OMRON

# M18 Cylindrical Photoelectric

# E3F2

## Threaded Cylindrical M18 Size Sensors with Built-in Amplifier



- Rugged stainless and nickel plated brass versions
- Chemical resistant, ABS resin case type
- Polarized models
- Compact and space-saving
- Long detection distance (7 m)
- DC switching types with connectors for easy maintenance
- Wide operating voltage range (10 to 30 VDC, or 24 to 240 VAC)
- Short-circuit and reverse connection protection (DC switching type)
- UL, CSA listed and CE marked

## Ordering Information

### ■ SENSORS

| Supply | Type | Connection | Output | Range | Housing | Part number |
|---|---|---|---|---|---|---|
| AC | Through-beam | Pre-leaded | Light-On | 3 m | Plastic | **E3F2-3Z1** |
| | | | Dark-On | | Plastic | **E3F2-3Z2** |
| | Retroreflective, Non-polarized | | Light-On | 2 m | Plastic | **E3F2-R2Z1** |
| | | | Dark-On | | Plastic | **E3F2-R2Z2** |
| | Diffuse | | Light-On | 100 mm | Plastic | **E3F2-DS10Z1N** |
| | | | Dark-On | | Plastic | **E3F2-DS10Z2N** |
| DC | Through-beam | Connector | NPN | 7 m | Plastic | **E3F2-7C4-P1** |
| | | | | | NPB | **E3F2-7C4-M1–C** |
| | | | | | SS | **E3F2-7C4-M1-S** |
| | | | PNP | | Plastic | **E3F2-7B4-P1** |
| | | | | | NPB | **E3F2-7B4-M1-C** |
| | | | | | SS | **E3F2-7B4-M1-S** |
| | Diffuse | | NPN | 10 cm | NPB | **E3F2-DS10C4-M1-C** |
| | | | | | SS | **E3F2-DS10C4-M1-S** |
| | | | | | Plastic | **E3F2-DS10C4-P1** |
| | | | | 30 cm | Plastic | **E3F2-DS30C4-P1** |

Note: NPB = Nickel plated brass; SS = Stainless steel

(This table continues on the next page.)

Ordering Information Table – continued from previous page

| Supply | Type | Connection | Output | Range | Housing | Part number |
|---|---|---|---|---|---|---|
| DC | Diffuse | Connector | PNP | 10 cm | NPB | **E3F2-DS10B4-M1-C** |
| | | | | | SS | **E3F2-DS10B4-M1-S** |
| | | | | | Plastic | **E3F2-DS10B4-P1** |
| | | | | 30 cm | Plastic | **E3F2-DS30B4-P1** |
| | Retroreflective, Non-polarized | | NPN | 2 m | Plastic | **E3F2-R2C4-P1** |
| | | | PNP | | Plastic | **E3F2-R2B4-P1** |
| | Retroreflective, Polarized | | NPN | | NPB | **E3F2-R2RC4-M1-C** |
| | | | | | SS | **E3F2-R2RC4-M1-S** |
| | | | PNP | | NPB | **E3F2-R2RB4-M1-C** |
| | | | | | SS | **E3F2-R2RB4-M1-S** |
| | Through-beam | Pre-leaded | NPN | 7 m | Plastic | **E3F2-7C4** |
| | | | | | NPB | **E3F2-7C4-C** |
| | | | | | SS | **E3F2-7C4-S** |
| | | | PNP | 7 m | Plastic | **E3F2-7B4** |
| | | | | | NPB | **E3F2-7B4-C** |
| | | | | | SS | **E3F2-7B4-S** |
| | Diffuse | | NPN | 10 cm | NPB | **E3F2-DS10C4-C** |
| | | | | | Plastic | **E3F2-DS10C4-N** |
| | | | | | SS | **E3F2-DS10C4–S** |
| | | | | 30 cm | Plastic | **E3F2-DS30C4** |
| | | | PNP | 10 cm | NPB | **E3F2-DS10B4-C** |
| | | | | | Plastic | **E3F2-DS10B4-N** |
| | | | | | SS | **E3F2-DS10B4-S** |
| | | | | 30 cm | Plastic | **E3F2-DS30B4** |
| | Retroreflective, Non-polarized | | NPN | 2 m | Plastic | **E3F2-R2C4** |
| | | | PNP | | Plastic | **E3F2-R2B4** |
| | Retroreflective, Polarized | | NPN | 2 m | NPB | **E3F2-R2RC4-C** |
| | | | | | SS | **E3F2-R2RC4-S** |
| | | | PNP | | NPB | **E3F2-R2RB4-C** |
| | | | | | SS | **E3F2-R2RB4-S** |

Note: NPB = Nickel plated brass; SS = Stainless steel

## ■ ACCESSORIES (ORDER SEPARATELY)

| Description | Part number |
|---|---|
| Sensor mounting bracket | **Y92E-B18** |
| Lens protector kit (glass plate, two gaskets and metal retainer) | **E39-F31** |
| Small corner cube reflector (38 H x 20 W x 11 D mm) | **E39-R3** |
| Adhesive backed reflector tape (10 H x 35 W x 0.7 D mm) | **E39-RSA** |
| Adhesive backed reflector tape (35 H x 40 W x 0.7 D mm) | **E39-RSB** |
| Mounting bracket for E39-R1 reflector | **E39-L7** |
| Right angle adapter for through-beam and retroreflective E3F2 sensors | **E39-RU1** |

## ■ CONNECTOR CORDSETS

| Connector type | Cable size | Length | Straight connector | Right angle connector |
|---|---|---|---|---|
| 4-wire DC Micro Change® connector | 22 AWG | 2 m (6.56 ft) | **Y96E-44SD2** | **Y96E-44RD2** |
| | | 5 m (16.40 ft) | **Y96E-44SD5** | **Y96E-44RD5** |
| | | 10 m (32.8 ft) | **Y96E-44SD10** | **Y96E-44RD10** |
| Robotic cable with M12 connector | | 2 m (6.56 ft) | **XS2F-D421-D80-R** | **XS2F-D422-D80-R** |
| | | 5 m (16.40 ft) | **XS2F-D421-G80-R** | **XS2F-D422-G80-R** |

## ■ REPLACEMENT PARTS

| Description | Part number |
|---|---|
| Reflector for E3F2-R2□4 retroreflective sensors | **E39-R1** |
| Two plastic M18 mounting nuts | **E3F-PHWS** |

