Proximity Sensor with All-stainless Housing

E2FM

Additions to the Series

Highly Durable Proximity Sensor for Tough Environments

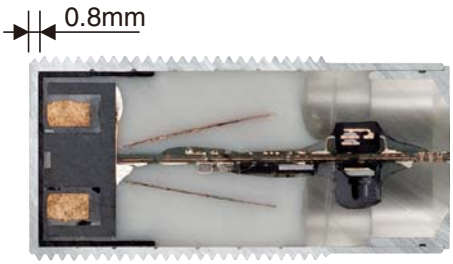
- Completely stainless-steel housing
- Aluminum chip immunity
- Embedding installation to metal (steel) fittings
- Chemical resistance certified by Ecolab Europe
- Lineup includes pre-wire models and DC 3-wire NPN output models with fluororesin coating.

⚠ Be sure to read *Safety Precautions* on page 8.

Features

One-piece completely stainless-steel housing with a face thickness of 0.8 mm

The face thickness is approximately 4 times that of previous models (E2ES) to enable sensing in even more severe conditions than ever.



Brush Test

After 3 Minutes

E2FM

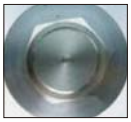
E2EQ
(Spatter-resistant)

The stainless-steel head means almost no wear when cleaned with a metal brush.

Continuous Impact Test

E2ES

The E2ES with a top wall thickness of 0.2 mm was **penetrated** after 10,000 impacts.



E2FM

The E2FM was not **penetrated** after 250,000 impacts (depth: 0.26 mm).

More than 20 times the durability of the E2ES!

Chemical and Detergent Proof

The one-piece completely stainless-steel housing of the sensing section withstands the following chemicals better.

- Sodium chloride
- Gasoline
- Dilute sodium hydroxide
- Dilute hydrochloric acid
- Mineral oil
- Barium hydroxide

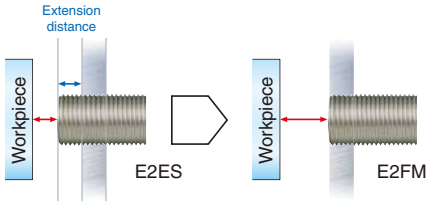
Any many others

Note: Cannot be used for explosion-proof applications.

Built-in Chip Immunity

Chip immunity performance has been provided to greatly reduce false signals caused by spatter accumulation and other causes, almost eliminating the needs for cleaning, e.g., with metal brushes.

Flush Mounting



Not influenced by surrounding installation environment.

Note: When mounted in steel.

Main Performance Comparison to Previous OMRON Products

Face thickness

	E2FM	E2ES
M8	0.4mm	---
M12	0.8mm	---
M18	0.8mm	0.2mm
M30	0.8mm	0.2mm

Sensing distance

	E2FM	E2ES
M8	1.5mm	---
M12	2.0mm	---
M18	5.0mm	4.0mm
M30	10.0mm	8.0mm

Response frequency

	E2FM	E2ES
M8	200Hz	---
M12	100Hz	---
M18	100Hz	12Hz
M30	50Hz	8Hz

Ambient operating temperature

E2FM	E2ES
-25 to 70°C	0 to 50°C

The chemical resistance has been certified by Ecolab Europe

ECOLAB

Ecolab GmbH & Co. OHG
P.O. Box 13 04 06
D-40551 Düsseldorf

certifies that for

OMRON

OMRON Manufacturing of Germany GmbH
Carl-Benz-Strasse 4
71154 Nufringen

material resistance tests

were performed with cleaning substances **P3-topax 56, P3-topax 66, P3-topax 91** and demineralized water as a zero reference factor.

The material resistance of the tested series

Inductive Proximity Sensor E2FM

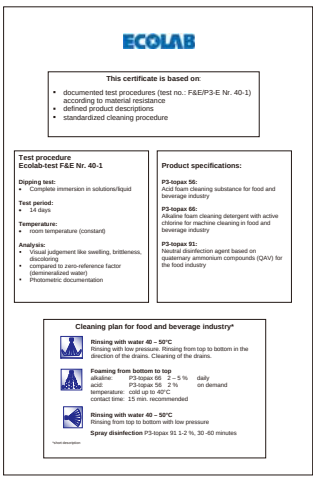
to the P3 products used in the test can be considered to be positive according to the cleaning procedure mentioned overleaf.

