


# E6F-A

## Rugged Encoder for High-precision Detection of Automatic Machine Timing

- Rugged construction with the highest shaft loading.  
Radial: 120 N, Thrust: 50 N
- IP65 oilproof construction.
- Support for more applications with a wider range of resolutions.  
(E6F-AG5C-C: Resolutions up to 720)
- Higher response speed for faster control.  
(Gray code: 20 kHz)



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

### 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	<b>E6F-AB3C 360P/R 2M *2</b>
				Pre-wired Connector Model (2 m)	<b>E6F-AB3C-C 360P/R 2M *2</b>
				Pre-wired Model	<b>E6F-AB5C 360P/R 2M</b>
				Pre-wired Connector Model (2 m)	<b>E6F-AB5C-C 360P/R 2M</b>
12 to 24 VDC	PNP open collector	Gray code	256, 360, 720	Pre-wired Model	<b>E6F-AB5B 360P/R 2M</b>
	NPN open collector			Pre-wired Connector Model (2 m)	<b>E6F-AG5C-C (resolution) 2M *1</b> Example: E6F-AG5C-C 256P/R 2M
			PNP open collector	256, 360, 720, 1,024	Pre-wired Model
	<b>E6F-AG5B (resolution) 2M</b> 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 and 10-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	<b>E69-C10B</b>	Provided with E6F Pre-wired Models.
	<b>E69-C610B</b>	Different end diameter
	<b>E69-C10M</b>	Metal construction
Servo Mounting Bracket	<b>E69-2</b>	Provided with the product. (Three brackets in a set.)
Extension Cable	<b>E69-DF5</b>	5 m
	<b>E69-DF10</b>	10 m
	<b>E69-DF20</b>	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		$1.5 \times 10^{-6}$ kg·m <sup>2</sup> max.								
Shaft loading	Radial	120 N								
	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, 1.5-mm double amplitude for 11 min 3 times each in X, Y, and Z directions								
Shock resistance		Destruction: 1,000 m/s <sup>2</sup> 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:

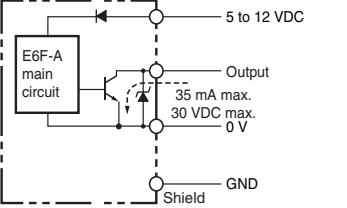
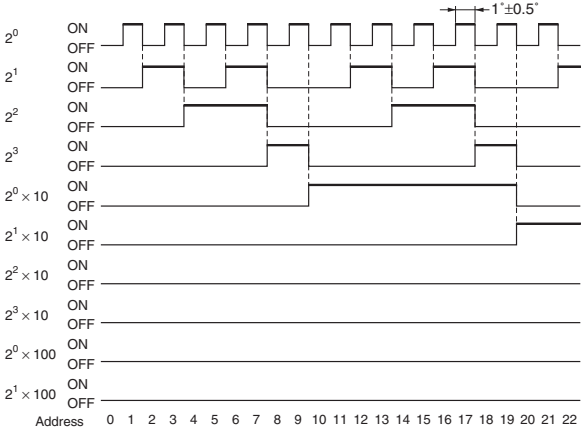
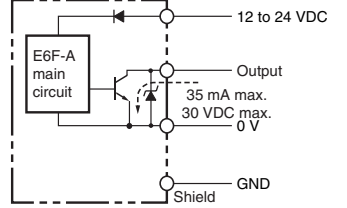
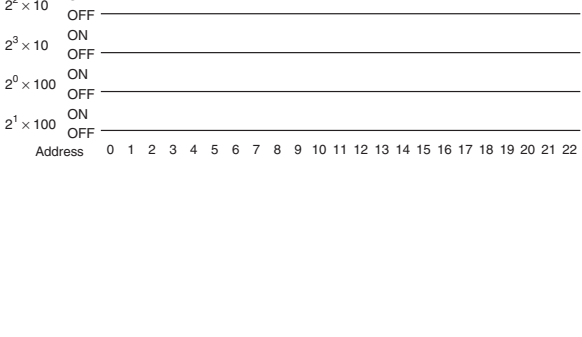
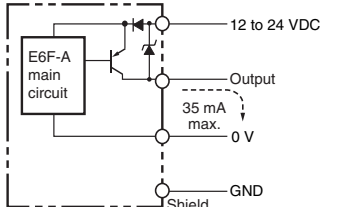