# Specifications

## ■ DC SWITCHING MODELS

| Part number | | **E3F2-7C4-□, E3F2-7B4-□** | **E3F2-R2C4-□, E3F2-R2B4-□** | **E3F2-R2RC4-□, E3F2-R2RB4-□** | **E3F2-DS10C4-□, E3F2-DS10B4-□** | **E3F2-DS30C4-□, E3F2-DS30B4-□** |
|---|---|---|---|---|---|---|
| Method of detection | | Through-beam | Retroreflective | | Diffuse | |
| | | | Non-polarized | Polarized | | |
| Sensing range | | 7 m (22.96 ft) | 2 m (6.56 ft) | 2 m (6.56 ft) | 10 cm (3.94 in) | 30 cm (11.81 in) |
| Standard target | | 11 x 11 mm | 56 x 56 mm | | 5 x 5 cm 90% Kodak White Card | 10 x 10 cm 90% Kodak White Card |
| Supply voltage | | 10-30 VDC 10% maximum permissible ripple, peak-to-peak | | | | |
| Output | | NPN or PNP open collector, 100 mA, residual voltage 2 V max. at 100 mA | | | | |
| Current consumption | | 45 mA max. | 25 mA max. | | | |
| Response time | | 2.5 ms max. | | | | |
| Stabilization on Powerup | | 50 ms | | | | |
| Ambient temperature | Operating | –25°C to 55°C (–13°F to 131°F) with no icing | | | | |
| | Storage | –30°C to 70°C (–22°F to 158°F) | | | | |
| Ambient light immunity | | Incandescent: 3,000 ℓx; Sunlight: 10,000 ℓx | | | | |
| Relative humidity | Operating | 35% to 85% RH, no condensation | | | | |
| | Storage | 35% to 95% RH | | | | |
| Insulation resistance | | 20 MΩ at 500 VDC | | | | |
| Dielectric strength | | 1,000 VAC, 50/60 Hz for 1 min. between current carrying parts and case | | | | |
| Vibration | | 10 to 55 Hz 1.5 mm double amplitude 1 hr each in X, Y, Z axes | | | | |
| Shock | | 500 m/s$^2$ (approx. 50 G) | | | | |
| Enclosure | | IP67, NEMA 6 for metal versions; IP66 NEMA, 4 for plastic versions | | | | |
| Light source | | Infrared LED | | Red LED | Infrared LED | |
| Indicators | | Power and light received LEDs | | | | |
| Sensitivity adjustment | | Fixed | | | | Adjustable |
| Operation mode | | Light-ON or Dark-ON selectable with control wire | | | | |
| Weight | Metal | Pre-leaded 100 g; connector: 60 g | | | | |
| | Plastic | Pre-leaded 85 g; connector: 40 g | | | | |
| Circuit protection | | Output short-circuit and reverse polarity | | | | |
| Materials | Lens | Plastic | | | | |
| | Housing | Plastic (ABS), nickel plated brass, stainless steel | Plastic | Nickel plated brass, stainless steel | Plastic (ABS), nickel plated brass, stainless steel | |
| | Cable sheath | PVC | | | | |

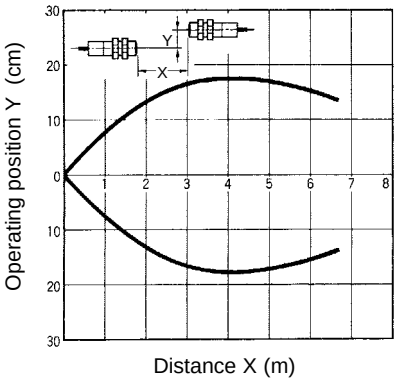
## ■ AC MODELS

| Part number | | E3F2-3Z1, E3F2-3Z2 | E3F2-R2Z1, E3F2-R2Z2 | E3F2-DS10Z1N, E3F2-DS10Z2N |
|---|---|---|---|---|
| Method of detection | | Through-beam | Retroreflective | Diffuse |
| Sensing range | | 3 m (9.84 ft) | 2 m (6.56 ft) | 10 cm (3.94 in) |
| Standard target | | 11 mm | 56 mm | 10 x 10 cm 90% Kodak white card |
| Supply voltage | | 24–240 VAC ±10%, 50/60 Hz | | |
| Output | | SCR 200 mA max.; residual voltage 5 V max. at 200 mA | | |
| Power consumption | | 10 mA max. | 5 mA max. | |
| Response time | | 30 ms max. | | |
| Stabilization on Powerup | | 100 ms | | |
| Ambient temperature | Operating | –25°C to 55°C (–13°F to 131°F) with no icing | | |
| | Storage | –30°C to 70°C (–22°F to 158°F) | | |
| Ambient light immunity | | Incandescent: 3,000 ℓx; sunlight: 10,000 ℓx | | |
| Relative humidity | Operating | 35% to 85% RH, no condensation | | |
| | Storage | 35% to 95% RH | | |
| Insulation resistance | | 20 MΩ at 500 VDC between current carrying parts and case | | |
| Dielectric strength | | 1,500 VAC, 50/60 Hz for 1 min. between current carrying parts and case | | |
| Vibration | | 10 to 55 Hz 1.5 mm double amplitude 2 hrs each in X, Y, Z axes | | |
| Shock | | 500 $m/s^2$ (approx. 50 G) | | |
| Enclosure | | IP66, NEMA 1, 2, 4 (indoor) | | |
| Light source | | Infrared LED | | |
| Indicators | | Power and light received LEDs | | |
| Sensitivity adjustment | | Fixed | | |
| Operation mode | | Light-ON (Z1 models) or Dark-ON (Z2 models) | | |
| Weight | Pre-leaded models | 110 g | | |
| | Connector models | 55 g | | |
| Circuit protection | | — | | |
| Materials | Lens | Acrylate resin | | |
| | Housing | Plastic ABS | | |
| | Cable sheath | PVC | | |

