

E3FA/E3RA/E3FB/E3RB

Ordering Information



Sensors (E3FA Plastic housing) [Refer to Dimensions on page 16.]

Red light Infrared light

Sensor type	Sensing distance	Connection method	Model	
			NPN output	PNP output
Through-beam *1. 	20 m	pre-wired	set E3FA-TN11 2M Emitter E3FA-TN11-L 2M Receiver E3FA-TN11-D 2M	set E3FA-TP11 2M Emitter E3FA-TP11-L 2M Receiver E3FA-TP11-D 2M
		M12 connector	set E3FA-TN21 Emitter E3FA-TN21-L Receiver E3FA-TN21-D	set E3FA-TP21 Emitter E3FA-TP21-L Receiver E3FA-TP21-D
	15 m	pre-wired	set E3FA-TN12 2M Emitter E3FA-TN12-L 2M Receiver E3FA-TN12-D 2M	set E3FA-TP12 2M Emitter E3FA-TP12-L 2M Receiver E3FA-TP12-D 2M
		M12 connector	set E3FA-TN22 Emitter E3FA-TN22-L Receiver E3FA-TN22-D	set E3FA-TP22 Emitter E3FA-TP22-L Receiver E3FA-TP22-D
Retro-reflective with MSR function *2. 	0.1 to 4 m with E39-R1S	pre-wired	E3FA-RN11 2M	E3FA-RP11 2M
		M12 connector	E3FA-RN21	E3FA-RP21
Coaxial Retro-reflective with MSR function *2. 	0 to 500 mm with E39-R1S	pre-wired	E3FA-RN12 2M	E3FA-RP12 2M
		M12 connector	E3FA-RN22	E3FA-RP22
Diffuse-reflective 	100 mm	pre-wired	E3FA-DN11 2M	E3FA-DP11 2M
		M12 connector	E3FA-DN21	E3FA-DP21
	300 mm	pre-wired	E3FA-DN12 2M	E3FA-DP12 2M
		M12 connector	E3FA-DN22	E3FA-DP22
	1 m	pre-wired	E3FA-DN13 2M	E3FA-DP13 2M
		M12 connector	E3FA-DN23	E3FA-DP23
	100 mm	pre-wired	E3FA-DN14 2M	E3FA-DP14 2M
		M12 connector	E3FA-DN24	E3FA-DP24
	300 mm	pre-wired	E3FA-DN15 2M	E3FA-DP15 2M
		M12 connector	E3FA-DN25	E3FA-DP25
	1 m	pre-wired	E3FA-DN16 2M	E3FA-DP16 2M
		M12 connector	E3FA-DN26	E3FA-DP26
BGS (background suppression) 	100 mm	pre-wired	E3FA-LN11 2M	E3FA-LP11 2M
		M12 connector	E3FA-LN21	E3FA-LP21
	200 mm	pre-wired	E3FA-LN12 2M	E3FA-LP12 2M
		M12 connector	E3FA-LN22	E3FA-LP22
Limited distance reflective 	10 to 50 mm	pre-wired	E3FA-VN11 2M	E3FA-VP11 2M
		M12 connector	E3FA-VN21	E3FA-VP21
Transparent detected with P-opaqing function *2. 	100 to 500 mm with E39-RP1	pre-wired	E3FA-BN11 2M	E3FA-BP11 2M
		M12 connector	E3FA-BN21	E3FA-BP21
Transparent detected with P-opaqing function *2. 	0.1 to 2 m with E39-RP1	pre-wired	E3FA-BN12 2M	E3FA-BP12 2M
		M12 connector	E3FA-BN22	E3FA-BP22

*1. The set type includes the emitter and receiver.

*2. The Reflector is sold separately. Select the Reflector model most suited to the application.

