Absolute 60-mm-dia. Rotary Encoder

E6F-A

CSM_E6F-A_DS_E_7_3

Rugged Rotary Encoder

- Absolute model.
- External diameter of 60 mm.
- Resolution of up to 1,024 (10-bit).
- IP65 oil-proof protection.
- Strong shaft.
  Radial: 120 N, Thrust: 50 N

⚠ Be sure to read *Safety Precautions* on page 5.

For the most recent information on models that have been certified for safety standards, refer to your OMRON website.

Ordering Information

Encoders [Refer to *Dimensions* on page 6.]

Power supply voltage	Output configuration	Output code	Resolution (divisions)	Connection method	Model
5 to 12 VDC	NPN open collector	BCD	360	Pre-wired Model	**E6F-AB3C 360P/R 2M *2**
				Pre-wired Connector Model (2 m)	**E6F-AB3C-C 360P/R 2M *2**
12 to 24 VDC				Pre-wired Model	**E6F-AB5C 360P/R 2M**
				Pre-wired Connector Model (2 m)	**E6F-AB5C-C 360P/R 2M**
	PNP open collector			Pre-wired Model	**E6F-AB5B 360P/R 2M**
	NPN open collector	Gray code	256, 360, 720	Pre-wired Connector Model (2 m)	**E6F-AG5C-C (resolution) 2M *1** Example: E6F-AG5C-C 256P/R 2M
			256, 360, 720, 1,024	Pre-wired Model	**E6F-AG5C (resolution) 2M** Example: E6F-AG5C 256P/R 2M
	PNP open collector				**E6F-AG5B (resolution) 2M** Example: E6F-AG5B 256P/R 2M

*1. The E6F-AG5C-C is designed for connection to Cam Positioners (H8PS).
*2. Models are also available with 5-m cables.

Accessories (Order Separately)

[Dimensions: Refer to *Accessories* for coupling dimensions and to page 6 for the dimensions of other accessories.]

Name	Model	Remarks	
Couplings	**E69-C10B**	Provided with E6F Pre-wired Models.	
	E69-C610B	Different end diameter	
	E69-C10M	Metal construction	
Servo Mounting Bracket	**E69-2**	Provided with the product. (Three brackets in a set.)	
Extension Cable	**E69-DF5**	5 m	Models are also available with 15-m and 98-m cables.
	E69-DF10	10 m	
	E69-DF20	20 m	

Refer to *Accessories* for details.

Ratings and Specifications

Item \ Model	E6F-AB3C-C	E6F-AB3C	E6F-AB5C-C	E6F-AB5C	E6F-AB5B	E6F-AG5C-C	E6F-AG5C	E6F-AG5B
Power supply voltage	5 VDC −5% to 12 VDC +10%, ripple (p-p): 5% max.		12 VDC −10% to 24 VDC +15%, ripple (p-p): 5% max.					
Current consumption*1	60 mA max.							
Resolution (pulses/rotation)*2	360					256, 360, 720	256, 360, 720, 1024	
Output code	BCD					Gray code		
Output configuration	NPN open-collector output				PNP open-collector output	NPN open-collector output		PNP open-collector output
Output capacity	Applied voltage: 30 VDC max. Sink current: 35 mA max. Residual voltage: 0.4 V max. (at sink current of 35 mA)				Source current: 35 mA max. Residual voltage: 0.4 V max. (at source current of 35 mA)	Applied voltage: 30 VDC max. Sink current: 35 mA max. Residual voltage: 0.4 V max. (at sink current of 35 mA)		Source current: 35 mA max. Residual voltage: 0.4 V max. (at source current of 35 mA)
Maximum response frequency*3	10 kHz					20 kHz		
Logic	Negative logic (high = 0, low = 1)				Positive logic (high = 1, low = 0)	Negative logic (high = 0, low = 1)		Positive logic (high = 1, low = 0)
Direction of rotation	Output code incremented by CW (as viewed from the end of the shaft)							
Rise and fall times of output	1 μs max. (E6F-AB3C, A□5C: Load voltage: 5 V, Load resistance: 1 kΩ, Output cable: 2 m max.; E6F-A□5B: Power supply voltage: 12 V, Load resistance: 1 kΩ, Output cable: 2 m max.)							
Starting torque	9.8 mN·m max. at room temperature, 14.7 mN·m max. at low temperature							
Moment of inertia	1.5×10^{-6} kg·m^2 max.							
Shaft loading Radial	120 N							
Shaft loading Thrust	50 N							
Maximum permissible speed	5000 r/min							
Ambient temperature range	Operating: −10 to 70°C (with no icing), Storage: −25 to 80°C (with no icing)							
Ambient humidity range	Operating: 35% to 85% (with no condensation), Storage: 35% to 95% (with no condensation)							
Insulation resistance	20 MΩ min. (at 500 VDC) between current-carrying parts and case							
Dielectric strength	500 VAC, 50/60 Hz for 1 min between current-carrying parts and case							
Vibration resistance	10 to 500 Hz, 2-mm double amplitude for 11 min 3 times each in X, Y, and Z directions							
Shock resistance	Destruction: 1,000 m/s^2 3 times each in X, Y, and Z directions							
Degree of protection	IEC 60529 IP65, in-house standards: oilproof							
Connection method	Connector Models (Standard cable length: 2 m)	Pre-wired Models (Standard cable length: 2 m)	Connector Models (Standard cable length: 2 m)	Pre-wired Models (Standard cable length: 2 m)		Connector Models (Standard cable length: 2 m)	Pre-wired Models (Standard cable length: 2 m)	
Material	Case: Zinc alloy, Main unit: Aluminum, Shaft: SUS420J2, Mounting Bracket: Galvanized iron							
Weight (packed state)	Approx. 500 g							
Accessories	Servo Mounting Bracket, Coupling (provided with Pre-wired Models only), Hexagonal wrench (provided with Pre-wired Models only), Instruction manual							

