

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
- IP65f water- and oil-proof 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)



Rotary Encoders

⚠ Be sure to read *Safety Precautions* on page 1072.

Ordering Information

Sensing Guide

Encoder

	Power supply voltage	Output configuration	Output code	Resolution (pulses/rotation)	Connection method	Model
Incremental Encoders	5 to 12 VDC	NPN open collector	BCD	360	Pre-wired Model	E6F-AB3C*3
					Connector Models	E6F-AB3C-C*1, *3
Absolute Encoders	12 to 24 VDC	PNP open collector	Gray code	256, 360, 720	Pre-wired Model	E6F-AB5C
					Connector Models	E6F-AB5C-C
Easy Scale	12 to 24 VDC	NPN open collector	Gray code	256, 360, 720, 1,024	Pre-wired Model	E6F-AB5B
					Connector Models	E6F-AG5C-C*2
Direction Discrimination Unit	12 to 24 VDC	PNP open collector	Gray code	256, 360, 720, 1,024	Pre-wired Model	E6F-AG5C
					Pre-wired Model	E6F-AG5B

Note: When ordering, specify the resolution in addition to the model number (example: E6F-AG5C 256 P/R).

*1. The E6F-AB3C-C is designed for connection to Rotary Positioners (H8PR-8, -16, -24).

*2. The E6F-AG5C-C is designed for connection to Cam Positioners (H8PS).

*3. Models are also available with 5-m and 10-m cables.

Peripheral Devices

Other Information

Accessories (Order Separately)

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
	E69-DF10	10 m
	E69-DF20	20 m
Models are also available with 15-m and 98-m cables.		

For details, refer to *Accessories* on page 1082.

E6C-N

E6CP-A

E6C3-A

E6F-A

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								
	Thrust	50 N								
Maximum permissible speed		5000 r/min								
Ambient temperature		Operating: -10 to 70°C (with no icing), Storage: -25 to 80°C (with no icing)								
Ambient humidity		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 ² 3 times each in X, Y, and Z directions								
Degree of protection		IEC 60529 IP65 *4								
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		Coupling (provided with Pre-wired Models only), Hexagonal wrench (provided with Pre-wired Models only), Servo Mounting Bracket, 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.

*4. JEM 1030: Applicable from 1991.

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Absolute Encoders

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Direct Discrimination Unit

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Other Information

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E6CP-A

E6C3-A

E6F-A

E6F-A

I/O Circuit Diagrams

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

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- E6F-A

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 × 10	2 ⁰	2 ⁰	2 ⁰
6	2 ¹ × 10	2 ⁷	2 ⁷	2 ⁷
7	2 ² × 10	2 ⁴	2 ⁴	2 ⁴
8	2 ³ × 10	2 ²	2 ²	2 ²
9	2 ⁰ × 100	2 ³	2 ³	2 ³
10	2 ¹ × 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)		

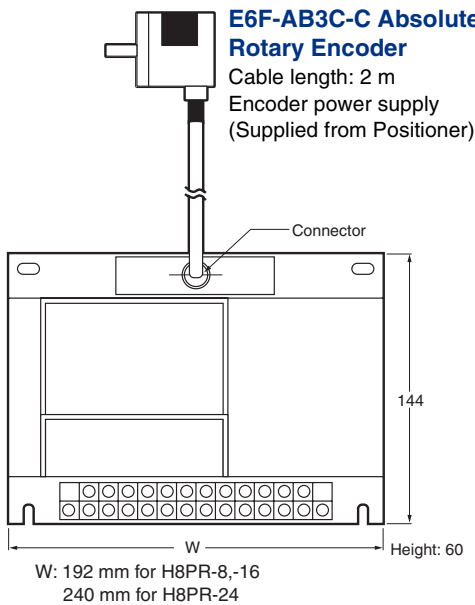
* Connector: RP13A-12PD-13SC (Hirose Electric Co., Ltd.)