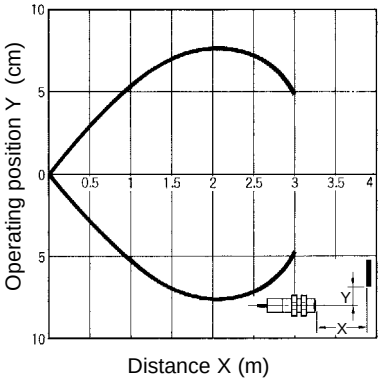
# Engineering Data

## ■ OPERATING RANGE (TYPICAL)

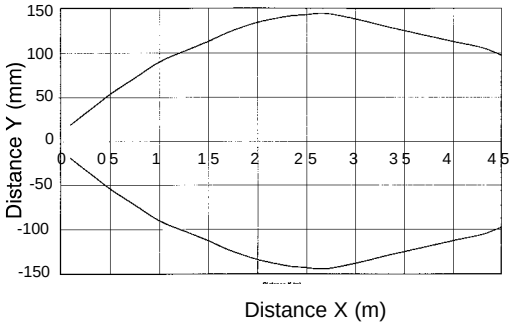
**E3F2-3□□-□□ (Through-beam)**



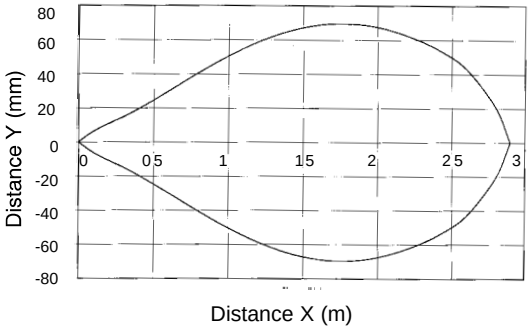

**E3F2-R2□□-□□ (Retroreflective)**



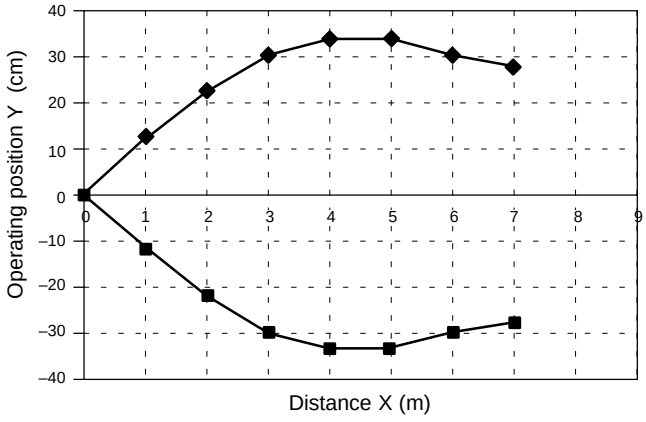

**E3F2-3 and E39-RU1 (Right angle adapter)**



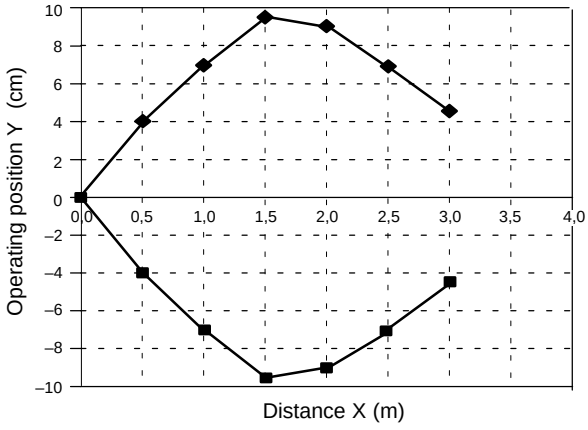

**E3F2-R2 and E39-RU1 (Right angle adapter)**



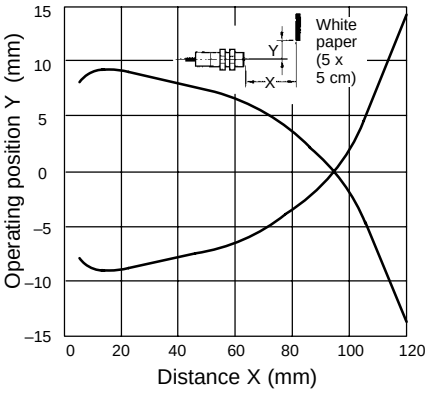

**E3F2-7□-4□ (Through-beam)**



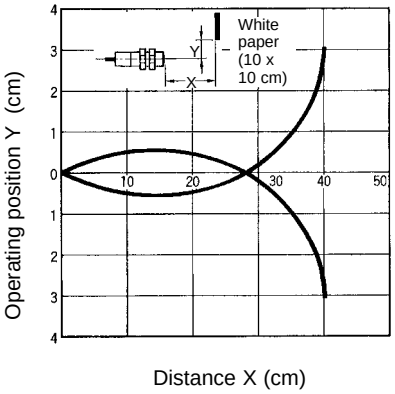

**E3F2-R2R□-4□ (Polarized, retroreflective)**



**E3F2-DS10□4-N**
**E3F2-DS10□4-P1**

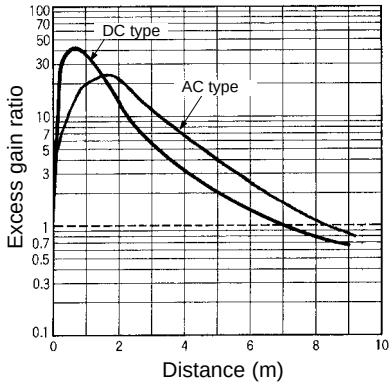



**E3F2-DS30□□-□□ (Diffuse)**

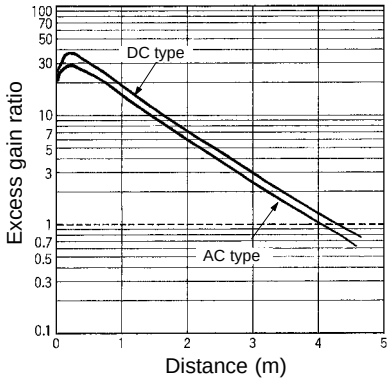



## ■ EXCESS GAIN VS. SET DISTANCE (TYPICAL)

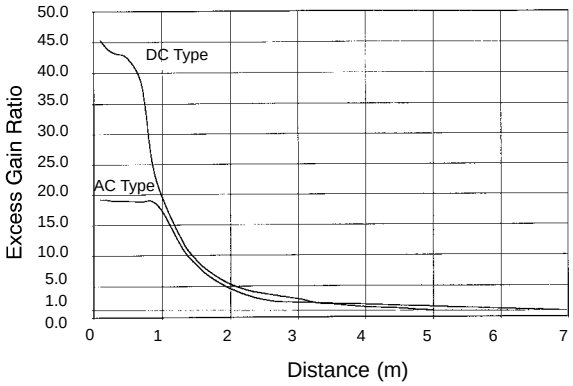