E3FA/E3RA/E3FB/E3RB

Ratings and Specifications

Straight type (E3FA/E3FB)

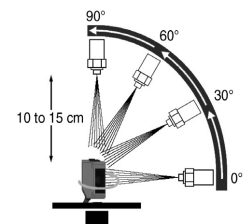
Model	Sensing method		Through-beam		Retro-reflective with MSR function	Coaxial Retro-reflective with MSR function
	NPN output	Pre-wired M12 Connector	E3F□-TN11 2M	E3FA-TN12 2M	E3F□-RN11 2M	E3F□-RN12 2M
Item	PNP output	Pre-wired M12 Connector	E3F□-TP11 2M	E3FA-TP12 2M	E3F□-RP11 2M	E3F□-RP12 2M
			E3F□-TP21	E3FA-TP22	E3F□-RP21	E3F□-RP22
Sensing distance			20 m	15 m	0.1 to 4 m (with E39-R1S)	0 to 500 mm (with E39-R1S)
Spot diameter (reference value)			—			
Standard sensing object			Opaque: 7 mm dia.min.		Opaque: 75 mm dia.min.	
Differential travel			—			
Directional angle			2° min.			
Light source (wavelength)			Red LED (624 nm)	Infrared LED (850 nm)	Red LED (624 nm)	
Power supply voltage			10 to 30 VDC (include voltage ripple of 10%(p-p) max.)			
Current consumption			40 mA max. (Emitter 25 mA max. Receiver 15 mA max.)		25 mA max.	
Control output			NPN/PNP (open collector) Load current: 100 mA max. (Residual voltage: 3 V max.), Load power supply voltage: 30 VDC max.			
Operation mode			Light-ON/Dark-ON selectable by wiring			
Indicator			Operation indicator (orange) Stability indicator (green) Power indicator (green): only Emitter of Through-beam			
Protection circuits			Power supply reverse polarity protection, Output short-circuit protection, and Output reverse polarity protection			
Response time			0.5 ms			
Sensitivity adjustment			One-turn adjuster			
Ambient illumination (Receiver side)			Incandescent lamp: 3,000 lx max./ Sunlight: 10,000 lx max.			
Ambient temperature range			Operating: -25 to 55°C/ Storage: -30 to 70°C (with no icing or condensation)			
Ambient humidity range			Operating: 35 to 85%/ Storage: 35 to 95% (with no condensation)			
Insulation resistance			20 MΩ min. at 500 VDC			
Dielectric strength			1,000 VAC at 50/60 Hz for 1 min. between current-carrying parts and case			
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			IEC: IP67, DIN 40050-9: IP69K *			
Weight (packed state/only sensor)	Pre-wired cable (2M)		E3FA: Approx. 110 g/ Approx. 50 g, respectively, E3FB: Approx. 175 g/ Approx. 65 g, respectively		E3FA: Approx. 60 g/ Approx. 50 g, E3FB: Approx. 95 g/ Approx. 65 g	
	Connector		E3FA: Approx. 30 g/ Approx. 10 g, respectively, E3FB: Approx. 85 g/ Approx. 20 g, respectively		E3FA: Approx. 20 g/ Approx. 10 g, E3FB: Approx. 50 g/ Approx. 20 g	
Material	Case		E3FA: ABS, E3FB: Nickel-brass			
	Lens and Display		PMMA			
	Adjuster		POM			
	Nut		E3FA: POM, E3FB: Nickel-brass			
Accessories			Instruction sheet M18 nuts (4 pcs)		Instruction sheet M18 nuts (2 pcs)	

* IP69K Degree of Protection Specifications

IP69K is a protection specification stipulated by DIN 40050 Part 9 of the German standards.

The test item is sprayed with 80°C water from a nozzle of a specified shape at a water pressure of 80 to 100 bar. The amount of water is 14 to 16 liters per minute.

The distance between the test item and the nozzle is 10 to 15 cm. The water is discharged at angles of 0°, 30°, 60°, and 90° from the horizontal plane for 30 seconds at each angle while the test item is rotated horizontally.



Straight type (E3FA/E3FB)

