △ |
| | TA | Conversion adapter (stainless steel) | Through-hole female screw M2.5 x 0.45 |  | Mounting D5SN-TN1/-TF1 or commercially available actuators on ZX-TDS-series sensors | ○ |

**Note:** ○ Replacement possible △ Conversion Adapter required

# Smart parallel laser through beam sensor

ZX-LT parallel laser through beam sensor is recommended for precise object sensing such as width, diameter size or edge control.

- Small and light sensor heads for easy integration
- High-speed response time of 150 µs for more stable detection
- Plug & play technology saves installation time
- Modular platform concept for different sensing technologies
- Wide range of sensor heads offering laser beam width from 1 mm to 30 mm

CE

## Ordering information

### Sensor head

| Optical method | Measurement width | Sensing distance | Resolution *1 | Size in mm (HxWxD) | | Model |
|---|---|---|---|---|---|---|
| | | | | Transmitter | Receiver | |
| Through-beam | 1 mm dia. | 0 to 2,000 mm | 4 µm | 15x15x34 | 15x15x19 | ZX-LT001 |
| | 5 mm | 0 to 500 mm | | | | ZX-LT005 |
| | 10 mm | | | 20x20x42 | 20x20x25 | ZX-LT010 |
| | 30 mm | | 12 µm | 64.25x70x22.6 | 64.25x54x22.6 | ZX-LT030 |

*1 At average count of 64 times

### Amplifier units

| Power supply | Output specifications | Model |
|---|---|---|
| DC | NPN output | ZX-LDA11-N |
| | PNP output | ZX-LDA41-N |

**Note:** Compatible with sensor head connection.

## Specifications

### Sensor head (transmissive type)

| Item model | ZX-LT001 | | ZX-LT005 | ZX-LT010 | ZX-LT030 |
|---|---|---|---|---|---|
| Optical method | Through-beam | | | | |
| Light source (wave length) | Visible-light semiconductor laser (wavelength 650 nm, 1 mW or less, Class 1) | | | | |
| Measurement width | 1 mm dia. | 1 to 2.5 mm dia. | 5 mm | 10 mm | 30 mm |
| Sensing distance | 0 to 500 mm | 500 to 2,000 mm | 0 to 500 mm | | |
| Min. sensing object | 8 mm dia. opaque object | 8 to 50 µm opaque object | opaque: 0.05 mm dia. | opaque: 0.1 mm dia. | opaque: 0.3 mm dia. |
| Resolution *1 | 4 µm *2 | --- | 4 µm *3 | | 12 µm |
| Protective structure | IEC 60529 IP40 | | | | IP 40 |

*1 The amount of fluctuation (±3 δ) of the linear output when connected to an amplifier unit, converted to a detection span.
*2 When the average count is 64.5 µm when the count is 32. The value when the smallest detection object shades the vicinity of the center of the 1 mm dia. detection span.
*3 When the average count is 64.5 µm when the count is 32.

### Amplifier units

| Item model | ZX-LDA11-N | ZX-LDA41-N |
|---|---|---|
| Measurement period | 150 s | |
| Possible average count settings *1 | 1/2/4/8/16/32/64/128/256/512/1,024/2,048/4,096 times | |
| Temperature drift | When reflective head is connected: 0.01% F.S./°C, when transmissive head is connected: 0.1% F.S./°C | |
| Linear output *2 | 4 to 20 mA/F.S., maximum load resistance of 300 ±4 V (±5 V, 1 to 5 V *3), output impedance of 100 . | |
| Decision output (HIGH/PASS/LOW: 3 outputs) *1 | NPN open collector output, 30 VDC 50 mA max., residual voltage 1.2 V or less | PNP open collector output, 30 V DC 50 mA max., residual voltage 2 V or less |
| Laser OFF input / zero reset input / timing input / reset | When ON: supply voltage 1.5 V or less, when OFF: open circuit (maximum leakage current 0.1 mA or less) | When ON: supply voltage 1.5 V or less, when OFF: open circuit (maximum leakage current 0.1 mA or less) |
| Functions | Measurement value display, setting value and incident level and resolution display, scaling, display reverse, display off mode, ECO mode, change number of display digits, sample hold, peak hold, bottom hold, peak to peak hold, self peak hold, self-bottom hold, intensity mode, zero reset, initial reset, on-delay timer, off-delay timer, one-shot timer, differential, sensitivity selection, keeping clamp change, threshold value settings, positioning teaching, two-point teaching, automatic teaching, hiss width variable, timing input, reset input, monitor focus, (A-B) operation, (A+B) operation *4, mutual interference *4, laser degradation detection zero reset memory, function lock | |
| Indicator lamp | Operation indicator lamp: high (orange), pass (green), low (yellow), 7-segment digital main display (red), 7-segment digital sub-display (yellow), laser ON (green), zero reset (green), enable display (green) | |
| Power supply voltage | 12 to 24 VDC ±10%, ripple (p-p) : 10% max. | |
| Current consumption | 200 mA or less (when sensor is connected) | |