*1. An inrush current of approximately 9 A will flow for approximately 5 μs when the power is turned ON.
*2. The code is as follows:

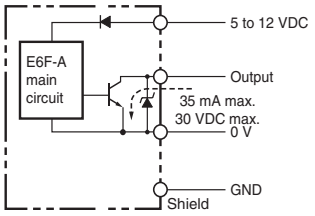
Output code	Resolution	Code No.
BCD	360	0 to 359
Gray code	256	0 to 255
	360	76 to 435 (gray after 76)
	720	152 to 871 (gray after 152)
	1024	0 to 1023

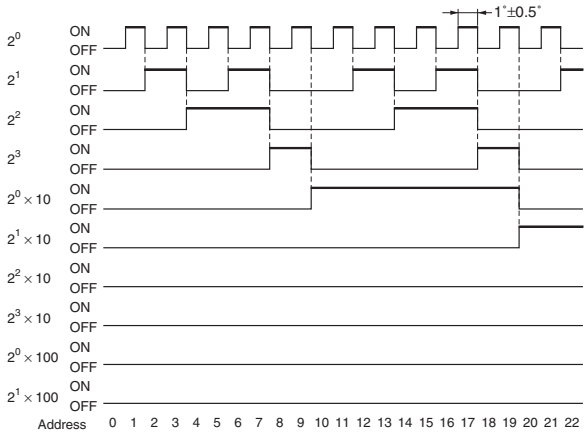
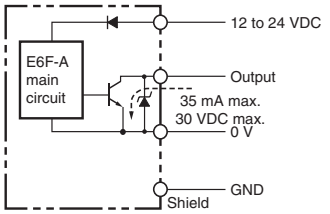
*3. The maximum electrical response speed is determined by the resolution and maximum response frequency as follows:

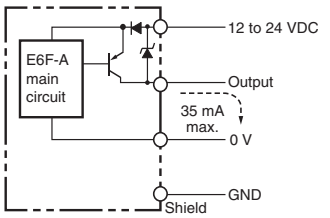
$$\text{Maximum electrical response speed (rpm)} = \frac{\text{Maximum response frequency}}{\text{Resolution}} \times 60$$

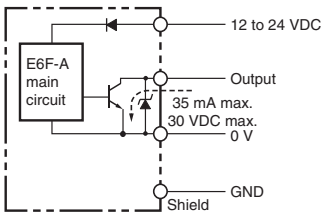
* This means that the Rotary Encoder will not operate electrically if its speed exceeds the maximum electrical response speed.

