Photoelectric sensors in M18 stainless steel housing

E3FC

Best durability for wash-down applications

- High grade steel housing (SUS316L)
- Withstands heat shock conditions
- Epoxy resin preventing water ingress if connector is not fixed properly
- Proven with various industrial detergents of Ecolab and Diversey (Details see page 10)
- Bright visible red LED enabling easy alignment



ECOLAB Diverse

Ordering Information

Sensors	Sensors Red light Infrared light						
Sonoor typo	Sonaing distance	Connection method	Mc	odel			
Sensor type	Sensing distance	Connection method	NPN output	PNP output			
Through-beam		pre-wired	E3FC-TN11 2M *1	E3FC-TP11 2M *1			
$= \bigcirc \bigcirc$)_20 m	M12 connector	E3FC-TN21 *1	E3FC-TP21 *1			
Retro-reflective with MSR function ^{*2}	0.1 to 4 m	pre-wired	E3FC-RN11 2M	E3FC-RP11 2M			
	with E39-R1S	M12 connector	E3FC-RN21	E3FC-RP21			
Diffuse-reflective *3	200 mm	pre-wired	E3FC-DN12 2M	E3FC-DP12 2M			
	300 mm	M12 connector	E3FC-DN22	E3FC-DP22			
⊴	1 m	pre-wired	E3FC-DN13 2M	E3FC-DP13 2M			
		M12 connector	E3FC-DN23	E3FC-DP23			
	300 mm	pre-wired	E3FC-DN15 2M	E3FC-DP15 2M			
		M12 connector	E3FC-DN25	E3FC-DP25			
	1 m	pre-wired	E3FC-DN16 2M	E3FC-DP16 2M			
		M12 connector	E3FC-DN26	E3FC-DP26			
BGS ^{*3} (background suppression)	[100 mm	pre-wired	E3FC-LN11 2M	E3FC-LP11 2M			
		M12 connector	E3FC-LN21	E3FC-LP21			
		pre-wired	E3FC-LN12 2M	E3FC-LP12 2M			
	200 mm	M12 connector	E3FC-LN22	E3FC-LP22			
Transparent object detection (co-axial retro-reflective with MSR ^{*2})	100 to 500 mm	pre-wired	E3FC-BN11 2M	E3FC-BP11 2M			
	with E39-RP1	M12 connector	E3FC-BN21	E3FC-BP21			

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

*2. The Reflector is sold separately. Select the Reflector model most suited to the application.
*3. L-On fixed output available for Diffuse reflective and BGS models. Please add "A" in order code (e.g. E3FC-DP11A 2M)

Sensing distance	Appearance	Model	Material	Remarks
0.1 to 4 m		E39-R1S	ABS, PMMA	IP67
0.1 to 4 m		E39-R50	PET	IP67, IP69K Ecolab tested plastic material
0 to 500 mm		E39-RP1	ABS, PMMA	for E3FC-B, enhanced PET detection, IP67
0.1 to 2 m		E39-R16	SUS316L, glass (window)	enhanced chemical resistance for pharma industry IP67, IP68, IP69K

Reflectors [Refer to *Dimensions on page 12.*] Reflectors required for Retro-reflective Sensors: A Reflector is not provided with the Sensor. Be sure to order a Reflector separately.

Mounting brackets [Refer to *Dimensions on page 12.*] A Mounting Bracket is not enclosed with the Sensor. Order a Mounting Bracket separately if required.

Sensor	Appearance	Model (Material)	Material	Remarks
all types		E39-L183	SUS304	Mounting bracket
	0	E39-EL16	SUS316L	M18 Flush mounting nut

Sensor I/O connectors

Models for Connectors: A Connector is not provided with the Sensor. Be sure to order a Connector separately.