**E3F2-3□□-□□ (Through-beam)**



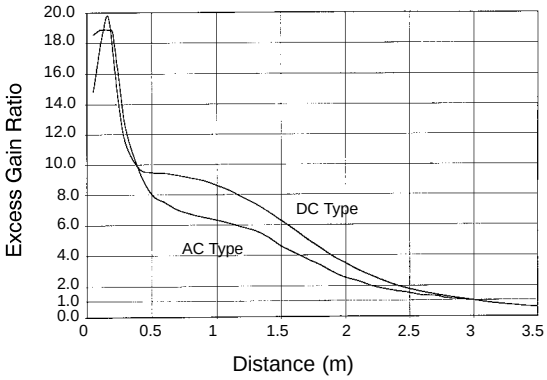

**E3F2-R2□□-□□ (Retroflective, Non-polarized)**



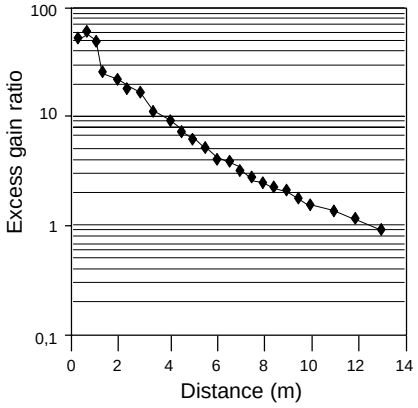

**E3F2-3 and E39-RU1 (Right angle adapter)**



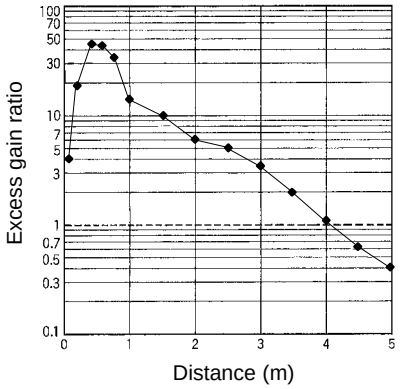

**E3F2-R2 and E39-RU1 (Right angle adapter)**



**E3F2-7□4-□ (Through beam)**

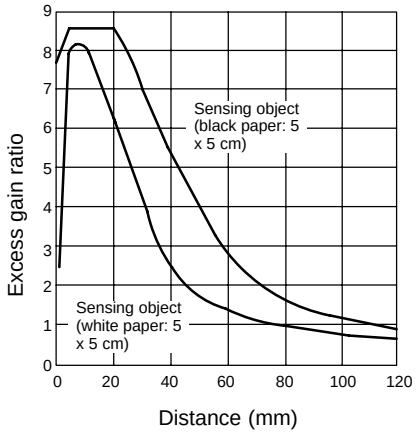



**E3F2-R2R□4-□ (Polarized retroreflective)**

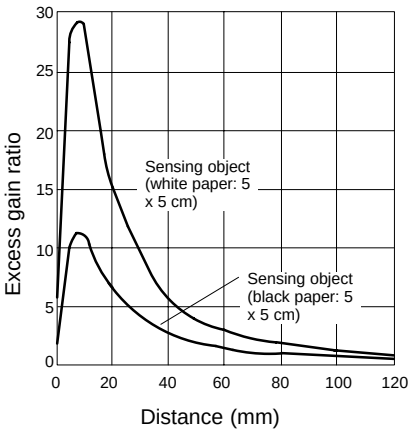



## ■ EXCESS GAIN VS. SET DISTANCE

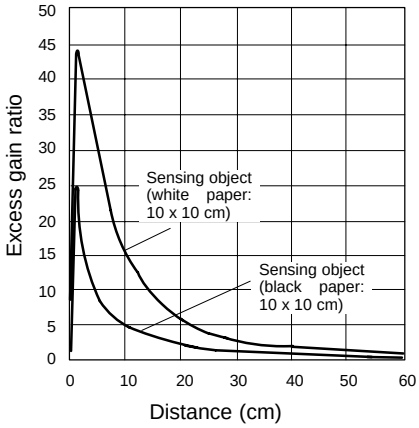
**E3F2-DS10Z□-N**




**E3F2-DS10□4-N**
**E3F2-DS10□4-P1**

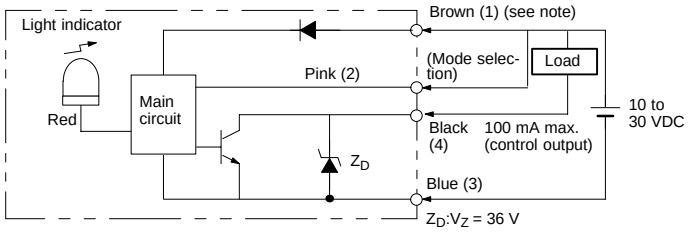
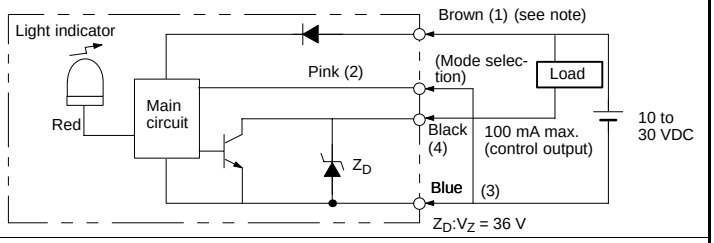
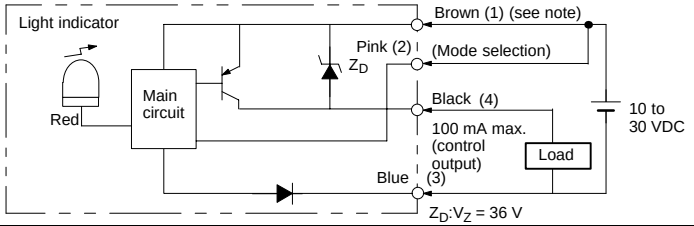
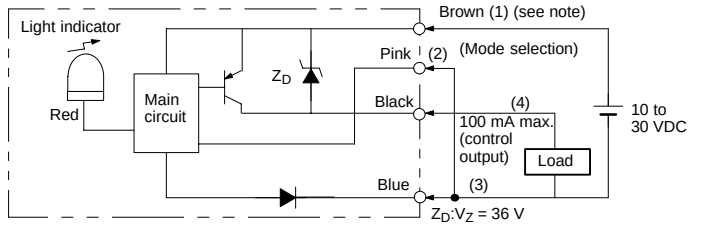
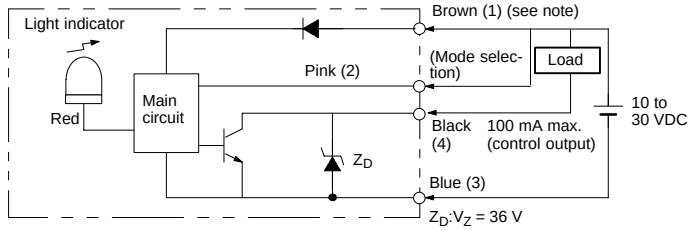
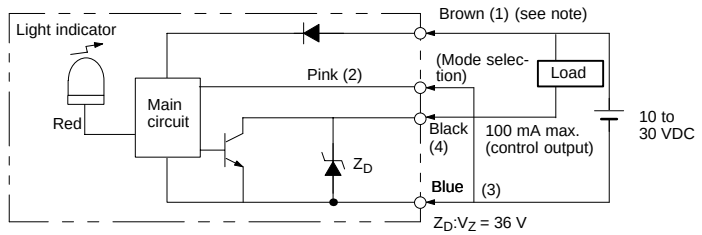