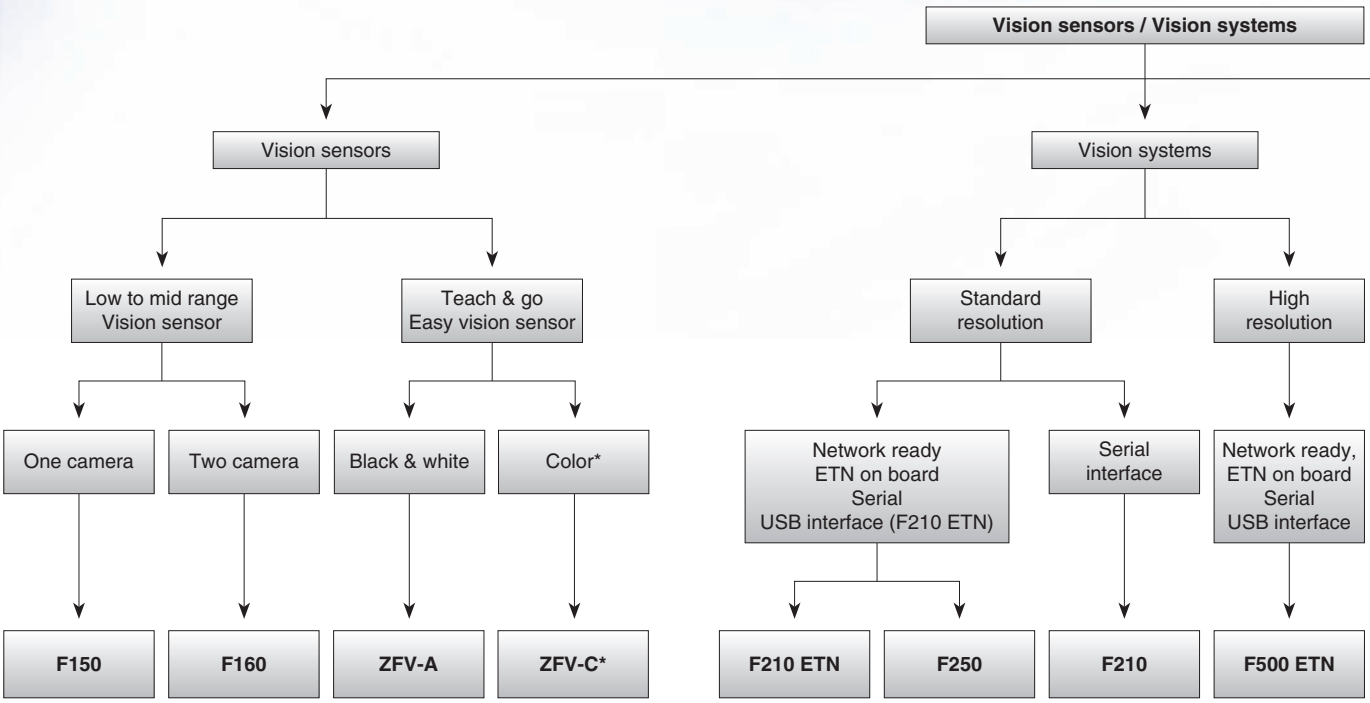
*1 The response speed of linear output (when the sensitivity is fixed) is calculated as (measurement period) x (average count setting + 1).
The response speed of decision output (when the sensitivity is fixed) is calculated as (measurement period) x (average count setting + 1).
*2 Current/voltage can be switched using the switch on the bottom of the amplifier unit.
*3 Can be set with the monitor focus function.
*4 Computing unit is required.

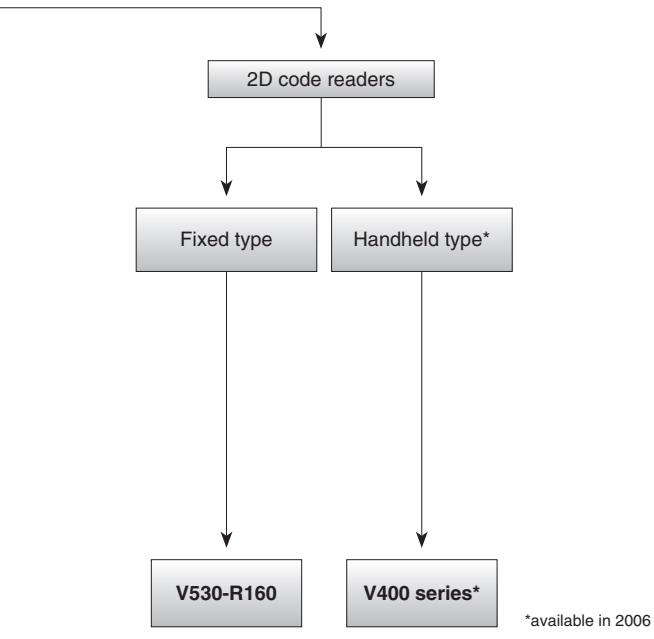
## Easy vision – teach & go

### ZFV smart vision sensor

Omron's new ZFV smart vision sensor is an image-processing system in a sensor format. It consists of two separate components, a camera head with an integrated light source and a processing unit. Parameter settings and lighting control are available at the touch of a button. A "smart" user interface allows parameter setting using a few buttons and the built-in colour LCD monitor. During operation, the display gives direct feedback showing results and images in real time.
Easy vision – teach & go, for applications which can be solved in minutes – not hours or days.