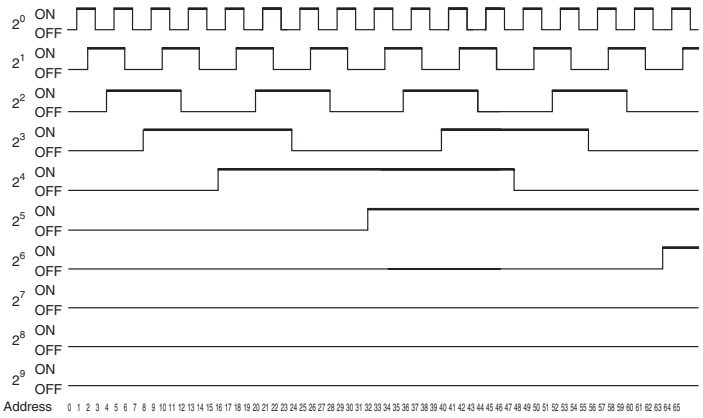
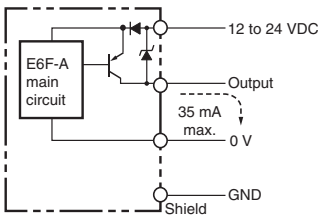
I/O Circuit Diagrams

<table>
<tr><th>Model</th><th>Output Circuits</th><th>Output mode</th></tr>
<tr><td>E6F-AB3C
E6F-AB3C-C</td><td> 

Note: The circuit is the same for all bit outputs.
Each E6F-A Rotary Encoder has one main circuit.</td><td rowspan="3">Direction of rotation: CW (as viewed from end of shaft)
 
</td></tr>
<tr><td>E6F-AB5C
E6F-AB5C-C</td><td> 

Note: The circuit is the same for all bit outputs.
Each E6F-A Rotary Encoder has one main circuit.</td></tr>
<tr><td>E6F-AB5B</td><td> 

Note: The circuit is the same for all bit outputs.
Each E6F-A Rotary Encoder has one main circuit.</td></tr>
<tr><td>E6F-AG5C
E6F-AG5C-C</td><td> 

Note: The circuit is the same for all bit outputs.
Each E6F-A Rotary Encoder has one main circuit.</td><td rowspan="2">Output transistor
Direction of rotation: CW (as viewed from end of shaft)
 
</td></tr>
<tr><td>E6F-AG5B</td><td> 

Note: The circuit is the same for all bit outputs.
Each E6F-A Rotary Encoder has one main circuit.</td></tr>
</table>

Connection Specifications

Connector Models*

Model	E6F-AB3C-C/ -AB5C-C	E6F-AG5C-C		
	Output signal	Output signal		
Pin No.	10-bit (360)	8-bit (256)	9-bit (360)	10-bit (720)
1	2^0	Connected internally	Not connected	2^9
2	2^1		2^8	2^8
3	2^2	2^5	2^5	2^5
4	2^3	2^1	2^1	2^1
5	$2^0 \times 10$	2^0	2^0	2^0
6	$2^1 \times 10$	2^7	2^7	2^7
7	$2^2 \times 10$	2^4	2^4	2^4
8	$2^3 \times 10$	2^2	2^2	2^2
9	$2^0 \times 100$	2^3	2^3	2^3
10	$2^1 \times 100$	2^6	2^6	2^6
11	Shield (ground)			
12	-AB3C-C: 5 to 12 VDC, -AB5C-C: 12 to 24 VDC	12 to 24 VDC		
13	0 V (common)	0 V (common)		

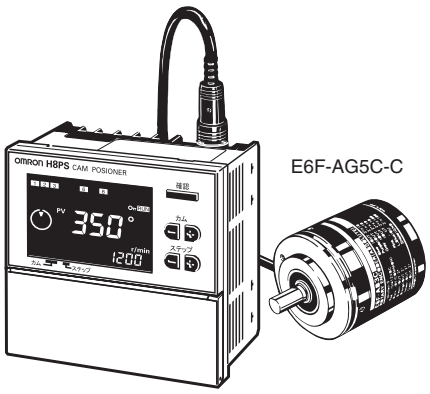
* Connector: RP13A-12PD-13SC (Hirose Electric Co., Ltd.)
Note: Normally connect GND to 0 V or to an external ground.