**E3F2-DS30□4**
**E3F2-DS30□4-P1**



# Operation

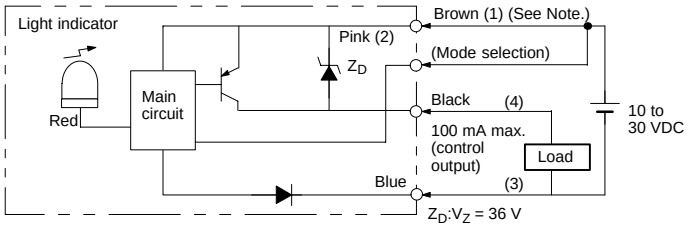
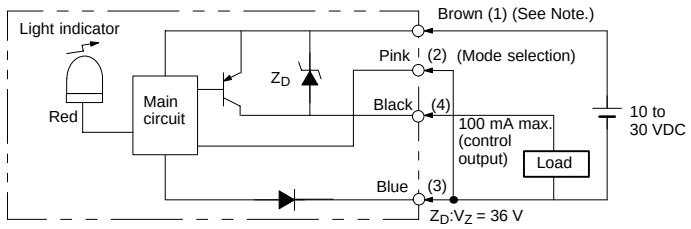
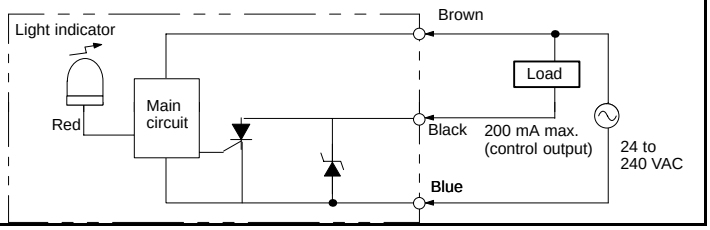
## ■ OUTPUT CIRCUITS

| Configuration | Model | Connection method | Output transistor | Output circuit |
|---|---|---|---|---|
| NPN pre-wired | E3F2-7C4<br>E3F2-7C4-M<br>E3F2-7C4-C<br>E3F2-7C4-S<br>E3F2-R2C4<br>E3F2-R2RC4-M<br>E3F2-R2RC4-C<br>E3F2-R2RC4-S<br>E3F2-DS10C4-N<br>E3F2-DS10C4-M<br>E3F2-DS10C4-C<br>E3F2-DS10C4-S<br>E3F2-DS30C4<br>E3F2-DS30C4-M<br>E3F2-DS30C4-S | Connect the pink and brown wires or open the pink wire. | ON when light is incident. (Light-ON) |  |
| | | Connect the pink and blue wires. | ON when light is interrupted. (Dark-ON) |  |
| PNP pre-wired | E3F2-7B4<br>E3F2-7B4-M<br>E3F2-7B4-C<br>E3F2-7B4-S<br>E3F2-R2B4<br>E3F2-R2RB4-M<br>E3F2-R2RB4-C<br>E3F2-R2RB4-S<br>E3F2-DS10B4-N<br>E3F2-DS10B4-M<br>E3F2-DS10B4-C<br>E3F2-DS10B4-S<br>E3F2-DS30B4<br>E3F2-DS30B4-M<br>E3F2-DS30B4-S | Connect the pink and brown wires or open the pink wire. | ON when light is incident. (Light-ON) |  |
| | | Connect the pink and blue wires. | ON when light is interrupted. (Dark-ON) |  |
| NPN connector | E3F2-7C4-P1<br>E3F2-7C4-M1-M<br>E3F2-7C4-M1-C<br>E3F2-7C4-M1-S<br>E3F2-R2C4-P1<br>E3F2-R2RC4-M1-M<br>E3F2-R2RC4-M1-C<br>E3F2-R2RC4-M1-S<br>E3F2-DS10C4-P1<br>E3F2-DS10C4-M1-M<br>E3F2-DS10C4-M1-C<br>E3F2-DS10C4-M1-S<br>E3F2-DS30C4-P1<br>E3F2-DS30C4-M1-M<br>E3F2-DS30C4-M1-S | Connect the pink and brown wires or open the pink wire. | ON when light is incident. (Light-ON) |  |
| | | Connect the pink and blue wires. | ON when light is interrupted. (Dark-ON) |  |

Note: Terminal numbers are for connector types.

(This table continues on the next page.)