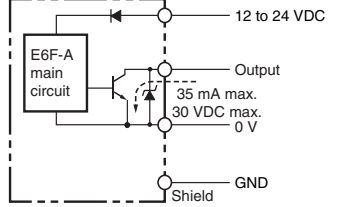
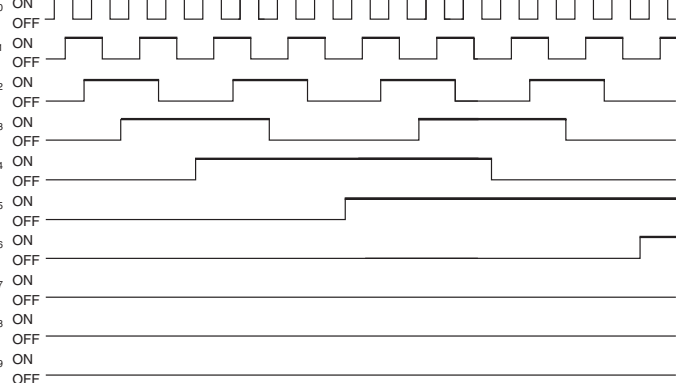
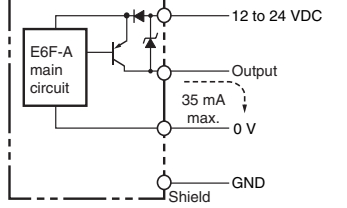
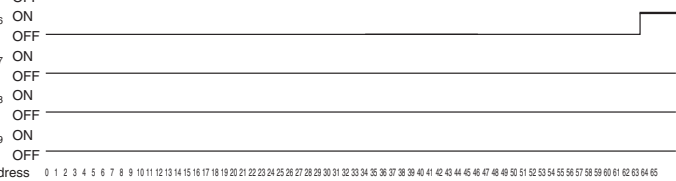
Output code	Resolution	Code No.
BCD	360	0 to 359
	256	0 to 255
Gray code	360	76 to 435 (gray after 76)
	720	152 to 871 (gray after 152)
	1024	0 to 1023

\*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

Model	Output Circuits	Output mode
<p><b>E6F-AB3C</b> <b>E6F-AB3C-C</b></p>	 <p>Note: The circuit is the same for all bit outputs.</p>	<p>Direction of rotation: CW (as viewed from end of shaft)</p> 
<p><b>E6F-AB5C</b> <b>E6F-AB5C-C</b></p>	 <p>Note: The circuit is the same for all bit outputs.</p>	
<p><b>E6F-AB5B</b></p>	 <p>Note: The circuit is the same for all bit outputs.</p>	
<p><b>E6F-AG5C</b> <b>E6F-AG5C-C</b></p>	 <p>Note: The circuit is the same for all bit outputs.</p>	<p>Output transistor</p> <p>Direction of rotation: CW (as viewed from end of shaft)</p> 
<p><b>E6F-AG5B</b></p>	 <p>Note: The circuit is the same for all bit outputs.</p>	

## 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 <sup>0</sup>	Connected internally	Not connected	2 <sup>9</sup>
2	2 <sup>1</sup>		2 <sup>8</sup>	2 <sup>8</sup>
3	2 <sup>2</sup>	2 <sup>5</sup>	2 <sup>5</sup>	2 <sup>5</sup>
4	2 <sup>3</sup>	2 <sup>1</sup>	2 <sup>1</sup>	2 <sup>1</sup>
5	2 <sup>0</sup> × 10	2 <sup>0</sup>	2 <sup>0</sup>	2 <sup>0</sup>
6	2 <sup>1</sup> × 10	2 <sup>7</sup>	2 <sup>7</sup>	2 <sup>7</sup>
7	2 <sup>2</sup> × 10	2 <sup>4</sup>	2 <sup>4</sup>	2 <sup>4</sup>
8	2 <sup>3</sup> × 10	2 <sup>2</sup>	2 <sup>2</sup>	2 <sup>2</sup>
9	2 <sup>0</sup> × 100	2 <sup>3</sup>	2 <sup>3</sup>	2 <sup>3</sup>
10	2 <sup>1</sup> × 100	2 <sup>6</sup>	2 <sup>6</sup>	2 <sup>6</sup>
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)		