Sensor	Model	Material	Appearance		Appearance Cable type		Model
M12 connector types	Detergent resistant connector cable	Cable: Detergent resistant PVC Connector: SUS316L	Straight		2 m	- 4-wire	Y92E-S12PVC4S2M-L
				C MP	5 m		Y92E-S12PVC4S5M-L
			Angle		2 m		Y92E-S12PVC4A2M-L
					5 m		Y92E-S12PVC4A5M-L

Ratings and Specifications

	Sensir	ig method	Through-beam	Retro-reflective with MSR function			
Model	NPN	Pre-wired	E3FC-TN11 2M	E3FC-RN11 2M			
	output	M12 Connector	E3FC-TN21	E3FC-RN21			
	PNP	Pre-wired	E3FC-TP11 2M	E3FC-RP11 2M			
Item	output	M12 Connector	E3FC-TP21	E3FC-RP21			
Sensing di	stance		20 m	0.1 to 4 m (with E39-R1S)			
Spot diame	eter (refere	nce value)					
Standard s	ensing obj	ect	Opaque: 7 mm dia.min.	Opaque: 75 mm dia.min.			
Differential	travel		_				
Directional	angle		2° min.				
Light source	ce (waveler	ngth)	Red LED (624 nm)	Red LED (624 nm)			
Power sup	ply voltage)	10 to 30 VDC (include voltage ripple of 10%(p-p) ma	ax.)			
Current co	nsumption		40 mA max. (Emitter 25 mA max. Receiver 15 mA max.)	25 mA max.			
Control out	tput		NPN/PNP (open collector) Load current: 100 mA max. (Residual voltage: 3 V max.), Load power supply voltage: 30 VDC max.				
Operation I	mode		Light-ON/Dark-ON selectable by wiring *1.				
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	adjustmen	t	Fixed				
Ambient illu	imination (F	Receiver side)	Incandescent lamp: 3,000 lx max./ Sunlight: 10,000 lx max.				
Ambient te	mperature	range	Operating: -25 to 55°C/ Storage: -30 to 70°C (with no icing or condensation)				
Ambient hu	umidity ran	ige	Operating: 35 to 85%/ Storage: 35 to 95% (with no condensation)				
Insulation	resistance		20 MΩ min. at 500 VDC				
Dielectric s	strength		1,000 VAC at 50/60 Hz for 1 min. between current-carrying parts and case				
Vibration re	esistance		Destruction: 10 to 55 Hz, 1.5 mm double amplitude for 2 hours each in X, Y and Z directions				
Shock resis	stance		Destruction: 500 m/s ² 3 times each in X, Y and Z directions				
Degree of p	protection		IEC: IP67, IP68 *2., DIN 40050-9: IP69K *3.				
Weight	Pre-wired	cable (2M)	152 g	76 g			
Weight	Connecto	or	44 g	22 g			
Case			SUS 316L (1.4404)				
Material	Lens and	Display	PMMA				
	Adjuster		-				
	Nut		SUS 316L (1.4404)				
Accessorie	s		Instruction sheet M18 nuts (4 pcs)	Instruction sheet M18 nuts (2 pcs)			

*1. L-On fixed output available for Diffuse reflective and BGS models. Please add "A" in order code (e.g. E3FC-DP11A 2M)

*2. IP68 Degree of Protection Specifications

2. IPos Degree of Protection Specifications IP68 is defined by heat shock resistance with 20 test cycles of 30 min. changing between 3° and 60° surface tensioned water.
 *3. 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.