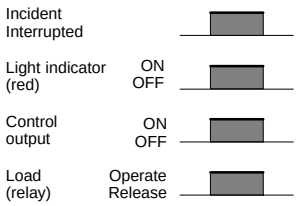
Operation Table – continued from previous page

| Configuration | Model | Connection method | Output transistor | Output circuit |
|---|---|---|---|---|
| PNP connector | E3F2-7B4-P1<br>E3F2-7B4-M1-M<br>E3F2-7B4-M1-C<br>E3F2-7B4-M1-S<br>E3F2-R2B4-P1<br>E3F2-R2RB4-M1-M<br>E3F2-R2RB4-M1-C<br>E3F2-R2RB4-M1-S<br>E3F2-DS10B4-P1<br>E3F2-DS10B4-M1-M<br>E3F2-DS10B4-M1-C<br>E3F2-DS10B4-M1-S<br>E3F2-DS30B4-P1<br>E3F2-DS30B4-M1-M<br>E3F2-DS30B4-M1-S | Connect the pink and brown wires or open the pink wire. | ON when light is incident. (Light-ON) |  |
| | | Connect the pink and blue wires. | ON when light is interrupted. (Dark-ON) |  |
| AC switching | E3F2-3Z1<br>E3F2-R2Z1<br>E3F2-DS10Z1-N | --- (Fixed) | ON when light is incident. (Light-ON) |  |
| | E3F2-3Z2<br>E3F2-R2Z2<br>E3F2-DS10Z2-N | | ON when light is interrupted. (Dark-ON) | |

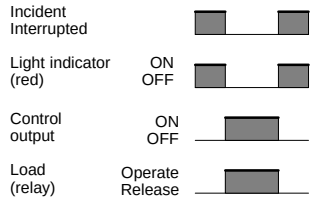
Note: Terminal numbers are for connector types.

## ■ TIMING CHART

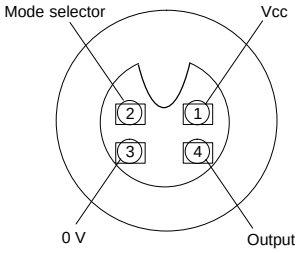
**Light-ON Mode**




**Dark-ON Mode**



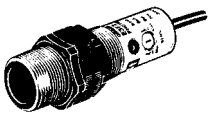

**Terminals/Connections**



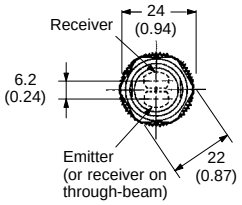
# Dimensions

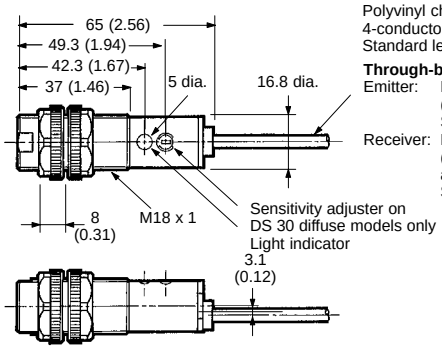
Unit: mm (inch)

## ■ PRE-LEADED DC MODELS



**E3F2-7□4-□**
**E3F2-DS10□4-□**
**E3F2-DS30□4**
**E3F2-R2□4**
**E3F2-R2R□4-□**



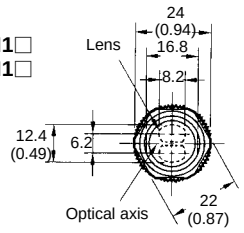



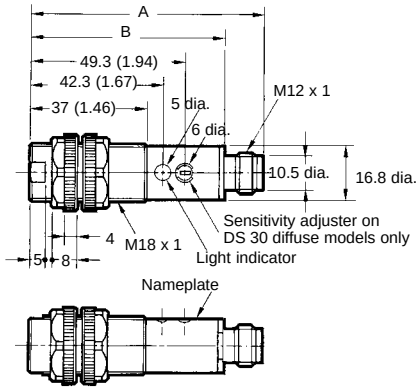

**Diffuse and Retroreflective (DC)**
Polyvinyl chloride-covered cord, 4-mm dia. (18/0.12), 4-conductor (brown, blue, black, and pink)
Standard length: 2 m

**Through-beam (DC)**
Emitter: Polyvinyl chloride-covered cord, 4-mm dia. (18/0.12), 2-conductor (brown and blue)
Standard length: 2 m
Receiver: Polyvinyl chloride-covered cord, 4-mm dia. (18/0.12), 4-conductor (brown, blue, black, and pink)
Standard length: 2 m

## ■ CONNECTOR DC MODELS

**E3F2-7L-P1**
**E3F2-7D-P1**
**E3F2-7C4-P1, -M1-□**
**E3F2-DS10□4-P1, -M1□**
**E3F2-DS30□4-P1, -M1□**
**E3F2-R2□-P1**
**E3F2-R2R□-M1-□**

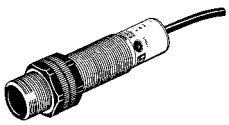


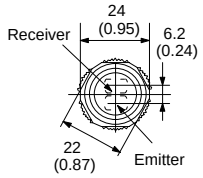



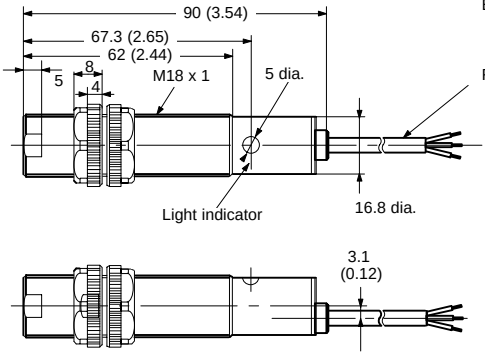

| | Metal body | Plastic body |
|---|---|---|
| | E3F2-DS□□□□-□1 | E3F2-DS30□4-P1 |
| A | 76 (2.99) | 73 (2.87) |
| B | 65.5 (2.58) | 61.7 (2.43) |

## ■ AC MODELS

**E3F2-3Z1, E3F2-3Z2**
**E3F2-R2Z1, E3F2-R2Z2**
**E3F2-DS10Z1-N,**
**E3F2-DS10Z2-N**





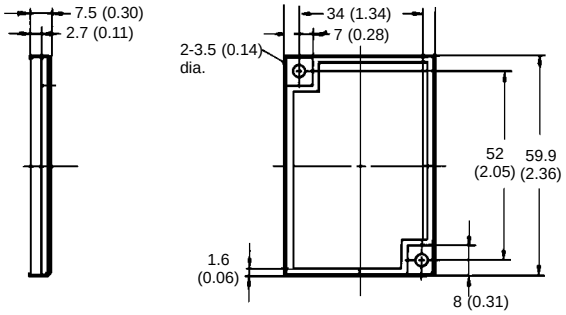




**Through-beam (AC)**
Emitter: Polyvinyl chloride-covered cord, 4-mm dia. (11/0.16), 2-conductor (brown and blue)
Standard length: 2 m
Receiver: Polyvinyl chloride-covered cord, 4-mm dia. (11/0.16), 3-conductor (brown, blue, and black)
Standard length: 2 m