- Brilliant colour display
- Real time result and image display
- Intuitive user interface
- One button teach – teach and go
- Up to seven inspection tools
- Adjustable inspection area and distance
- Integrated, adjustable LED light
- Up to 250 inspections per second


*available in 2006

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# Selection table

| | | Vision sensors | | | Vision systems |
|---|---|---|---|---|---|
| | |  |  |  |  |
| Selection criteria | Model | ZFV | F150 | F160 | F210 |
| | Number of connectable cameras | 1 | 1<br>(2 with optional extension) | 2 | 2 |
| | Camera type | Digital black&white | Analogue black&white | | |
| | Resolution (usable) | 468 x 432 | 512 x 484 | 512 x 484 | 512 x 484 |
| | Working distance mm Min. | 34 | depends on selected lens | | |
| | Max. | 194 | | | |
| | Field of view mm Min. | 5 | depends on selected lens | | |
| | Max. | 50 | | | |
| | Number of storable configurations | 8 | 16 | 32 (expandable using CF card) | |
| | Number of tools/ configuration | 1 | 16 | 32 | limited only by memory space / depends on type of |
| | Cycle time | app. 4-25 ms depending on setup | Depends on setup and used tools | | |
| | IP-Rating camera head | IP65 | n/a | | |
| | Supply voltage | 24 VDC | | | |
| Features | Image processing tools | Up to seven (area, brightness, width, position, character, count, pattern) | App. 30 processing tools for object or defect recognition, measurements, calculations, input / output and more | App. 50 processing tools for object or defect recognition, measurements, calculations, input / output and more, including character recognition tool | App. 70 processing tools for object or defect recognition, measurements, calculations, input / output, display and more. Includes also character recognition and high precision edge code inspection tools. |
| | Image preprocessing | | Smoothing, edge enhancement, edge extraction, background suppression | Smoothing, edge enhancement, edge extraction, erosion, dilation, median, background suppression | Smoothing, edge enhancement, edge extraction, erosion, dilation, median, background suppression - multiple passes, configurable |
| | Optional macro programming interface | | | | ■ |
| | User interface | on board 'teach&go' | point to point GUI | | |
| | Optional PC configuration software | | Yes, via serial interface | | |
| | Security tools | | | | |
| Communication | RS-232 | Optional via ZS-DSU | ■ | ■ | ■ |
| | USB | | | | |
| | Ethernet | | | | |
| | Number of digital I/O | 5 in / 3 out | 11 in / 21 out | 13 in / 22 out | 13 in / 22 out |
| | Page | 100 | 102 | 103 | 104 |

| | | Vision systems | | 2D code reader |
|---|---|---|---|---|
| | |  |  |  |
| Selection criteria | Model | F250 | F210ETN / F500ETN | V530-R160 |
| | Number of connectable cameras | 4 | 2 | 2 |
| | Camera type | Analogue black&white | Digital black&white | Analogue black&white |
| | Resolution (usable) | 512x484 | 512x484 F210 ETN<br>1K x 1K F500 ETN | 512x484 |
| | Working distance mm Min. | depends on selected lens | | |
| | Max. | | | |
| | Field of view mm Min. | depends on selected lens | | |
| | Max. | | | |
| | Number of storable configurations | 32 (expandable using CF card) | | 10 |
| | Number of tools/ configuration | limited only by memory space / depends on type of tools | | n/a |
| | Cycle time | Depends on setup and used tools | | Depends on code size, type and orientation |
| | IP-Rating camera head | n/a | | |
| | Supply voltage | 24 VDC | | |
| Features | Image processing tools | App. 70 processing tools for object or defect recognition, measurements, calculations, input/output, display and more. Includes also character recognition and high precision edge code inspection tools. Hardware support fast object location | App. 80 processing tools for object or defect recognition, measurements, calculations, input/output, display and more. Includes also character recognition and high precision edge code inspection tools. Enhanced image and data logging functions | Data matrix ECC200: 10 × 10 to 64 × 64, 8 × 18, 8 × 32, 12 × 26, 12 × 36, 16 × 36, 16 × 48 Data matrix ECC000, ECC050, ECC080, ECC100, ECC140: 9 × 9 to 25 × 25 QR code (Model 1, 2): 21 × 21 to 41 × 41 (Version 1 to 6) |
| | Image preprocessing | Smoothing, edge enhancement, edge extraction, erosion, dilation, median, background suppression - multiple passes, configurable | Smoothing, edge enhancement, edge extraction, erosion, dilation, median, background suppression - multiple passes, configurable | n/a |
| | Optional macro programming interface | ■ | ■ | |
| | User interface | point to point GUI | | |
| | Optional PC configuration software | | Yes, via Ethernet | |
| | Security tools | | Yes, user log in, 3 user levels, change history log, etc., via optional PC software | |
| Communication | RS-232 | ■ | ■ | ■ |
| | USB | | ■ | |
| | Ethernet | 10 Base T | 10/100 Base T/TX | |
| | Number of digital I/O | 21 in / 46 out | 11 in / 21 out | 5 in / 6 out |
| | Page | 105 | 106 | 107 |

■ Standard  ☐ No / not available

# Easy vision - teach & go

The ZFV proves that vision sensors can be 'teach&go'. Parameter settings are available at the touch of a button. A smart user interface allows intuitive configuration using a built-in colour monitor. In Run-mode, the display gives live feedback showing results and images in real time.