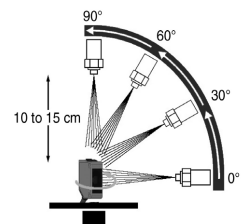
Model	Sensing method		Diffuse-reflective					
	NPN output	Pre-wired	E3F□-DN11 2M	E3F□-DN12 2M	E3F□-DN13 2M	E3FA-DN14 2M	E3FA-DN15 2M	E3FA-DN16 2M
		M12 Connector	E3F□-DN21	E3F□-DN22	E3F□-DN23	E3FA-DN24	E3FA-DN25	E3FA-DN26
Item	PNP output	Pre-wired	E3F□-DP11 2M	E3F□-DP12 2M	E3F□-DP13 2M	E3FA-DP14 2M	E3FA-DP15 2M	E3FA-DP16 2M
		M12 Connector	E3F□-DP21	E3F□-DP22	E3F□-DP23	E3FA-DP24	E3FA-DP25	E3FA-DP26
Sensing distance			100 mm (white paper: 300 × 300 mm)	300 mm (white paper: 300 × 300 mm)	1 m (white paper: 300 × 300 mm)	100 mm (white paper: 300 × 300 mm)	300 mm (white paper: 300 × 300 mm)	1 m (white paper: 300 × 300 mm)
Spot diameter (reference value)			40 × 45 mm Sensing distance of 100 mm	40 × 50 mm Sensing distance of 300 mm	120 × 150 mm Sensing distance of 1 m	40 × 45 mm Sensing distance of 100 mm	40 × 50 mm Sensing distance of 300 mm	120 × 150 mm Sensing distance of 1 m
Standard sensing object			—					
Differential travel			20% max.					
Directional angle			—					
Light source (wavelength)			Red LED (624 nm)			Infrared LED (850 nm)		
Power supply voltage			10 to 30 VDC (include voltage ripple of 10%(p-p) max.)					
Current consumption			25 mA max.					
Control output			NPN/PNP (open collector) Load current: 100 mA max. (Residual voltage: 3 V max.), Load power supply voltage: 30 VDC max.					
Operation mode			Light-ON/Dark-ON selectable by wiring					
Indicator			Operation indicator (orange) Stability indicator (green)					
Protection circuits			Power supply reverse polarity protection, Output short-circuit protection, and Output reverse polarity protection					
Response time			0.5 ms					
Sensitivity adjustment			One-turn adjuster					
Ambient illumination (Receiver side)			Incandescent lamp: 3,000 lx max./ Sunlight: 10,000 lx max.					
Ambient temperature range			Operating: -25 to 55°C/ Storage: -30 to 70°C (with no icing or condensation)					
Ambient humidity range			Operating: 35 to 85%/ Storage: 35 to 95% (with no condensation)					
Insulation resistance			20 MΩ min. at 500 VDC					
Dielectric strength			1,000 VAC at 50/60 Hz for 1 min. between current-carrying parts and case					
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			IEC: IP67, DIN 40050-9: IP69K *					
Weight (packed state/only sensor)	Pre-wired cable (2M)		E3FA: Approx. 60 g/ Approx. 50 g, E3FB: Approx. 95 g/ Approx. 65 g					
	Connector		E3FA: Approx. 20 g/ Approx. 10 g, E3FB: Approx. 50 g/ Approx. 20 g					
Material	Case		E3FA: ABS, E3FB: Nickel-brass					
	Lens and Display		PMMA					
	Adjuster		POM					
	Nut		E3FA: POM, E3FB: Nickel-brass					
Accessories			Instruction sheet M18 nuts (2 pcs)					

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The test item is sprayed with 80°C water from a nozzle of a specified shape at a water pressure of 80 to 100 bar. The amount of water is 14 to 16 liters per minute.

The distance between the test item and the nozzle is 10 to 15 cm. The water is discharged at angles of 0°, 30°, 60°, and 90° from the horizontal plane for 30 seconds at each angle while the test item is rotated horizontally.



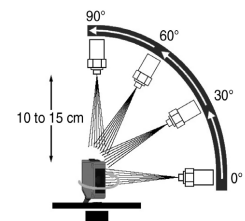
E3FA/E3RA/E3FB/E3RB

Straight type (E3FA/E3FB)