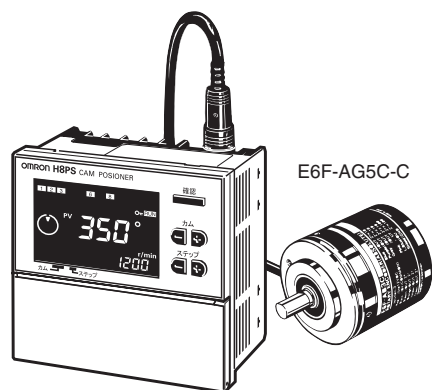
\* Connector: RP13A-12PD-13SC (Hirose Electric Co., Ltd.)  
Note: Normally connect GND to 0 V or to an external ground.

### 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 <sup>0</sup>	2 <sup>0</sup>	2 <sup>0</sup>	2 <sup>0</sup>
Orange	2 <sup>1</sup>	2 <sup>1</sup>	2 <sup>1</sup>	2 <sup>1</sup>
Yellow	2 <sup>2</sup>	2 <sup>2</sup>	2 <sup>2</sup>	2 <sup>2</sup>
Green	2 <sup>3</sup>	2 <sup>3</sup>	2 <sup>3</sup>	2 <sup>3</sup>
Blue	2 <sup>0</sup> × 10	2 <sup>4</sup>	2 <sup>4</sup>	2 <sup>4</sup>
Purple	2 <sup>1</sup> × 10	2 <sup>5</sup>	2 <sup>5</sup>	2 <sup>5</sup>
Gray	2 <sup>2</sup> × 10	2 <sup>6</sup>	2 <sup>6</sup>	2 <sup>6</sup>
White	2 <sup>3</sup> × 10	2 <sup>7</sup>	2 <sup>7</sup>	2 <sup>7</sup>
Pink	2 <sup>0</sup> × 100	Not connected	2 <sup>8</sup>	2 <sup>8</sup>
Light blue	2 <sup>1</sup> × 100	Not connected	Not connected	2 <sup>9</sup>
---	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

<b>Rated voltage</b>	24 VDC
<b>Cam precision</b>	0.5° (for 720 resolution), 1° (for 256/360 resolution)
<b>No. of output points</b>	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
<b>Encoder response</b>	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)
<b>Additional functions</b>	<ul style="list-style-type: none"> <li>• Origin compensation (zeroing)</li> <li>• Rotation direction switching</li> <li>• Angle display switching</li> <li>• Teaching</li> <li>• Pulse output</li> <li>• Angle/number of rotations display switching</li> <li>• Puncture *</li> <li>• Angle advance</li> <li>• Number of rotations alarm output</li> <li>• Setting with support software (order separately) *</li> </ul>

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

### Programmable Controller Connection

Connection is possible with the CQM1H-CPU51 and CQM1H-ABB21.

For details, refer to *Connection to Peripheral Devices*.

Refer to the *CQM1H Programmable Controller Catalog (P050)* for details on the CQM1H Programmable Controller.

## Safety Precautions

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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.



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### 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<sup>0</sup>) of the code changes for the E6F-AB3C and E6F-AB3C-C.

#### ● Wiring

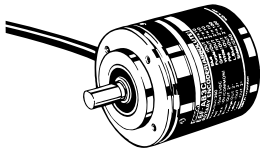
Spurious pulses may be generated when power is turned ON and OFF. Wait at least 0.1 s after turning ON the power to the Encoder before using the connected device, and stop using the connected device at least 0.1 s before turning OFF the power to the Encoder. Also, turn ON the power to the load only after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