- Intuitive - 'teach&go' user interface
- Live - LCD display for setup and live inspection feedback
- Versatile - up to seven inspection tools included
- Scalable - add controllers to add functionality
- Flexible - adjustable working distance and area

CE

## Ordering information

### Sets of sensor head and amplifier unit

| Type | NPN | PNP |
|---|---|---|
| Narrow view / Single function | ZFV-R1010 | ZFV-R1015 |
| Narrow view / Standard | ZFV-R1020 | ZFV-R1025 |
| Wide view / Single function | ZFV-R5010 | ZFV-R5015 |
| Wide view / Standard | ZFV-R5020 | ZFV-R5025 |

### Sensor heads

| Type | Working length | Sensing area | Model |
|---|---|---|---|
| Narrow view | 34 to 49 mm (variable) | 5x4.6 mm (HxV) to 9x8.3 mm (HxV) | ZFV-SR10 |
| Wide view | 38 to 194 mm (variable) | 10x9.2 mm (HxV) to 50x46 mm (HxV) | ZFV-SR50 |

### Amplifier units

| Type | Power supply | Output type | Model |
|---|---|---|---|
| Single function | 24 VDC ±10% | NPN | ZFV-A10 |
| | | PNP | ZFV-A15 |
| Standard | | NPN | ZFV-A20 |
| | | PNP | ZFV-A25 |

## Specifications

### Sensor heads

| Item | ZFV-SR10 (Narrow view) | ZFV-SR50 (Wide view) |
|---|---|---|
| Setting distance (L) | 34 to 49 mm | 38 to 194 mm |
| Detection range (H× V) | 5x4.6 mm to 9x8.3 mm | 10x9.2 mm to 50x46 mm |
| Guide light | Provided (center, sensing area) | |
| Built-in lens | Focus: f15.65 | Focus: f13.47 |
| Object lighting method | Pulse lighting | |
| Object light source | Eight red LEDs | |
| Sensing element | 1/3-inch CCD, partial scan | |
| Shutter | Electronic shutter, shutter time: 1/1,000 to 1/4,000 | |
| Degree of protection | IEC60529, IP65 | |

### Amplifier units

| Item | Single function models | | Multi function models | |
|---|---|---|---|---|
| | ZFV-A10 | ZFV-A15 | ZFV-A20 | ZFV-A25 |
| Output method | NPN | PNP | NPN | PNP |
| Inspection items | Pattern (PTRN), Brightness (BRGT) | | Patterns (PTRN), Brightness (BRGT), Area (AREA), Width (WID), Position (POSI), Count (CNT), Characters (CHAR) | |
| Teaching area | Rectangular, one area | | | |
| Teaching area size | • Pattern (PTRN), Brightness (BRGT): Any rectangular area (256x256 max.)<br>• Area (AREA), Width (WID), Position (POSI), Count (CNT), Characters (CHAR): Any rectangular area (full screen max.) | | | |
| Sensing area | Full screen | | | |
| Resolution | 468Hx432V max. | | | |
| Bank selection | Supported for 8 banks. | | | |
| Response time | Pattern (PTRN), Brightness (BRGT): High-speed: 4 ms, Standard: 8 ms, High-precision: 12 ms (not using partial scan)<br>Area (AREA), Width (WID), Position (POSI), Count (CNT), Characters (CHAR): 128 x 128: 15 ms max. | | | |
| Other functions | Control output switching: ON for OK or ON for NG<br>ON delay / OFF delay, One-shot output, 'ECO' mode | | | |
| Output signals | (1) Control output (OUTPUT), (2) Enable output (ENABLE), (3) Error output (ERROR) | | | |
| Input signals | (1) Simultaneous measurement input (TRIG) or continuous measurement input (TRIG), switched by using menu.<br>(2) Bank selection inputs (BANK1 to BANK3)<br>(3) Workpiece still teaching (TEACH) or workpiece moving teaching (TEACH), switched by using menu. | | | |

| Item | Single function models | | Multi function models | |
|---|---|---|---|---|
| | ZFV-A10 | ZFV-A15 | ZFV-A20 | ZFV-A25 |
| **Connecting to ZS-DSU** | Image logging trigger | Stores NG images or all images. | | |
| | Sampling rate | ZFV measurement cycle *1 | | |
| | Number of logged image | Logs up to 128 images in series | | |
| | Number of connected | 15 max. (ZFV: 5 Units max., ZS-LDC: 9 Units max., ZS-MDC *2: 1 Unit max.) | | |
| | External bank function | Amplifier unit setting data can be saved to the memory card as bank data.<br>Reading bank data enables bank switching. | | |
| **Sensor head interface** | Digital interface | | | |
| **Image display** | Compact TFT 1.8-inch LCD (Display dots: 557x234) | | | |
| **Indicators** | • Judgement result indicator (OUTPUT) • Inspection mode indicator (RUN) | | | |
| **Operation interface** | • Cursor keys (up, down, left, right) • Setting key (SET) • Escape key (ESC)<br>• Operating mode switching (slide switch) • Menu switching (slide switch)<br>• Teaching / Display switching key (TEACH/VIEW) | | | |
| **Power supply voltage** | 20.4 to 26.4 VDC (including ripple) | | | |
| **Current consumption** | 600 mA max. (with sensor head connected) | | | |

*1 This is the sampling rate when logging images. To log measurement data only, use the ZS-DSU settings.
*2 Image logging is not possible when the ZS-MDC is connected.