Pre-wired Model

Model	E6F-AB3C/ -AB5C/-AB5B	E6F-AG5C/-AG5B		
	Output signal	Output signal		
Wire color	10-bit (360)	8-bit (256)	9-bit (360)	10-bit (720,1024)
Brown	2^0	2^0	2^0	2^0
Orange	2^1	2^1	2^1	2^1
Yellow	2^2	2^2	2^2	2^2
Green	2^3	2^3	2^3	2^3
Blue	$2^0 \times 10$	2^4	2^4	2^4
Purple	$2^1 \times 10$	2^5	2^5	2^5
Gray	$2^2 \times 10$	2^6	2^6	2^6
White	$2^3 \times 10$	2^7	2^7	2^7
Pink	$2^0 \times 100$	Not connected	2^8	2^8
Light blue	$2^1 \times 100$	Not connected	Not connected	2^9
---	Shield (ground)	Shield (ground)		
Red	-AB3C: 5 to 12 VDC, -AB5C: 12 to 24 VDC	12 to 24 VDC		
Black	0 V (common)	0 V (common)		

Connection Example

H8PS Cam Positioner Connection



Ordering Information

Model
H8PS-8A
H8PS-8AP
H8PS-8AF
H8PS-8AFP
H8PS-16A
H8PS-16AP
H8PS-16AF
H8PS-16AFP
H8PS-32A
H8PS-32AP
H8PS-32AF
H8PS-32AFP

Specifications

Rated voltage	24 VDC
Cam precision	0.5° (for 720 resolution), 1° (for 256/360 resolution)
No. of output points	8-point output type: 8 cam outputs, 1 RUN output, 1 pulse output 16-point output type: 16 cam outputs, 1 RUN output, 1 pulse output 32-point output type: 32 cam outputs, 1 RUN output, 1 pulse output
Encoder response	RUN mode, test mode: 256/360 resolution ...1,600 r/min max. (1,200 r/min when advance compensation is set for four cams or more) 720 resolution .....800 r/min max. (600 r/min when advance compensation is set for four cams or more)
Additional functions	• Origin compensation (zeroing) • Rotation direction switching • Angle display switching • Teaching • Pulse output • Angle/number of rotations display switching • Puncture * • Angle advance • Number of rotations alarm output • Setting with support software (order separately) *

Note: For 16-point and 32-point output types only

Safety Precautions

Refer to *Warranty and Limitations of Liability*.

⚠ WARNING

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

Precautions for Correct Use

Do not use the Encoder under ambient conditions that exceed the ratings.

● **Adjustment**

Reading the Output Code

Read the code after the LSB (output 2^0) of the code changes for the E6F-AB3C and E6F-AB3C-C.

● **Wiring**

Spurious pulses may be generated when power is turned ON and OFF. Wait at least 0.1 s after turning ON the power to the Encoder before using the connected device, and stop using the connected device at least 0.1 s before turning OFF the power to the Encoder. Also, turn ON the power to the load only after turning ON the power to the Encoder.

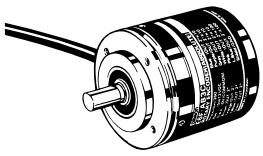
(Unit: mm)

Dimensions

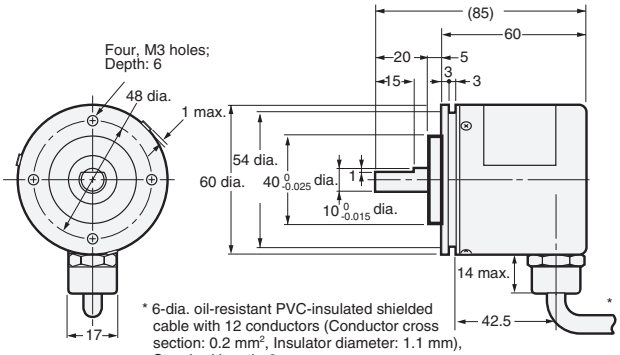
Tolerance class IT16 applies to dimensions in this datasheet unless otherwise specified.

Encoder

E6F-AB3C
E6F-AB5C
E6F-AG5C
E6F-AG5B
E6F-AB5B

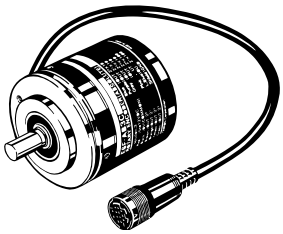


The E69-C10B Coupling is provided.