Düsseldorf, 14th February 2006

Ecolab GmbH & Co. OHG

i.V. **Thomas Tyborski**

i.V. **Reimund Laaff**



ECOLAB

This certificate is based on:

- documented test procedures (test no.: F&E/P3-E Nr. 40-1) according to material resistance
- defined product descriptions
- standardized cleaning procedure

Test procedure
Ecolab-test F&E Nr. 40-1

Dipping test:
- Complete immersion in solutions/liquid

Test period:
- 14 days

Temperature:
- room temperature (constant)

Analysis:
- Visual judgement like swelling, brittleness, discoloring
- compared to zero-reference factor (demineralized water)
- Photometric documentation

Product specifications:

P3-topax 56:
Acid foam cleaning substance for food and beverage industry

P3-topax 66:
Alkaline foam cleaning detergent with active chlorine for machine cleaning in food and beverage industry

P3-topax 91:
Neutral disinfection agent based on quaternary ammonium compounds (QAV) for the food industry

Cleaning plan for food and beverage industry*

Rinsing with water 40 – 50°C
Rinsing with low pressure. Rinsing from top to bottom in the direction of the drains. Cleaning of the drains.

Foaming from bottom to top
alkaline: P3-topax 66 2 – 5 % daily
acid: P3-topax 56 2 % on demand
temperature: cold up to 40°C
contact time: 15 min. recommended

Rinsing with water 40 – 50°C
Rinsing from top to bottom with low pressure

Spray disinfection P3-topax 91 1-2 %, 30 -60 minutes

*short description

E2FM

Ordering Information

Sensors

DC 2-Wire, Pre-wired Models

Size		Sensing distance	Output	Operation mode	Model
Shielded 	M8	1.5 mm	DC 2-Wire (polarity)	NO	**E2FM-X1R5D1** *
	M12	2 mm			**E2FM-X2D1** *
	M18	5 mm			**E2FM-X5D1** *
	M30	10 mm			**E2FM-X10D1** *

Note: Fluororesin-coated models are also available. The model numbers are E2FM-QX□D.

DC 3-Wire, Pre-wired Models

Size		Sensing distance	Model	
			Output configuration: NPN NO	Output configuration: PNP NO
Shielded 	M8	1.5 mm	**E2FM-X1R5C1**	**E2FM-X1R5B1**
	M12	2 mm	**E2FM-X2C1**	**E2FM-X2B1**
	M18	5 mm	**E2FM-X5C1**	**E2FM-X5B1**
	M30	10 mm	**E2FM-X10C1**	**E2FM-X10B1**

DC 2-Wire, Pig-tail Connector Models

Size		Sensing distance	Output	Operation mode	Model
Shielded 	M8	1.5 mm	Polarity Pin allocations: 1-4	NO	**E2FM-X1R5D1-M1GJ** *
	M12	2 mm	Polarity Pin allocations: 1-4		**E2FM-X2D1-M1GJ** *
			No polarity Pin allocations: 3-4		**E2FM-X2D1-M1GJ-T** *
	M18	5 mm	Polarity Pin allocations: 1-4		**E2FM-X5D1-M1GJ** *
			No polarity Pin allocations: 3-4		**E2FM-X5D1-M1GJ-T** *
	M30	10 mm	Polarity Pin allocations: 1-4		**E2FM-X10D1-M1GJ** *
			No polarity Pin allocations: 3-4		**E2FM-X10D1-M1GJ-T** *

Note: Fluororesin-coated models are also available. The model numbers are E2FM-QX□D1-M1GJ□.

DC 3-Wire, M12 Connector Models

Size		Sensing distance	Model	
			Output configuration: NPN NO	Output configuration: PNP NO
Shielded 	M8	1.5 mm	**E2FM-X1R5C1-M1**	**E2FM-X1R5B1-M1**
	M12	2 mm	**E2FM-X2C1-M1**	**E2FM-X2B1-M1**
	M18	5 mm	**E2FM-X5C1-M1**	**E2FM-X5B1-M1**
	M30	10 mm	**E2FM-X10C1-M1**	**E2FM-X10B1-M1**

Accessories (Order Separately)