## Dimensions

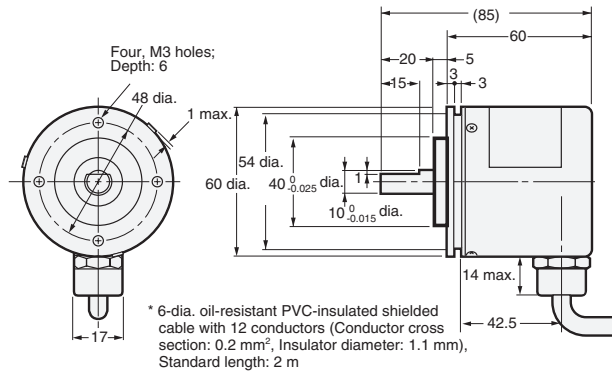
Tolerance class IT16 applies to dimensions in this datasheet unless otherwise specified.

### Encoder

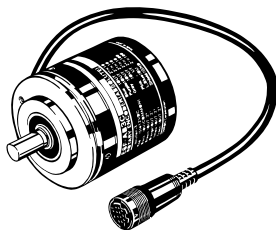
E6F-AB3C  
E6F-AB5C  
E6F-AG5C  
E6F-AG5B  
E6F-AB5B



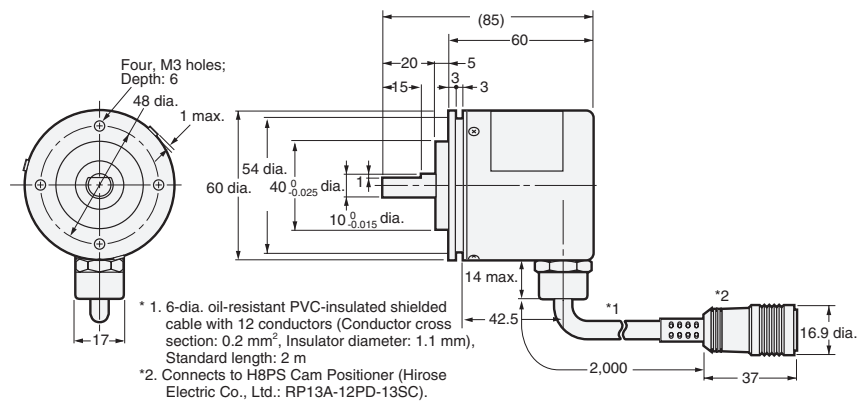
The E69-C10B Coupling is provided.



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



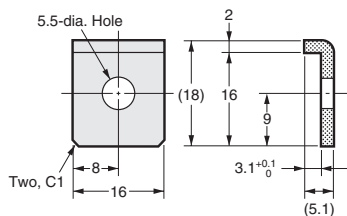
The E69-C10B Coupling is sold separately.



## Accessories (Order Separately)

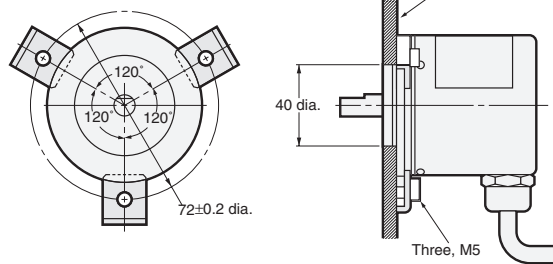
### Servo Mounting Bracket

E69-2



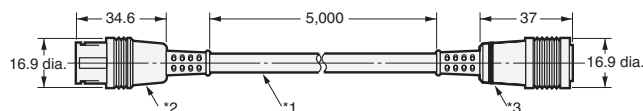
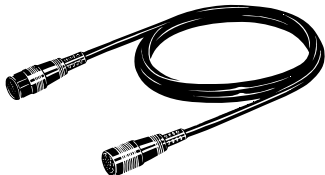
Note: Provided with the product.

### Mounting Bracket Installation



### Extension Cable

E69-DF5



\*1. 6-dia. shielded cable with 12 conductors (Conductor cross section: 0.2 mm<sup>2</sup>, Insulator diameter: 1.1 mm), Standard length: 5 m  
\*2. Connects to connector on E6F-AB3C-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.

## Read and Understand This Catalog

Please read and understand this catalog before purchasing the products. Please consult your OMRON representative if you have any questions or comments.

## Warranty and Limitations of Liability

### WARRANTY

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- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

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