## Easy to use and highly efficient

The F150 offers the diverse measurement options of an image processing system but with the added benefits of fast start-up, easy operation via a graphical interface and an excellent price / value ratio. Easy-to-use on-screen dropdown menus allow fast and flexible parameter changes.

- Easy configuration with built in graphical user interface
- Variety of inspection tools: defect, pattern, rotation, edge, etc.
- 16 configurations can be stored in non-volatile memory
- One camera connection (two-camera option using two-camera unit)
- DeviceNet and PROFIBUS-DP models also available

CE

## Ordering information

| Name | | Model | Remarks |
|---|---|---|---|
| Controller | Serial version | F150-C10E-3 | NPN input / output |
| | Serial version | F150-C15E-3 | PNP input / output |
| | CompoBus/D version | F150-C10E-3-DRT | NPN input / output |
| | PROFIBUS version | F150-C15E-3-PRT | PNP input / output |
| Camera | Camera with intelligent lighting | F150-SLC20 | Field of view 20 mm□, adjustable |
| | | F150-SLC50 | Field of view 50 mm□, adjustable |
| | Camera with light | F150-SL20A | Field of view 20 mm□ |
| | | F150-SL50A | Field of view 50 mm□ |
| | Camera only | F150-S1A | 659Hx494V pixel |
| Extension unit | | F150-A20 | 2 camera extension unit |
| Monitor | | F150-M05L | 5.5" color TFT LCD |
| Console | | F150-KP | Standard console |
| Camera cable | | F150-VS | Cable length 3m *1 |
| Monitor cable | | F150-VM | Cable length 2m *1 |

*1 Other length on request

## Specifications

### Controller: F150-C10E-3/15E-3 and F150-C10E-3-DRT/-C15E-3-PRT

| | |
|---|---|
| **Number of connected cameras** | 1 unit / 2 units (using the F150-A20) |
| **Processing resolution** | 512Hx484V |
| **Number of scenes** | 16 scenes (can be saved to a computer through the RS-232C) |
| **Image memory function** | Up to 23 images can be saved |
| **Processing method** | Grey Levels (256) / Binary |
| **Image pre-processing** | Smoothing, edge enhancement, edge extraction, background cut-off |
| **Binary levels** | 256 levels (per measurement area) |
| **Position correction function** | Correction directions: X, Y, θ Detection modes: binary center of gravity / main axis angle, model position: middle point, edge position |
| **Number of measurement areas** | 16 areas/scene |
| **Measured data** | Area center of gravity, main axis angle, dark-light correlation value, dark-light search position, defect degree, edge position, edge number, density average, relative position |
| **Calculation functions** | Four arithmetic operations, distance, maximum value / minimum value, absolute value, others |
| **Result output** | Overall decision, computation result (decision) per measurement area, measurement / computation data (RS-232C and parallel output possible) |
| **Monitor** | 1 ch (supports pin jack and over-scan monitor) |
| **RS-232C** | 1 ch (Dsub 9-pin, female) |
| **CompoBus/D** | 1 ch (F150-C10E-3-DRT) |
| **PROFIBUS-DP** | 1 ch (F150-C15E-3-PRT) |
| **Parallel input / output** | F150-C10E-3 and F150-C15E-3: Inputs: 11 points, outputs: 21 points F150-C10E-3-DRT/-C15E-3-PRT: Inputs: 1 point, outputs: 5 points (including control inputs / outputs) |
| **Power supply voltage** | 20.4 to 26.4 VDC |

## Intelligent sensor with high speed image processing

The F160 offers all features of the F150, including quick start-up, simple operation and an excellent price / value ratio. The main difference is that image capture and processing are accelerated many times. New functions include OCR, rotation search, customizable display and many more.

- Two camera connections - high-speed image acquisition
- Accelerated processing algorithms for all inspection tools
- Optical character recognition / verification tool
- Compact flash slot for storage of data and images
- Configurable user interface and monitor output

CE

### Ordering information

| Name | | Model | Remarks |
|---|---|---|---|
| Controller | | F160-C10E-2 | NPN input / output |
| | | F160-C15E-2 | PNP input / output |
| Double-speed camera | Camera with intelligent lighting | F160-SLC20 | Field of view 20 mm □, adjustable |
| | | F160-SLC50 | Field of view 50 mm □, adjustable |
| | Camera only | F160-S1 | 659x494 pixel (HxV) |
| | | F160-S2 | With partial scan function. |
| Compatible F150 cameras | Camera with intelligent lighting | F150-SLC20 | Field of view 20 mm□, adjustable |
| | | F150-SLC50 | Field of view 50 mm□, adjustable |
| | Camera with light | F150-SL20A | Field of view 20 mm□ |
| | | F150-SL50A | Field of view 50 mm□ |
| | Camera only | F150-S1A | 659Hx494V pixel |
| Console | | F160-KP | Console with additional function keys |
| | | F150-KP | Standard console |
| Color LCD monitor | | F150-M05L | 5.5" color TFT LCD |
| Memory card | | F160-N64S(S) | Memory capacity 64 MB |
| Camera cable | | F150-VS | For double-speed camera and compatible F150 cameras. Cable length: 3 m *1 |
| Monitor cable | | F150-VM | Cable length: 2 m *1 |
| Parallel cable | | F160-VP | Loose-wire cable for parallel I/O connectors. Cable length: 2 m |