Pre-wired Model

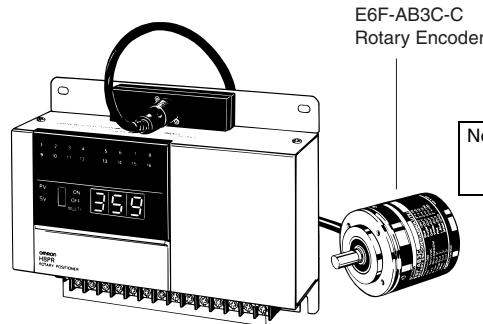
Model	E6F-AB3C/ -AB5C/-AB5B	E6F-AG5C/-AG5B		
	Output signal	Output signal		
Wire color	10-bit (360)	8-bit (256)	9-bit (360)	10-bit (720,1024)
Brown	2 ⁰	2 ⁰	2 ⁰	2 ⁰
Orange	2 ¹	2 ¹	2 ¹	2 ¹
Yellow	2 ²	2 ²	2 ²	2 ²
Green	2 ³	2 ³	2 ³	2 ³
Blue	2 ⁰ × 10	2 ⁴	2 ⁴	2 ⁴
Purple	2 ¹ × 10	2 ⁵	2 ⁵	2 ⁵
Gray	2 ² × 10	2 ⁶	2 ⁶	2 ⁶
White	2 ³ × 10	2 ⁷	2 ⁷	2 ⁷
Pink	2 ⁰ × 100	Not connected	2 ⁸	2 ⁸
Light blue	2 ¹ × 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

H8PR Rotary Positioner Connection



H8PR-8, -16, -24 Easy-key-switching Rotary Positioner



Note: The cable length between the H8PR and E6F-AB3C-C can be extended to a maximum of 30 m.

Ordering Information

Model	Applicable model
H8PR-8	E6F-AB3C-C
H8PR-16	
H8PR-24	

Specifications

Rated voltage	100 to 240 VAC
Cam precision	1° (360 divisions per revolution)
No. of output points	H8PR-8: 8 points H8PR-16: 16 points H8PR-24: 24 points
Encoder response	833 r/min
Additional functions	<ul style="list-style-type: none"> • Origin compensation (zeroing) • Rotation direction switching • Initial angle specification • Angle teaching • Retentive memory for power interruptions (10 years min.)

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Other Information

E6C-N

E6CP-A

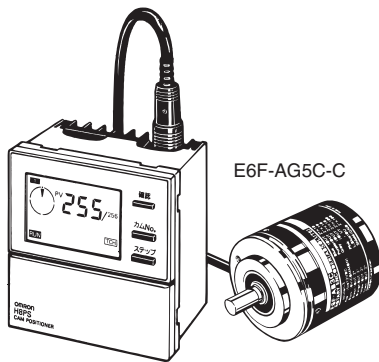
E6C3-A

E6F-A

E6F-A

H8PS Cam Positioner Connection

H8PS-8A, -8AF
Cam Positioner



Ordering Information

Model	Applicable model
H8PS-8A	E6F-AG5C-C
H8PS-8AF	

Note: The cable length between the H8PS and E6F-AG5C-C can be extended to a maximum of 100 m.

Specifications

Rated voltage	24 VDC
Cam precision	1.4° (256 divisions per revolution)
No. of output points	8 cam outputs 1 RUN output 1 rotating output
Encoder response	330 r/min
Additional functions	<ul style="list-style-type: none"> • Origin compensation (zeroing) • Rotation direction switching • Angle display switching • Teaching

Rotary Encoders

Programmable Controller Connection

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

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

Sensing Guide

Safety Precautions

Incremental Encoders

Refer to *Warranty and Limitations of Liability on page F-2.*

WARNING

This product is not designed or rated for ensuring safety of persons. 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 2⁰) 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.