Model	Sensing method		BGS (Background suppression)		Limited distance reflective	Transparent detected with P-opaquiring function	
	NPN output	Pre-wired	E3F□-LN11 2M	E3F□-LN12 2M	E3F□-VN11 2M	E3F□-BN11 2M	E3F□-BN12 2M
		M12 Connector	E3F□-LN21	E3F□-LN22	E3F□-VN21	E3F□-BN21	E3F□-BN22
Item	PNP output	Pre-wired	E3F□-LP11 2M	E3F□-LP12 2M	E3F□-VP11 2M	E3F□-BP11 2M	E3F□-BP12 2M
		M12 Connector	E3F□-LP21	E3F□-LP22	E3F□-VP21	E3F□-BP21	E3F□-BP22
Sensing distance			100 mm (white paper: 300 × 300 mm)	200 mm (white paper: 300 × 300 mm)	10 to 50 mm (glass(t = 1.0 mm): 150 × 150 mm)	100 to 500 mm (with E39-RP1)	0.1 to 2 m (with E39-RP1)
Spot diameter (reference value)			10 × 10 mm Sensing distance of 100 mm	10 × 15 mm Sensing distance of 200 mm	10 × 10 mm Sensing distance of 50 mm	—	
Standard sensing object			—			glass(t = 1.0 mm): 150 × 150 mm	
Differential travel			20% max.		—		
Directional angle			—				
Light source (wavelength)			Red LED (624 nm)				
Power supply voltage			10 to 30 VDC (include voltage ripple of 10%(p-p) max.)				
Current consumption			25 mA max.				
Control output			NPN/PNP (open collector) Load current: 100 mA max. (Residual voltage: 3 V max.), Load power supply voltage: 30 VDC max.				
Operation mode			Light-ON/Dark-ON selectable by wiring				
Indicator			Operation indicator (orange) Stability indicator (green)				
Protection circuits			Power supply reverse polarity protection, Output short-circuit protection, and Output reverse polarity protection				
Response time			0.5 ms				
Sensitivity adjustment			Fixed		One-turn adjuster		
Ambient illumination (Receiver side)			Incandescent lamp: 3,000 lx max./ Sunlight: 10,000 lx max.				
Ambient temperature range			Operating: -25 to 55°C/ Storage: -30 to 70°C (with no icing or condensation)				
Ambient humidity range			Operating: 35 to 85%/ Storage: 35 to 95% (with no condensation)				
Insulation resistance			20 MΩ min. at 500 VDC				
Dielectric strength			1,000 VAC at 50/60 Hz for 1 min. between current-carrying parts and case				
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			IEC: IP67, DIN 40050-9: IP69K *				
Weight (packed state/only sensor)	Pre-wired cable (2M)		E3FA: Approx. 60 g/ Approx. 50 g, E3FB: Approx. 95 g/ Approx. 65 g				
	Connector		E3FA: Approx. 20 g/ Approx. 10 g, E3FB: Approx. 50 g/ Approx. 20 g				
Material	Case		E3FA: ABS, E3FB: Nickel-brass				
	Lens and Display		PMMA				
	Adjuster		POM				
	Nut		E3FA: POM, E3FB: Nickel-brass				
Accessories			Instruction sheet M18 nuts (2 pcs)				

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IP69K is a protection specification stipulated by DIN 40050 Part 9 of the German standards.
The test item is sprayed with 80°C water from a nozzle of a specified shape at a water pressure of 80 to 100 bar. The amount of water is 14 to 16 liters per minute.
The distance between the test item and the nozzle is 10 to 15 cm. The water is discharged at angles of 0°, 30°, 60°, and 90° from the horizontal plane for 30 seconds at each angle while the test item is rotated horizontally.



Radial type (E3RA/E3RB)