*1 Other length on request

### Specifications

**Controller: F160-C10E-2/-C15E-2**

| | | |
|---|---|---|
| **Connectable cameras** | F150-S1A/SL20A/SL50A/SLC20/SLC50, F160-S1/S2/SLC20/SLC50, etc. | |
| **Number of cameras connectable** | 1 | 2 |
| **Number of pixels** | 512Hx484V | |
| **Number of scenes** | 32 scenes (Expansion possible using memory card) | |
| **Image storage function** | Maximum of 35 images stored | |
| **Filtering** | Smoothing (strong / weak), edge enhancement, edge extraction (horizontal, vertical, both horizontal and vertical), dilation, erosion, median, background suppression | |
| **Position displacement compensation** | Compensation directions: X, Y, and θ (360°)directions<br>Detection methods: Binary center of gravity, axis angle, labeling, rotation search, gray search, edge position | |
| **Number of measurement regions** | 32 regions per scene | |
| **Measurement data** | Gravity and area, gravity and axis, gray search, precise search, rotation search, flexible search, relative search, defect, area (variable box), defect (variable box), edge position, edge pitch, edge width, density average, labeling, OCR for 1 character, classification | |
| **Data operation functions (expressions)** | Number: 32 expressions can be set for judgements, data, and variables used in other expressions.<br>Operations: Arithmetic operations, square root, absolute value, remainder, distance, angle, maximum, minimum, SIN, COS, ATAN, AND, OR, NOT | |
| **Functions for customizing operations** | Menu masking , password setting, shortcut keys | |
| **Functions for customizing screens** | Display items: Character strings (measured values, judgement results, times, user-specified characters, measurement region names)<br>Specified parameters: Display color, position, size | |
| **Number of slots for memory cards** | 1 | |
| **Monitor interface** | 1 channel (color, monochrome) | |
| **Serial communications** | RS-232C/22A 1 channel | |
| | 13 inputs and 22 outputs including control I/O points | |
| **Power supply voltage** | 20.4 to 26.4 VDC | |

## Compact hardware, high end software

The F210 contains powerful algorithms such as Edge Code, Fine Matching and OCR / OCV. Inspection tasks can be configured easily via the user-friendly GUI. A Macro Function for OEMs and system integrators allows customization through which nearly every system function can be manipulated.

- Enhanced flexibility using branching and conditional operations
- Two camera connections
- Fine Matching tool-for-print quality inspection
- Edge Code (EC) technology for high-precision inspections
- High-speed Character Recognition / Verification tool

CE

## Ordering information

| Name | | Model | Remarks |
|---|---|---|---|
| Controller | | F210-C10 | NPN input / output |
| | | F210-C15 | PNP input / output |
| Double-speed camera | Camera with intelligent lighting | F160-SLC20 | Field of view 20 mm □, adjustable |
| | | F160-SLC50 | Field of view 50 mm □, adjustable |
| | Camera only | F160-S1 | 659Hx494V pixel |
| | | F160-S2 | With partial scan function. |
| Compatible F150 cameras | Camera with intelligent lighting | F150-SLC20 | Field of view 20 mm□, adjustable |
| | | F150-SLC50 | Field of view 50 mm□, adjustable |
| | Camera with light | F150-SL20A | Field of view 20 mm□ |
| | | F150-SL50A | Field of view 50 mm□ |
| | Camera only | F150-S1A | 659Hx494V pixel |
| Console | | F160-KP | Console with additional function keys |
| | | F150-KP | Standard Console |
| Color LCD monitor | | F150-M05L | 5.5" color TFT LCD |
| Memory card | | F160-N64S(S) | Memory capacity 64 MB |
| Camera cable | | F150-VS | For double-speed camera and compatible F150 Cameras. Cable length: 3 m*1 |
| Monitor cable | | F150-VM | Cable length: 2 m*1 |
| Parallel cable | | F160-VP | Loose-wire cable for parallel I/O connectors. Cable length: 2 m |
| Application software | | F500-UM3ME | with macro function |
| | | F500-UM3FE | without macro function |

*1 Other length on request.

## Specifications

### Controller: F210-C10/-15

| | |
|---|---|
| **Connectable cameras** | F150-S1A/-SL20A/-SL50A/-SLC20/-SLC50, F160-S1/-S2/-SLC20/-SLC50, F300-S2R/-S3DR, etc. |
| **Number of cameras connectable** | 2 |
| **Number of pixels** | 512Hx484V |
| **Number of scenes** | 32 (Expansion possible using memory cards.) |
| **Image storage function** | Maximum of 35 images stored |
| **Filtering** | Smoothing (strong, weak), edge enhancement, edge extraction (horizontal, vertical, both), dilation, erosion, median, background suppression |
| **Operation and settings** | Installing measurement items using application software, and combining and setting measurement items by menu operations |
| **Trend monitor function** | Supported |
| **Memory card slots** | 1 |
| **Monitor interface** | 1 channel |
| **Serial communications** | RS-232C/22A: 1 channel |
| **Parallel I/O** | 13 inputs and 22 outputs |
| **Strobe interface** | 2 channels (included in parallel outputs) |
| **Power supply voltage** | 20.4 to 26.4 VDC |

## Speed, flexibility, accuracy

The F250 offers all inspection tools such as the F210, and in addition to that a hardware accelerated, ultra fast object location. 4 camera ports allow multiple inspection stations within one system. With an Ethernet interface, the F250 can communicate with almost every company computer system.