	Sensir	ng method		Diffu	se-reflective			
Model	NPN	Pre-wired	E3FC-DN12 2M	E3FC-DN13 2M	E3FC-DN15 2M	E3FC-DN16 2M		
	output	M12 Connector	E3FC-DN22	E3FC-DN23	E3FC-DN25	E3FC-DN26		
	PNP	Pre-wired	E3FC-DP12 2M	E3FC-DP13 2M	E3FC-DP15 2M	E3FC-DP16 2M		
Item	output	M12 Connector	E3FC-DP22	E3FC-DP23	E3FC-DP25	E3FC-DP26		
Sensing distance			300 mm (white paper: 300 × 300 mm)	1 m (white paper: 300 × 300 mm)	300 mm (white paper: 300 × 300 mm)	1 m (white paper: 300 × 300 mm)		
Spot diameter (reference value)			40 × 50 mm Sensing distance of 300 mm	120 × 150 mm Sensing distance of 1 m	40 × 50 mm Sensing distance of 300 mm	120 × 150 mm Sensing distance of 1 m		
Standard s	ensing obj	ect			_			
Differential	travel		20% max.					
Directional	angle				_			
Light source	e (waveler	ngth)	Red LED (624 nm)		Infrared LED (850 nm)			
Power sup	ply voltage		10 to 30 VDC (include vo	Itage ripple of 10%(p-p)) max.)			
Current co	nsumption		25 mA max.					
Control out	tput		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 *3.								
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	adjustmen	t	One-turn adjuster					
Ambient illu	umination		Incandescent lamp: 3,00	0 lx max./ Sunlight: 10,0	000 lx max.			
Ambient te	mperature	range	Operating: -25 to 55°C/ S	storage: -30 to 70°C (wit	h no icing or condensation)	l		
Ambient hu	umidity ran	ge	Operating: 35 to 85%/ Storage: 35 to 95% (with no condensation)					
Insulation I	resistance		20 MΩ min. at 500 VDC					
Dielectric s	trength		1,000 VAC at 50/60 Hz for 1 min. between current-carrying parts and case					
Vibration re	esistance		Destruction: 10 to 55 Hz, 1.5 mm double amplitude for 2 hours each in X, Y and Z directions					
Shock resi	stance		Destruction: 500 m/s ² 3 times each in X, Y and Z directions					
Degree of p	Jree of protection IEC: IP67, IP68 *2., DIN 40050-9: IP69K *3.							
Weight Pre-wired cable (2M)			/6 g					
	Connector 22 g							
	Lana and	Diaplay	SUS 316L (1.4404)					
Material	Adjuster	Display						
	Nut							
	Nut		Instruction sheet					
Accessorie	s		M18 nuts (2 pcs)					

*1. L-On fixed output available for Diffuse reflective and BGS models. Please add "A" in order code (e.g. E3FC-DP11A 2M)

*2. IP68 Degree of Protection Specifications

IP68 is defined by heat shock resistance with 20 test cycles of 30 min. changing between 3° and 60° surface tensioned water. *3. IP69K Degree of Protection Specifications

IPBK 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.



	Sensir	ng method	BGS (Backgrou	und suppression)	Transparent detected with P-opaquing function			
Model	NPN	Pre-wired	E3FC-LN11 2M	E3FC-LN12 2M	E3FC-BN11 2M			
	output	M12 Connector	E3FC-LN21	E3FC-LN22	E3FC-BN21			
	PNP	Pre-wired	E3FC-LP11 2M	E3FC-LP12 2M	E3FC-BP11 2M			
Item	output	M12 Connector	E3FC-LP21	E3FC-LP22	E3FC-BP21			
Sensing distance			100 mm (white paper: 300 × 300 mm)	200 mm (white paper: 300 × 300 mm)	100 to 500 mm (with E39-RP1)			
Spot diame	ter (refere	nce value)	10×10 mm Sensing distance of 100 mm	10×15 mm Sensing distance of 200 mm	_			
Standard s	ensing obj	ect		<u> </u>	glass (t = 1.0 mm): 150 × 150 mm			
Differential	travel		20% max.		-			
Directional	angle			—	·			
Light source	e (wavele	ngth)	Red LED (624 nm)					
Power sup	oly voltage)	10 to 30 VDC (include voltage rip	ple of 10%(p-p) max.)				
Current co	nsumption	l	25 mA max.					
Control out	put		NPN/PNP (open collector) Load current: 100 mA max. (Residual voltage: 3 V max.), Load power supply voltage: 30 VDC max.					
Operation I	node		Light-ON/Dark-ON selectable by wiring *1.					
Indicator			Operation indicator (orange) Stability indicator (green)					
Protection	circuits		Power supply reverse polarity protection, Output short-circuit protection, and Output reverse polarity protection					
Response	ime		0.5 ms					
Sensitivity	adjustmer	ıt	Fixed		One-turn adjuster			
Ambient ill	umination		Incandescent lamp: 3,000 lx max./ Sunlight: 10,000 lx max.					
Ambient te	mperature	range	Operating: -25 to 55°C/ Storage: -30 to 70°C (with no icing or condensation)					
Ambient hu	imidity rar	ige	Operating: 35 to 85%/ Storage: 35 to 95% (with no condensation)					
Insulation I	resistance		20 MΩ min. at 500 VDC					
Dielectric s	trength		1,000 VAC at 50/60 Hz for 1 min. between current-carrying parts and case					
Vibration re	esistance		Destruction: 10 to 55 Hz, 1.5 mm double amplitude for 2 hours each in X, Y and Z directions					
Shock resis	stance		Destruction: 500 m/s ² 3 times each in X, Y and Z directions					
Degree of p	protection		IEC: IP67, IP68 *2., DIN 40050-9): IP69K *3.	IEC: IP67, DIN 40050-9: IP69K *3			
Weight (packed	Pre-wired	cable (2M)	76 g		Approx. 95 g/Approx. 65 g			
state/only sensor)	Connecto	or	22 g		Approx. 50 g/Approx. 20 g			
	Case		SUS316L (1.4404)					
Material	Lens and	Display	РММА					
material	Adjuster		-		РОМ			
	Nut		SUS316L (1.4404)					
Accessorie	s		Instruction sheet M18 nuts (2 pcs)					