Sensor I/O Connectors

Appearance	Cable length	Sensor I/O Connector model number	Applicable Proximity Sensor model number
Straight 	2m	**XS2F-D421-DD0**	E2FM-X□D1-M1GJ-T
	5m	**XS2F-D421-GD0**	
L-shape 	2m	**XS2F-D422-DD0**	
	5m	**XS2F-D422-GD0**	
Straight 	2m	**XS2F-D421-DA0-A**	E2FM-X□D1-M1GJ
	5m	**XS2F-D421-GA0-A**	
L-shape 	2m	**XS2F-D422-DA0-A**	
	5m	**XS2F-D422-GA0-A**	
Straight 	2m	**XS2F-D421-DC0-A**	E2FM-X□C1-M1 E2FM-X□B1-M1
	5m	**XS2F-D421-GC0-A**	
L-shape 	2m	**XS2F-D422-DC0-A**	
	5m	**XS2F-D422-GC0-A**	

Note: Refer to *Introduction to Sensor I/O Connectors* for details.

Ratings and Specifications

DC 2-Wire (E2FM-X□D□)

Item	Size	M8	M12	M18	M30	M12	M18	M30
	Shielded	Shielded						
	Model	E2FM-X1R5D1-□	E2FM-X2D1-□	E2FM-X5D1-□	E2FM-X10D1-□	E2FM-X2D1 -M1GJ-T	E2FM-X5D1 -M1GJ-T	E2FM-X10D1 -M1GJ-T
Sensing distance		1.5 mm±10%	2 mm±10%	5 mm±10%	10 mm±10%	2 mm±10%	5 mm±10%	10 mm±10%
Set distance		0 to 1.05 mm	0 to 1.4 mm	0 to 3.5 mm	0 to 7 mm	0 to 1.4 mm	0 to 3.5 mm	0 to 7 mm
Differential travel		15% max. of sensing distance						
Sensing object		Ferrous metal (The sensing distance decreases with non-ferrous metal. Refer to *Engineering Data* on page 6.)						
Standard sensing object		Iron, 8 × 8 × 1 mm	Iron, 12 × 12 × 1 mm	Iron, 30 × 30 × 1 mm	Iron, 54 × 54 × 1 mm	Iron, 12 × 12 × 1 mm	Iron, 30 × 30 × 1 mm	Iron, 54 × 54 × 1 mm
Response frequency *1		200 Hz	100 Hz	100 Hz	50 Hz	100 Hz	100 Hz	50 Hz
Power supply voltage (operating voltage range)		12 to 24 VDC (10 to 30 VDC), ripple (p-p): 10% max.						
Leakage current		0.8 mA max.						
Output configuration		With polarity				Without polarity		
Control output	Switching capacity	3 to 100 mA						
	Residual voltage	3 V max. (Load current: 100 mA max., Cable length: 2 m)				5 V max. (Load current: 100 mA max., Cable length: 2 m)		
Indicators		Operation indicator (red LED), Setting/Operation indicator (green LED)						
Operation mode (with sensing object approaching)		NO *2						
Protection circuits		Surge suppressor, Load short-circuit protection						
Ambient temperature range		Operating/Storage: –25 to 70°C (with no icing or condensation)						
Ambient humidity range		Operating/Storage: 35% to 95% (with no condensation)						
Temperature influence		±20% max. of sensing distance at 23°C in the temperature range of –25 to 70°C.						
Voltage influence		±1% max. of sensing distance at rated voltage in the rated voltage ±15% range						
Insulation resistance		50 MΩ min. (at 500 VDC) between current-carrying parts and case						
Dielectric strength		1,000 VAC, 50/60 Hz for 1 minute 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/s² 10 times each in X, Y, and Z directions	Destruction: 1,000 m/s² 10 times each in X, Y, and Z directions					
Degree of protection		IEC 60529 IP67						
Connection method		Unmarked: Pre-wired Models (Standard cable length: 2 m) Models ending with -M1GJ-□: Pre-wired Connector Models (Standard cable length: 300 mm)						
Weight (packed state)		Approx. 65 g	Approx. 85 g	Approx. 110 g	Approx. 190 g	Approx. 85 g	Approx. 110 g	Approx. 190 g
Materials	Case	Stainless steel (SUS303)						
	Sensing surface	Stainless steel (SUS303)						
	(thickness)	(0.4 mm)	(0.8 mm)			(0.8 mm)		
	Clamping nuts	Stainless steel (SUS303)						
	Cable	PVC (flame retardant)						
	Toothed washer	Zinc-plated iron						
Accessories		Instruction manual						

*1. The response frequency of the DC switching section 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.
*2. NC (normally closed) models are also available. Contact your OMRON representative.