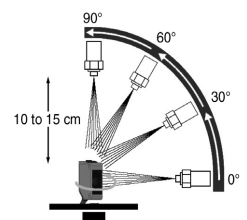
Model	Sensing method		Through-beam	Retro-reflective with MSR function	Diffuse-reflective		
	NPN output	Pre-wired	E3R□-TN11 2M	E3R□-RN11 2M	E3R□-DN11 2M	E3R□-DN12 2M	E3R□-DN13 2M
		M12 Connector	E3R□-TN21	E3R□-RN21	E3R□-DN21	E3R□-DN22	E3R□-DN23
Item	PNP output	Pre-wired	E3R□-TP11 2M	E3R□-RP11 2M	E3R□-DP11 2M	E3R□-DP12 2M	E3R□-DP13 2M
		M12 Connector	E3R□-TP21	E3R□-RP21	E3R□-DP21	E3R□-DP22	E3R□-DP23
Sensing distance			15 m	0.1 to 3 m (with E39-R1S)	100 mm (white paper: 300 × 300 mm)	300 mm (white paper: 300 × 300 mm)	700 mm (white paper: 300 × 300 mm)
Spot diameter (reference value)			—		35 × 40 mm Sensing distance of 100 mm	40 × 45 mm Sensing distance of 300 mm	90 × 120 mm Sensing distance of 700 mm
Standard sensing object			Opaque: 7 mm dia.min.	Opaque: 75 mm dia.min.	—		
Differential travel			—		20% max.		
Directional angle			2° min.		—		
Light source (wavelength)			Red LED (624 nm)				
Power supply voltage			10 to 30 VDC (include voltage ripple of 10%(p-p) max.)				
Current consumption			40mA max. (Emitter 25 mA max. Receiver 15 mA max.)	25 mA max.			
Control output			NPN/PNP (open collector) Load current: 100 mA max. (Residual voltage: 2 V max.), Load power supply voltage: 30 VDC max.				
Operation mode			Light-ON/Dark-ON selectable by wiring				
Indicator			Operation indicator (orange) Stability indicator (green) Power indicator (green): only Emitter of Through-beam				
Protection circuits			Power supply reverse polarity protection, Output short-circuit protection, and Output reverse polarity protection				
Response time			0.5 ms				
Sensitivity adjustment			One-turn adjuster				
Ambient illumination (Receiver side)			Incandescent lamp: 3,000 lx max./ Sunlight: 10,000 lx max.				
Ambient temperature range			Operating: -25 to 55°C/ Storage: -30 to 70°C (with no icing or condensation)				
Ambient humidity range			Operating: 35 to 85%/ Storage: 35 to 95% (with no condensation)				
Insulation resistance			20 MΩ min. at 500 VDC				
Dielectric strength			1,000 VAC at 50/60 Hz for 1 min. between current-carrying parts and case				
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			IEC: IP67, DIN 40050-9: IP69K *				
Weight (packed state/only sensor)	Pre-wired cable (2M)		E3RA: Approx. 110 g/ Approx. 50 g, respectively, E3RB: Approx. 175 g/ Approx. 65 g, respectively	E3RA: Approx. 60 g/ Approx. 50 g, E3RB: Approx. 95 g/ Approx. 65 g			
	Connector		E3RA: Approx. 30 g/ Approx. 10 g, respectively, E3RB: Approx. 85 g/ Approx. 20 g, respectively	E3RA: Approx. 20 g/ Approx. 10 g, E3RB: Approx. 50 g/ Approx. 20 g			
Material	Case		E3RA: ABS, E3RB: Nickel-brass				
	Lens and Display		PMMA				
	Adjuster		POM				
	Nut		E3RA: POM, E3RB: Nickel-brass				
Accessories			Instruction sheet M18 nuts (4 pcs)	Instruction sheet M18 nuts (2 pcs)			

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Output circuit diagram

PNP Output

Model	Operation mode	Timing charts	Operation selector	Output circuit
E3F□-TP□ E3F□-RP□ E3F□-DP□ E3F□-VP□ E3F□-BP□ E3R□-TP□ E3R□-RP□ E3R□-DP□	Light-ON		Connect the pink wire (Pin(2)) to the brown (Pin(1))	Through-beam Receivers, Retro-reflective Models, Diffuse-reflective Models, Limited reflective Models. Transparent detected with P-opaquing function.
	Dark-ON		Connect the pink wire (Pin(2)) to the blue (Pin(3)) or open the pink wire (Pin(2))	
E3F□-LP□	Light-ON		Connect the pink wire (Pin(2)) to the brown (Pin(1))	Background suppression.
	Dark-ON		Connect the pink wire (Pin(2)) to the blue (Pin(3)) or open the pink wire (Pin(2))	