 *1. L-On fixed output available for Diffuse reflective and BGS models. Please add "A" in order code (e.g. E3FC-DP11A 2M)
 *2. IP68 Degree of Protection Specifications IP68 is defined by heat shock resistance with 20 test cycles of 30 min. changing between 3° and 60° surface tensioned water. *3. 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.



Engineering Data (Reference Value)

Parallel Operating Range



Retro-reflective Models (with MSR function) E3FC-R \square



Operating Range Diffuse-reflective Models E3FC-D

E3FC-D06

100

80

60

40

20

0

-20

-40

-80

-100 l

= -60

200

Distance Y (mm)



Sensing object: 300 × 300 (mm) white paper

-‡

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Х-

600 800 1000 1200 1400 1600

Distance X (mm)

400

E3FC-D3



BGS Models E3FC-L 1, E3FC-L 2



E3FC-D₅



Transparent object detection models E3FC-B□1



Retro-reflective Models (with MSR function) E3FC-R \square







30 40

Diffuse-reflective Models

50 60

Distance (m)

E3FC-D06

0.1 L

E3FC-D2









Transparent object detection models E3FC-B \square 1



Sensing Distance vs. Sensing Object Material BGS Models





Output circuit diagram

PNP Output

Model	Operation mode	Timing charts	Operation selector	Output circuit	
E3FC-TP E3FC-RP E3FC-DP E3FC-BP	Light-ON	Light incident Light interrupted Operation indicator ON (orange) OFF Output transistor OFF Load Operate (e.g., relay) Reset (Between blue and black leads)	Connect the pink wire (Pin(2)) to the brown (Pin(1))	Through-beam Receivers, Retro-reflective Models, Diffuse-reflective Models	
	Dark-ON	Light incident Light interrupted Operation indicator ON (orange) OFF Output transistor OFF Load OPErta (e.g., relay) Poerate (Between blue and black leads)	Connect the pink wire (Pin(2)) to the blue (Pin(3)) or open the pink wire (Pin(2))	Blue (Relay) Dark-ON 0 V Pink	
	Through-beam Emitter				
E3FC-LP	Light-ON	Operation indicator ON (orange) OFF Output transistor OF Load (e.g., relay) Operate (Between blue and black leads)	Connect the pink wire (Pin(2)) to the brown (Pin(1))	Background suppression.	
	Dark-ON	Operation indicator ON (orange) OFF Output transistor OFF Load (e.g., relay) Operate (Between blue and black leads)	Connect the pink wire (Pin(2)) to the blue (Pin(3)) or open the pink wire (Pin(2))	Blue Blue Circuit Blue	