DC 3-Wire (E2FM-X□C□, E2FM-X□B□)

Item \ Size	M8	M12	M18	M30
Shielded	Shielded			
Model	E2FM-X1R5□	E2FM-X2□	E2FM-X5□	E2FM-X10□
Sensing distance	1.5 mm±10%	2 mm±10%	5 mm±10%	10 mm±10%
Set distance	0 to 1.05 mm	0 to 1.4 mm	0 to 3.5 mm	0 to 7 mm
Differential travel	15% max. of sensing distance			
Sensing object	Ferrous metal (The sensing distance decreases with non-ferrous metal. Refer to *Engineering Data* on page 6.)			
Standard sensing object	Iron, 8 × 8 × 1 mm	Iron, 12 × 12 × 1 mm	Iron, 30 × 30 × 1 mm	Iron, 54 × 54 × 1 mm
Response frequency *1	200 Hz	100 Hz	100 Hz	50 Hz
Power supply voltage (operating voltage range)	12 to 24 VDC (10 to 30 VDC), ripple (p-p): 10% max.			
Current consumption	10 mA max.			
Output configuration	PNP open collector output			
Control output: Switching capacity	200 mA max.			
Control output: Residual voltage	2 V max. (Load current: 200 mA, Cable length: 2 m)			
Indicators	Operation indicator (yellow LED)			
Operation mode (with sensing object approaching)	C1 Models : NPN open collector, NO (normally open) *2 B1 Models : PNP open collector, NO (normally open) *2			
Protection circuits	Reversed power supply polarity protection, Surge suppressor, Load short-circuit protection, and Reversed output polarity protection (except the E2FM-X1R5B1-M1)			
Ambient temperature range	Operating/Storage: –25 to 70°C (with no icing or condensation)			
Ambient humidity range	Operating/Storage: 35% to 95% (with no condensation)			
Temperature influence	±20% max. of sensing distance at 23°C in the temperature range of –25 to 70°C.			
Voltage influence	±1% max. of sensing distance in the rated voltage ±15% range (using the sensing distance at the rated voltage as standard)			
Insulation resistance	50 MΩ min. (at 500 VDC) between current-carrying parts and case			
Dielectric strength	1,000 VAC, 50/60 Hz for 1 minute 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 10 times each in X, Y, and Z directions	Destruction: 1,000 m/s^2 10 times each in X, Y, and Z directions		
Degree of protection	IEC 60529 IP67			
Connection method	Unmarked: Pre-wired Models (Standard cable length: 2 m) Models ending with -M1: Connector Models			
Weight (packed state)	Approx. 45 g	Approx. 55 g	Approx. 75 g	Approx. 160 g
Materials: Case	Stainless steel (SUS303)			
Materials: Sensing surface	Stainless steel (SUS303)			
Materials: (thickness)	(0.4mm)	(0.8mm)		
Materials: Clamping nuts	Stainless steel (SUS303)			
Materials: Toothed washer	Zinc-plated iron			
Accessories	Instruction manual			

*1. The response frequency of the DC switching section 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.
*2. NC (normally closed) models are also available. Contact your OMRON representative.

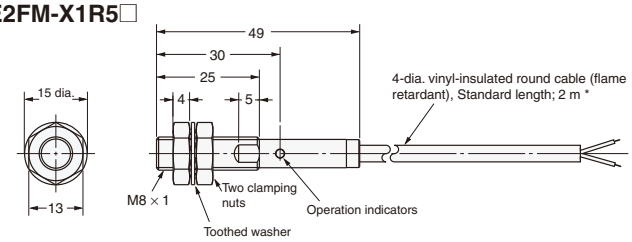
Dimensions

(Unit: mm)