- Hardware accelerated inspection tools for extreme speed applications
- Four camera connections, Real-time object location tools
- Enhanced flexibility using branching and conditional operations
- 2 CF slots for data storage and logging
- Ethernet interface, 67 digital I/Os, RS-232C

CE

## Ordering information

| Name | | Model | Remarks |
|---|---|---|---|
| Controller | | F250-C50 | NPN Input/Output |
| | | F250-C55 | PNP Input/Output |
| Double-speed camera | Camera with intelligent lighting | F160-SLC20 | Field of view 20 mm □, adjustable |
| | | F160-SLC50 | Field of view 50 mm□, adjustable |
| | Camera only | F160-S1 | 659x494 pixel (HxV) |
| | | F160-S2 | Includes Partial Scan functionality |
| F150 Compatible cameras | Camera with intelligent lighting | F150-SLC20 | Field of view 20 mm□, adjustable |
| | | F150-SLC50 | Field of view 50 mm□, adjustable |
| | Camera with lighting | F150-SL20A | Field of view 20 mm□ |
| | | F150-SL50A | Field of view 50 mm□ |
| | Camera only | F150-S1A | 659Hx494V pixel |
| Console | | F160-KP | Console with additional function keys |
| | | F150-KP | Standard console |
| LCD monitor | | F150-M05L | 5.5" color TFT LCD |
| Memory card | | F160-N64S(S) | Memory capacity 64 MB |
| Application software | | F500-UM3ME | with Macro function |
| | | F500-UM3FE | without Macro function |
| Camera cable | | F150-VS | Length of cable for double-speed camera and F150 common camera: 3 m *1 |
| Monitor cable | | F150-VM | Cable length: 2 m *1 |
| Parallel cable | | F160-VP | Length of pigtail cable for parallel input / output connector: 2 m |

*1 Other length on request.

## Specifications

### Controller: F250-C50/55

| | |
|---|---|
| **Connected camera** | F150-S1A/SL20A/SL50A/SLC20/SLC50, F160-S1/S2/SLC20/SLC50 |
| **Number of connectable cameras** | 4 |
| **Processing resolution** | 512Hx484V |
| **Number of scenes** | 32 scenes (expansion possible using memory card) |
| **Image storage function** | Maximum 35 images |
| **Image pre-processing** | Smoothing (strong / weak), edge enhancement, edge extraction (horizontal, vertical, both), erosion, dilation, median, background deletion |
| **Operation and settings** | Install measurement routines from a software application, combine and establish settings for measurement routines from menus. |
| **Operation customization function** | Password function, short-cut key function |
| **Screen customization function** | Display items: Character strings (measured values, decisions, time, any character string, measurement area names), graphics (straight lines, rectangles, circles, cross-hair cursors)<br>Parameters specified: display color, postion, size |
| **Trend monitor function** | Yes |
| **Memory card slot** | 2 slots |
| **Monitor** | Composite video output: 1 CH, S-video output: 1 CH |
| **Ethernet** | 10Base-T 1CH |
| **Serial communication** | RS-232C/22A 1CH |
| **Parallel input / output** | Inputs: 21 points, outputs: 46 points |
| **Strobe** | 4 CH (included in parallel outputs) |
| **Power supply voltage** | 20.4 to 26.4 VDC |

## Ultimate power - high resolution, network - ready vision system

The F500 / F210ETN are network ready, digital vision systems. The optional software VisionComposerNET allows configuration and maintenance of a vision network from a central PC. For documentation or later audits, the system provides tools for logging images and results for later analysis.

- Two digital camera ports, high resolution (1 K x 1 K) with F500 ETN
- Advanced real time data logging and storage functions
- 10/100 Base TX Ethernet Port, USB, RS-232C/-422, 33 digital I/O
- Optional VisionComposerNET for remote configuration / maintenance
- Security tools, audit trail creation in security sensitive environment

CE

### Ordering information

| Name | | Model | Remarks |
|---|---|---|---|
| Controller | Standard resolution | F210-C10-ETN | NPN input / output |
| | Standard resolution | F210-C15-ETN | PNP input / output |
| | High resolution | F500-C10-ETN | NPN input / output |
| | High resolution | F500-C15-ETN | PNP input / output |
| Camera | 250 K Pixel | F210-S1 | For F210ETN only |
| | 1 M Pixel | F500-S1 | For F500ETN only |
| Monitor | | F150-M05L | 5.5" color TFT LCD |
| | | F150-M10L | 10.4" color TFT LCD |
| Console | | F150-KP | Standard console |
| | | F-160-KP | Console with additional function keys |
| Memory cards | | F160-N64S(S) | Memory capacity 64 MB |
| | | F160-N256S | Memory capacity 256 MB |
| PC-Software | | F500-CD | Optional remote configuration software (via ETN) |
| Application software | | F500-UM3ME | With macro function |
| | | F500-UM3FE | Without macro function |
| High precision lenses | | F500-LE16 | focal length 16 mm |
| | | F500-LE25 | focal length 25 mm |
| | | F500-LE50 | focal length 50 mm |
| Camera cable | | F500-VS2 | Available lenght 2 m, 5 m, 10 m |
| Monitor cable | | F500-VM | Cable length 2 m |
| Parallel cable | | F160-VP | Loose-wire cable for parallel I/O connectors. Cable length |