NPN Output

Model	Operation mode	Timing charts	Operation selector	Output circuit	
E3FC-TN E3FC-RN E3FC-DN E3FC-BN	Light-ON	Light incident Light interrupted Operation indicator ON (orange) OFF Output transistor OFF Load Operate (e.g., relay) Reset (Between brown and black leads)	Connect the pink wire (Pin(2)) to the brown (Pin(1)) or open the pink wire (Pin(2))	Through-beam Receivers, Retro-reflective Models, Diffuse-reflective Models	
	Dark-ON	Light incident Light interrupted Operation indicator ON (orange) OFF Output transistor OFF Load Operate (e.g., relay) Reset (Between brown and black leads)	Connect the pink wire (Pin(2)) to the blue (Pin(3))	Blue (Control output)	
	Through-beam Emitter				
E3FC-LN	Light-ON	Operation indicator ON (orange) OFF Output transistor OFF Load (e.g., relay) Operate Reset (Between brown and black leads)	Connect the pink wire (Pin(2)) to the brown (Pin(1)) or open the pink wire (Pin(2))	Background suppression.	
	Dark-ON	Operation indicator ON (orange) OFF Output transistor OFF Load (e.g., relay) Operate (e.g., relay) Between brown and black leads)	Connect the pink wire (Pin(2)) to the blue (Pin(3))	Blue Circuit Pink Dark-ON 0 V	

Connector Pin Arrangement M12 Connector Pin Arrangement

Connectors (Sensor I/O connectors) M12 4-wire Connectors



Classification	Wire color	Connector pin No.	Application
DC	Brown	1	Power supply (+V)
	White	2	L/on · D/on selectable
	Blue	3	Power supply (0 V)
	Black	4	Output

Safety Precautions

Refer to Warranty and Limitations of Liability.

<u> WARNING</u>

This product is not designed or rated for directly or indirectly ensuring safety of persons. Do not use it for such a purpose.



Never use the product with an AC power supply. Do not use the product with voltage in excess of the rated voltage.



Do not use the product with incorrect wiring. Otherwise, explosion, fire, malfunction may result.



Precautions for Safe Use

Be sure to follow the safety precautions below for added safety.

- 1. Do not use the sensor under the environment with explosive, flammable or corrosive gas.
- Do not use the sensor under the oil or chemical environment exceeding specifications. Performance is assured for typical detergents and disinfectants used in Food & Beverage industry. Refer to the following table when using these agents:

Manufacturer	Product name	Concen- tration	Testtime
	Diverfoam SMS HD	5%	720 h
	Oxofoam	5%	720 h
Diversey	Acifoam	5%	720 h
	Divosan Hypochlorit	1%	720 h
	Divosan Forte	1%	720 h
	P3-topactive® 200	5%	720 h
	P3-topax® 56	5%	720 h
Ecolab	P3-topactive® OKTO	3%	720 h
	P3-topax® 990	3%	720 h
	P3-topax® 66	3%	720 h
General	H ₂ O ₂	6,5%	240 h

- Do not use the sensor under the environment under the other conditions in excess of rated.
- 4. Do not use the sensor in place that is exposed by direct sunlight.
- 5. Do not use the sensor in place where the sensor may receive
- direct vibration or shock.
- Do not use the thinner, alcohol, or other organic solvents.
 Never disassemble, repair nor tamper with the sensor.
- 8. Please process it as industrial waste.

Precautions for Correct Use

- Laying Sensor wiring in the same conduit or duct as high-voltage wires or power lines may result in malfunction or damage due to conduit or use shielded cable.
- 2. Do not pull on the cable with excessive force.
- 3. If a commercial switching regulator is used, ground the FG (frame ground) terminal.
- 4. The sensor will be available 100 ms after the power supply is tuned ON. Start to use the sensor 100 ms or more after turning ON the power supply. If the load and the sensor are connected to separate power supplies, be sure to turn ON the sensor first.
- Output pulses may be generated even when the power supply is OFF. Therefore, it is recommended to first turn OFF the power supply for the load or the load line.
- 6. The sensor must be mounted using the provided nuts. The proper tightening torque is 20 N°m max..

Dimensions

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

Sensors





Accessories (Order Separately)



ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. E98E-EN-02

In the interest of product improvement, specifications are subject to change without notice.

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Mouser Electronics

Authorized Distributor

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Omron:

E3FC-DP12 2M E3FC-LN11 2M E3FC-RN11 2M E3FC-RP11 2M E3FC-TP11 2M