E3FA/E3RA/E3FB/E3RB

Dimensions

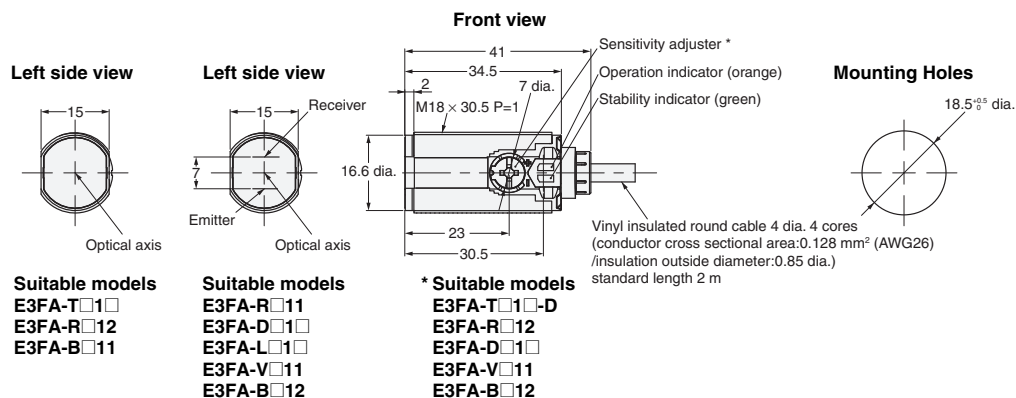
(Unit: mm)
Tolerance class IT16 applies to dimensions in this data sheet unless otherwise specified.

Sensors (E3FA/E3RA Plastic housing)

E3FA series

Pre-wired Models

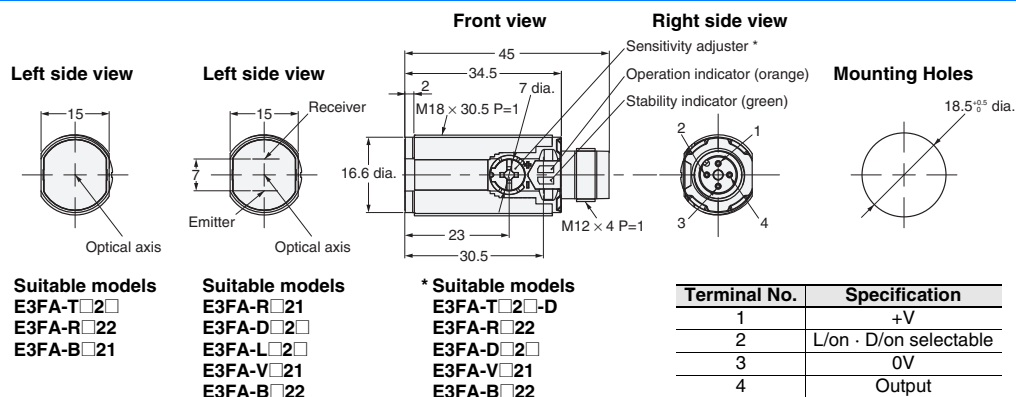
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E3FA-R□1□
E3FA-D□1□
E3FA-L□1□
E3FA-V□11
E3FA-B□1□



E3FA series

M12 Connector Models

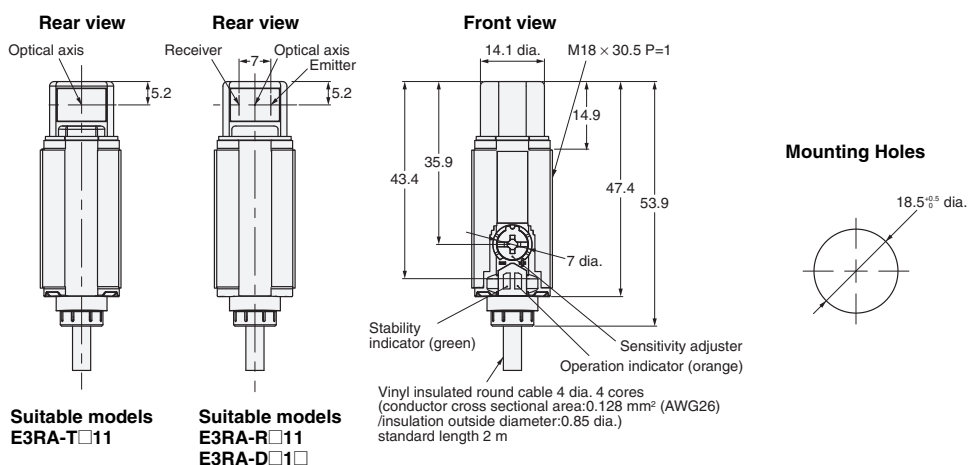
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E3FA-R□2□
E3FA-D□2□
E3FA-L□2□
E3FA-V□21
E3FA-B□2□



E3RA series

Pre-wired Models

E3RA-T□11
E3RA-R□11
E3RA-D□1□



E3RA series

M12 Connector Models

E3RA-T□21
E3RA-R□21
E3RA-D□2□