### Specifications

| Model | | F210-C10-ETN/-C15-ETN | F500-C10-ETN/-C15-ETN |
|---|---|---|---|
| **Connected camera** | | F210-S1 | F500-S1 |
| **No. of connectable cameras** | | 2 | 2 |
| **Processing resolution** | | 512Hx484V | 1024Hx1024V |
| **No. of scenes** | | 32 (can be increased using Memory Cards.) | |
| **Image memory function** | | 35 images max. | |
| **Storage** | | 64 MB non-volatile memory | 256 MB non-volatile memory |
| **Operation and settings** | | Measurement items installed using Applications Software.<br>Menu operations used to combine measurement items.<br>Vision Composer Net can be used for operation and settings. | |
| **Serial communications** | | USB series B: 1 channel, RS-232C/22: 1 channel | |
| **Network communications** | | Ethernet 100Base-TX/10Base-T | |
| **Parallel I/O** | | 11 inputs, 22 outputs | |
| **Monitor interface** | | Composite video output: 1 channel, S-VIDEO output: 1 channel | |
| **Memory card interface** | | Compact Flash card slot, 1 channel | |
| **Power supply voltage** | | 20.4 to 26.4 V DC | |

**System requirements for F500-CD3E Vision composer net**

| | | |
|---|---|---|
| **CPU** | | Pentium III 600 MHz min.(Pentium III 1 GHz min. recommended) |
| **OS** | | Windows 2000 Professional, Service Pack 4 or higher<br>Windows XP Home Edition, Service Pack 2 or higher<br>Windows XP Professional, Service Pack 2 or higher |
| **Memory** | | 192 MB min. (256 MB min. recommended) |
| **Hard disk** | | 300 MB min. available space |
| **Monitor** | | Resolution: 1,024x768 min. Display colors: High Color (16-bit) min. (True Color (32-bit) min. recommended) |
| **Network** | | 10BaseT-compliant network(100Base-TX recommended) |
| **Vision sensor** | **Controller** | F210-C10-ETN/F210-C15-ETN, F500-C10-ETN/F500-C15-ETN |
| | **Applications software** | F500-UM Version 3.00 or later |

## Fixed type reader solution for highly degraded codes

The V530-R160 2D-code reader is designed especially for reading direct marked codes on surfaces such as metal, plastic and glass. Its newly developed advanced algorithms allow reliable reading of codes made from dots (pin stamped), laser edged or ink jet.

- Reads direct marked Data Matrix and QR code
- Can read codes in all directions (360°)
- Trend monitoring, statistics functions for quality feedback
- Communication via RS-232C/-422 and 11 digital I/Os
- 2 camera connection

CE

### Ordering information

| Name | Model No. | Remarks |
|---|---|---|
| Controller | V530-R160E | Controller NPN input / output |
| | V530-R160EP | Controller PNP input / output |
| Console | F150-KP | Standard console |
| Camera | F150-S1A | 659Hx494V pixel |
| Camera cable | F150-VS | 3 m cable |
| Monitor cable | F150-VM | 2 m cable |
| Liquid crystal monitor | F150-M05L | Monitor 5.5" color TFT LCD |
| Parallel cable | F160-VP | Cable with loose wires for parallel I/O connector (2 m cable) |
| Memory card | F160-N64S(S) | Card capacity: 64 MB |
| RS-232C cable | XW2Z-200S-V | For IBM PC/AT or compatible computer (2 m cable) |
| | XW2Z-200T | For SYSMAC PLC (2 m cable) |

### Specifications

| Item | V530-R160E | V530-R160EP |
|---|---|---|
| **Input / output type** | NPN | PNP |
| **Applicable codes** | Data Matrix ECC200: 10 × 10 to 64 × 64, 8 × 18, 8 × 32, 12 × 26, 12 × 36, 16 × 36, 16 × 48<br>Data Matrix ECC000, ECC050, ECC080, ECC100, ECC140: 9 × 9 to 25 × 25<br>QR Code (Model 1, 2): 21 × 21 to 41 × 41 (Version 1 to 6) | |
| **Readable direction** | 360° | |
| **Number of pixels (resolution)** | 512Hx484V | |
| **Number of connectable cameras** | 2 max. | |
| **Image memory function** | Maximum of 35 images stored (internal memory in controller). | |
| **Operation method** | Selected from menu. | |
| **Processing method** | Gray | |
| **Memory card slot** | 1 | |
| **Monitor interface** | 1 channel (color / monochrome) | |
| **Serial communications** | RS-232C/22A, 1 channel | |
| **Parallel I/O** | 5 inputs: TRIG-A, TRIG-B, TRIG-C, TRIG-D, and RESET<br>6 outputs: RUN, ERROR, OK/NG, BUSY, GATE, and ALARM | |
| **Power supply voltage** | 20.4 to 26.4 VDC | |