Sensors

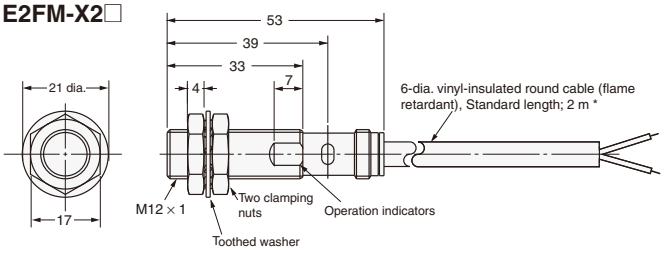
Pre-wired Models

E2FM-X1R5□



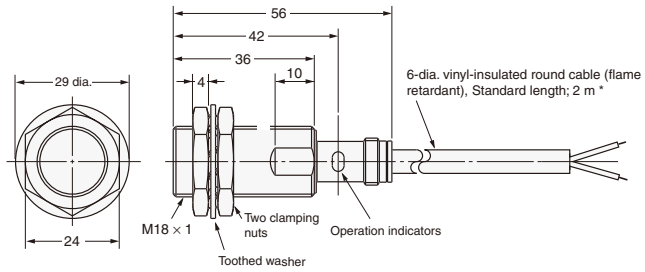
* 4-dia. vinyl-insulated round cable with 2 conductors
(Conductor cross section: 0.2 mm², Insulator diameter: 1.4 mm)
4-dia. vinyl-insulated round cable with 3 conductors
(Conductor cross section: 0.2 mm², Insulator diameter: 1.2 mm)

E2FM-X2□



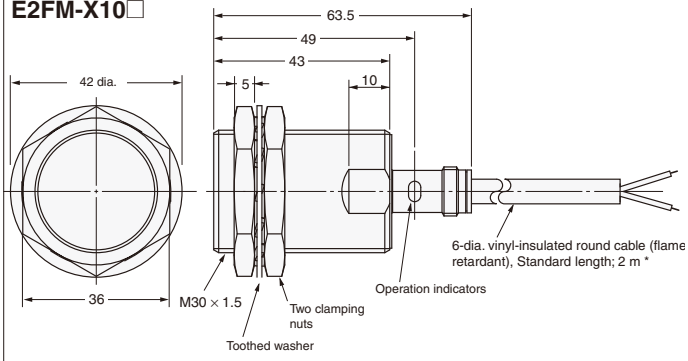
* 6-dia. vinyl-insulated round cable with 2 conductors
(Conductor cross section: 0.5 mm², Insulator diameter: 1.75 mm)
6-dia. vinyl-insulated round cable with 3 conductors
(Conductor cross section: 0.5 mm², Insulator diameter: 1.75 mm)

E2FM-X5□



* 6-dia. vinyl-insulated round cable with 2 conductors
(Conductor cross section: 0.5 mm², Insulator diameter: 1.75 mm)
6-dia. vinyl-insulated round cable with 3 conductors
(Conductor cross section: 0.5 mm², Insulator diameter: 1.75 mm)

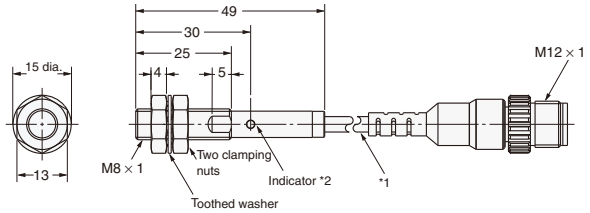
E2FM-X10□



* 6-dia. vinyl-insulated round cable with 2 conductors
(Conductor cross section: 0.5 mm², Insulator diameter: 1.75 mm)
6-dia. vinyl-insulated round cable with 3 conductors
(Conductor cross section: 0.5 mm², Insulator diameter: 1.75 mm)

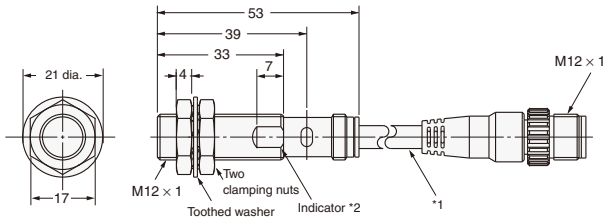
Pig-tail Connector Models

E2FM-X1R5D□-M1GJ-□



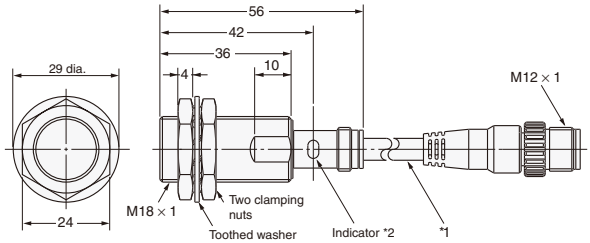
*1. 4-dia. vinyl-insulated round cable (flame retardant), Standard length; 300 mm
*2. Operation indicator (red/green)
Setting indicator (green)