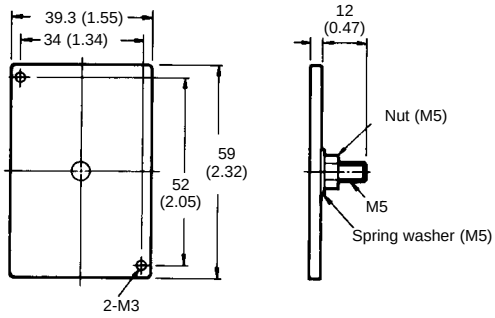
**Diffuse and Retroreflective (AC)**
Vinyl insulated round cord, 4-mm dia. (11/0.16), 3-conductor (brown, blue, and black)
Standard length: 2 m

## ■ ACCESSORIES

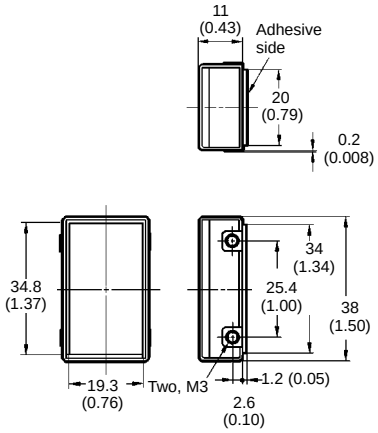
**E39-R1 Reflector (included with retroreflective units)**



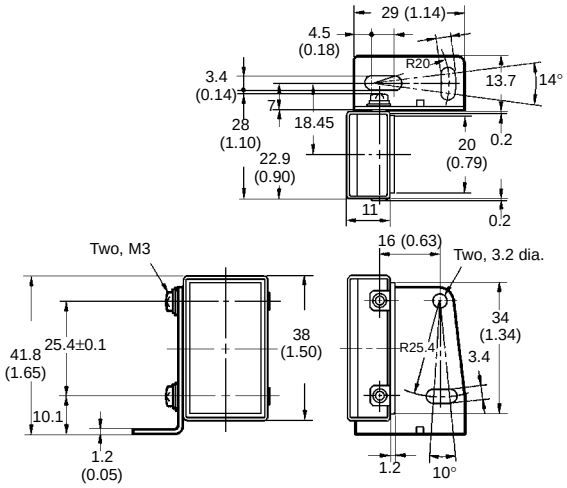

**E39-L7 Reflector Adapter (order separately)**



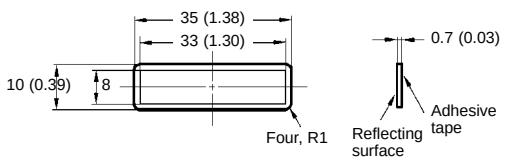

**E39-R3 Reflector (order separately)**



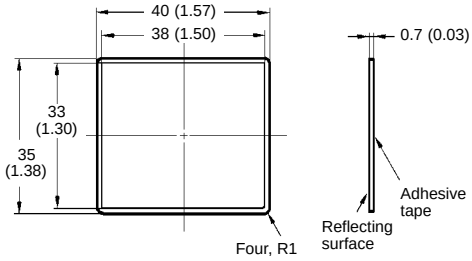

**Mounting Bracket for E39-R3 (included with E39-R3)**



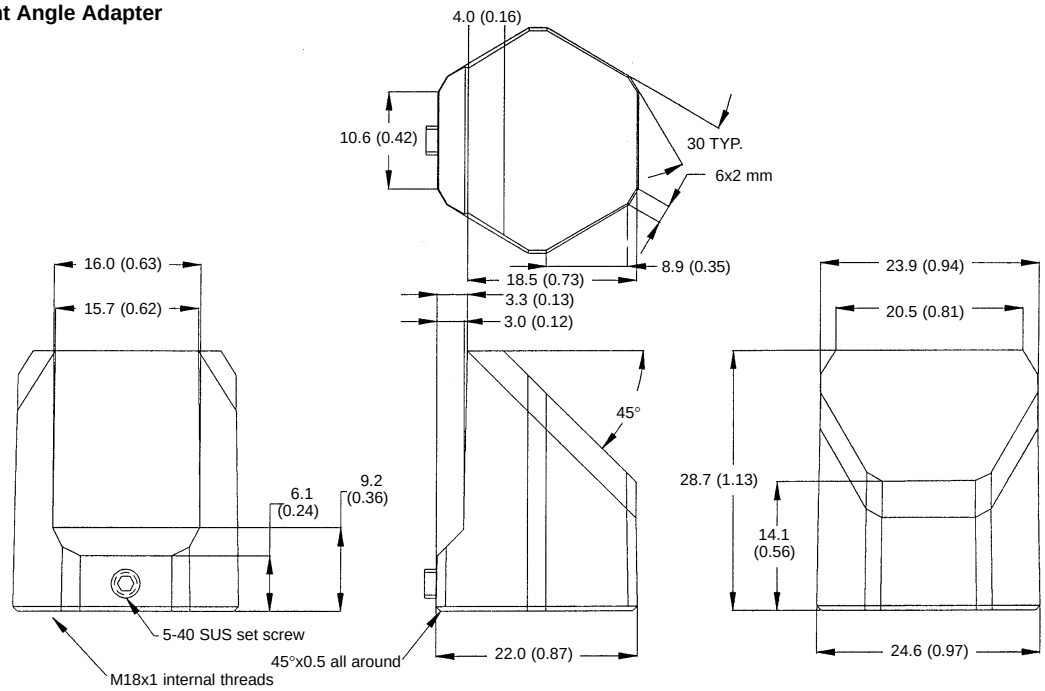
**E39-RSA Reflector**




**E39-RSB Reflector**




**E39-RU1 Right Angle Adapter**

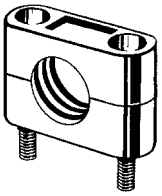


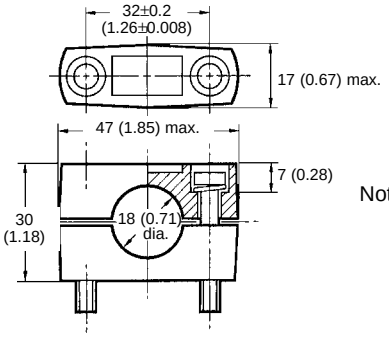

**Mounting E39-RU1**

Do not exceed a torque value of 20 kg • cm (2.0 N • m, 17.4 in • lbs) when tightening the adapter onto the sensor.