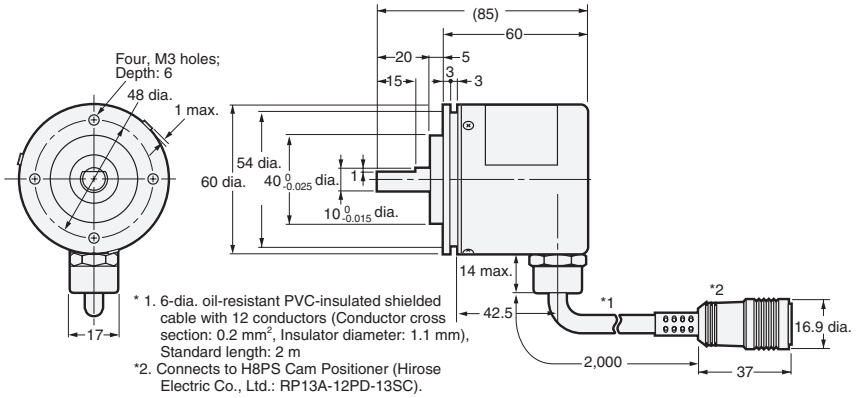


* 6-dia. oil-resistant PVC-insulated shielded cable with 12 conductors (Conductor cross section: 0.2 mm², Insulator diameter: 1.1 mm), Standard length: 2 m

E6F-AB3C-C
E6F-AB5C-C
E6F-AG5C-C



The E69-C10B Coupling is sold separately.

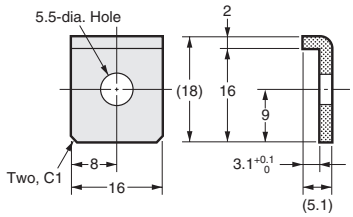


* 1. 6-dia. oil-resistant PVC-insulated shielded cable with 12 conductors (Conductor cross section: 0.2 mm², Insulator diameter: 1.1 mm), Standard length: 2 m
*2. Connects to H8PS Cam Positioner (Hirose Electric Co., Ltd.: RP13A-12PD-13SC).

Accessories (Order Separately)

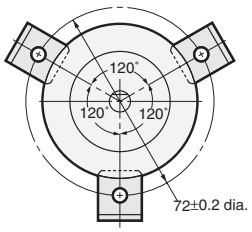
Servo Mounting Bracket

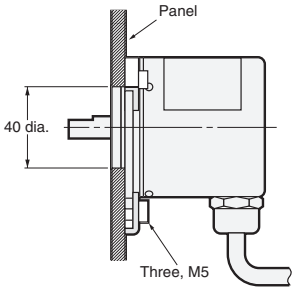
E69-2



Note: Provided with the product.

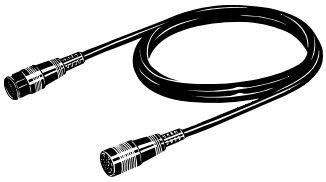
Mounting Bracket Installation

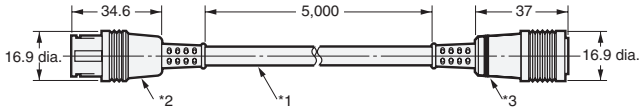




Extension Cable

E69-DF5





*1. 6-dia. shielded cable with 12 conductors (Conductor cross section: 0.2 mm², Insulator diameter: 1.1 mm), Standard length: 5 m
*2. Connects to connector on E6F-AB□C-C or E6F-AG5C-C.
*3. Connects to H8PS Cam Positioner.

Note: 1. The E69-DF5 (5 m) is also available with the following cable lengths: 10 m, 15 m, 20 m, and 98 m.
2. Cable can be extended to 100 m when the H8PS Cam Positioner is connected.

Couplings

E69-C10B
E69-C610B
E69-C10M

Refer to *Accessories* for details.

Terms and Conditions Agreement

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Product specifications and accessories may be changed at any time based on improvements and other reasons. It is our practice to change part numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the Product may be changed without any notice. When in doubt, special part numbers may be assigned to fix or establish key specifications for your application. Please consult with your Omron's representative at any time to confirm actual specifications of purchased Product.

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2015.9

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Industrial Automation Company

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