E2FM-X2D□-M1GJ-□



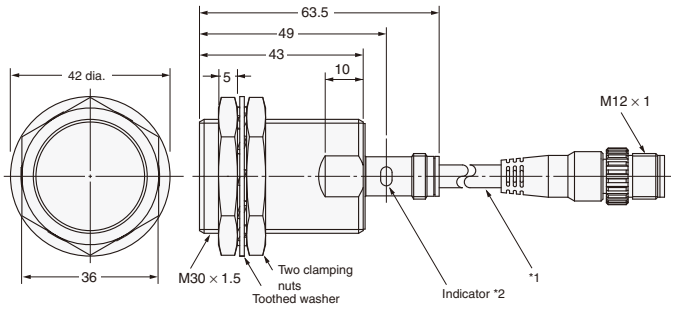
*1. 6-dia. vinyl-insulated round cable (flame retardant), Standard length; 300 mm
*2. Operation indicator (red/green)
Setting indicator (green)

E2FM-X5D□-M1GJ-□



*1. 6-dia. vinyl-insulated round cable (flame retardant), Standard length; 300 mm
*2. Operation indicator (red/green)
Setting indicator (green)

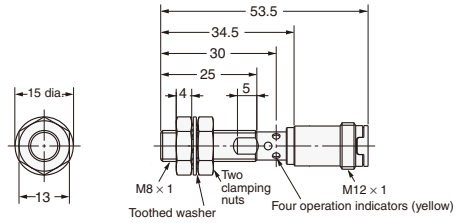
E2FM-X10D□-M1GJ-□



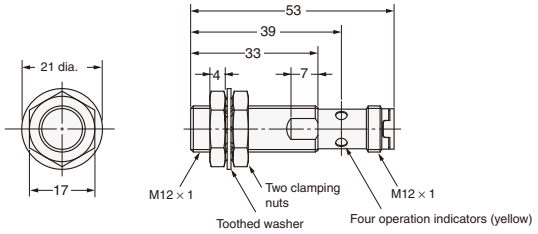
*1. 6-dia. vinyl-insulated round cable (flame retardant), Standard length; 300 mm
*2. Operation indicator (red/green)
Setting indicator (green)

M12 Connector Models

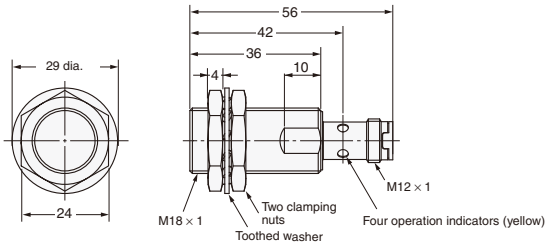
E2FM-X1R5□□-M1



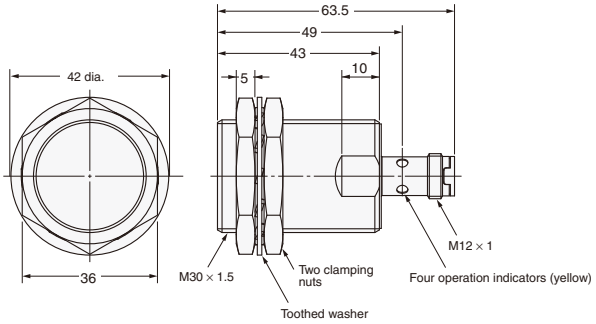
E2FM-X2□□-M1



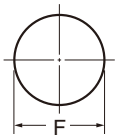
E2FM-X5□□-M1



E2FM-X10□□-M1



Mounting Hole Dimensions



Dimension	M8	M12	M18	M30
F (mm)	$8.5^{+0.5}_{0}$ dia.	$12.5^{+0.5}_{0}$ dia.	$18.5^{+0.5}_{0}$ dia.	$30.5^{+0.5}_{0}$ dia.