Use a 1/16” (1.5 mm) hex key on the set screw to secure the adapter to the E3F2. Do not exceed a torque of 3.5 kg • cm (0.35 N • m, 3.0 in • lbs). When set properly, the set screw will still extend beyond the adapter wall. Make sure to loosen the set screw before removing the adapter from the sensor.

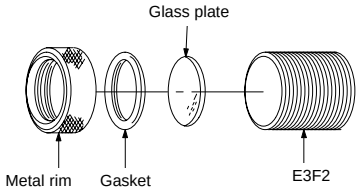
**Y92E-B18 Mounting Bracket**

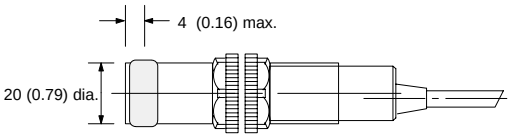





Note: Hexagonal nut: M5 x 32
Material: plastic

**E39-F31 Lens Cap**

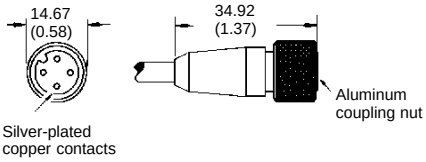



## ■ OPTIONAL CONNECTOR CABLES

### Straight Connector Cable

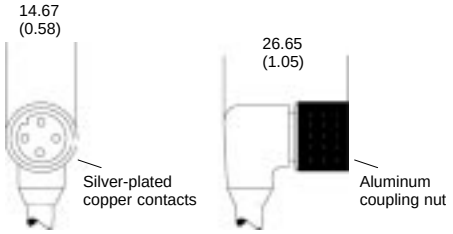
**Y96E-44SD□**




22 AWG, PVC jacketed cable rated for 300 V, 90°C:
2 m (6.56 ft) length for Y96E-44SD2
5 m (16.40 ft) length for Y96E-44SD5
10 m (32.81 ft) length for Y96E-44SD10

### Right Angle Connector Cable

**Y96E-44RD□**

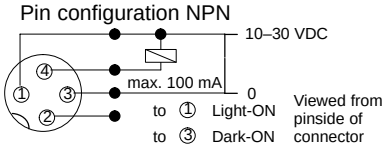



22 AWG, PVC jacketed cable rated for 300 V, 90°C:
2 m (6.56 ft) length for Y96E-44RD2
5 m (16.40 ft) length for Y96E-44RD5
10 m (32.81 ft) length for Y96E-44RD10

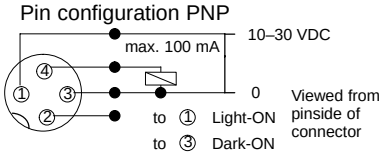
Note: Cable may be extended to a maximum of 200 m (656 ft.)

### Terminals/Connections

Pin configuration NPN

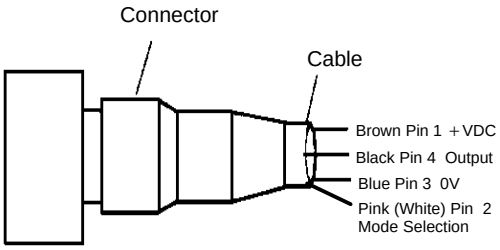



Pin configuration PNP




### Assembly Directions

Insert the M12 threaded end of the sensor into socket of connector so that the notch correctly aligns the pins. Tighten the coupling nut by hand, not using a tool, until all the threads on the rear of the sensor are covered. This assures a positive connection, important for installations with vibration.



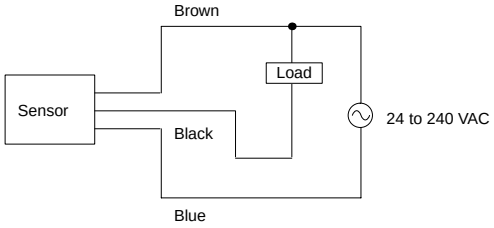

Note: Water tightness with connector is only valid when authorized connections are used. Cordset wire colors are shown in parentheses.

# Precautions

If the input/output lines of the Photoelectric Sensor are placed in the same conduit or duct as power lines or high-voltage lines, the Photoelectric Sensor could be induced to malfunction, or even be damaged, by electrical noise. Separate the wiring, or use shielded lines as input/output lines to the Photoelectric Sensor.

Do not subject the Photoelectric Sensor to excessive shock when mounting, in keeping with IEC60529 IP66 standards.

Do not connect the black wire to the brown wire without a load. Direct connection of these wires may damage the Photoelectric Sensor (AC switching type).

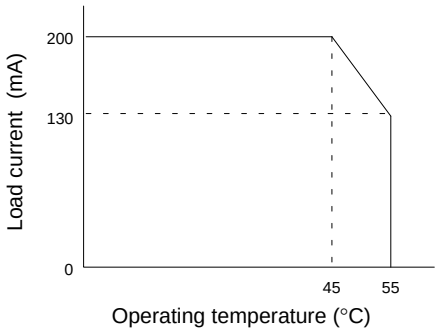



**⚠ WARNING**

The E3F2 Photoelectric Sensor is not a safety component for ensuring the safety of people which is defined in EC Directive (91/368/EEC) and covered by separate European standards or by any other regulations or standards.

When using the Photoelectric Sensor in the vicinity of an inverter motor, be sure to connect the ground wire of the motor to earth. Failure to ground the motor may result in malfunction of the Sensor.

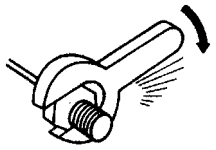
When using the Photoelectric Sensor at temperatures over 45°C, the load current must be within the rated value shown in the figure below.




## ■ MOUNTING

Do not exceed a torque of

- 2.0 N • m {20 kgf • cm} 17.7 in • lb when tightening mounting nuts for plastic models.
- 20.0 N • m {200 kgf • cm} 177 in • lb when tightening mounting nuts for metal models.



**NOTE: DIMENSIONS SHOWN ARE IN MILLIMETERS. To convert millimeters to inches divide by 25.4.**

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## Перечень производителей, продукцию которых мы поставляем на российский рынок



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С удовольствием будем прорабатывать для Вас поставки всех необходимых компонентов по текущим запросам для скорейшего выявления групп элементов, по которым сотрудничество именно с нашей компанией будет для Вас максимально выгодным!

С уважением,

Менеджер отдела продаж ООО

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