Absolute Encoders

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Direction Discrimination Unit

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Other Information

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E6CP-A

E6C3-A

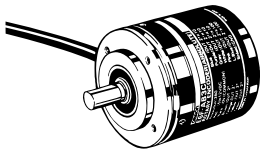
E6F-A

Dimensions

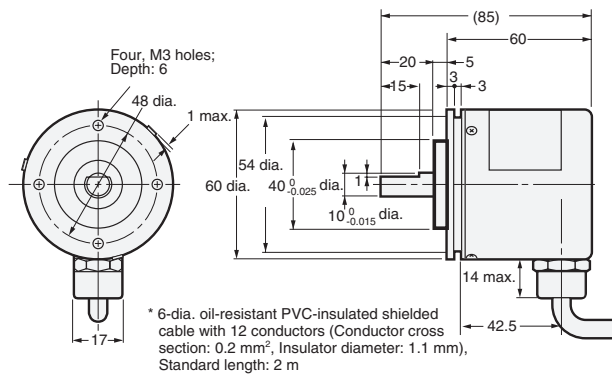
Encoder

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

CAD data

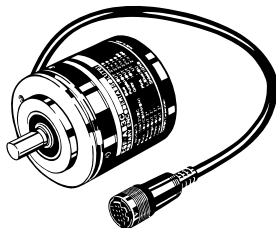


The E69-C10B Coupling is provided.

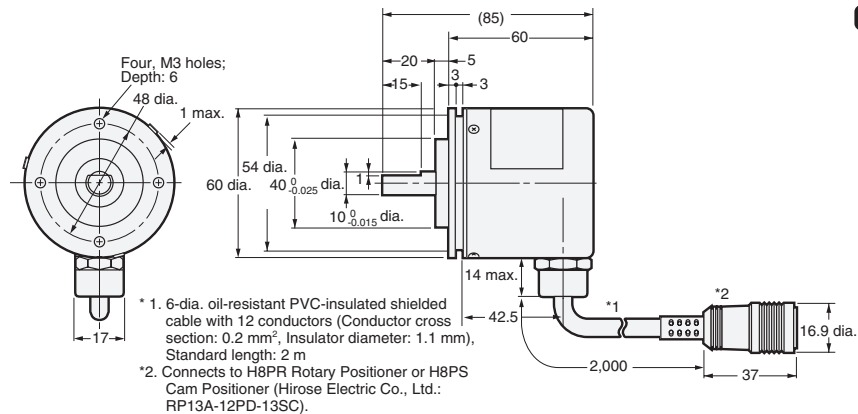


E6F-AB3C-C
E6F-AB5C-C
E6F-AG5C-C

CAD data



The E69-C10B Coupling is sold separately.



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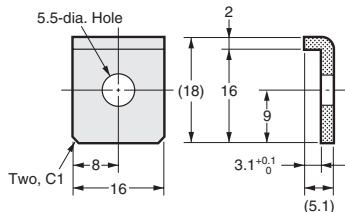
Peripheral Devices

Other Information

Accessories (Order Separately)

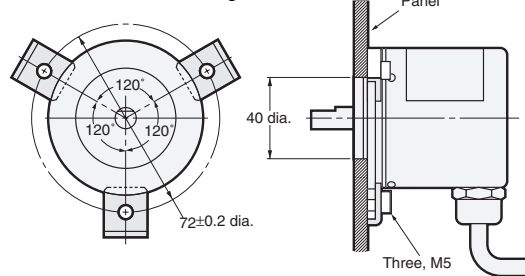
Servo Mounting Bracket

E69-2



Note: Provided with the product.

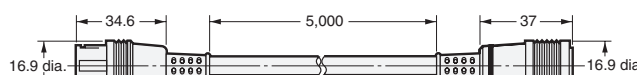
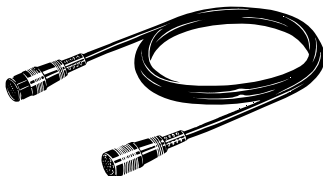
Mounting Bracket Installation



Extension Cable

E69-DF5

CAD data



*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-AB3C-C or E6F-AG5C-C.

*3. Connects to H8PR Rotary Positioner or H8PS Cam Positioner.

Note: The cable length between the H8PR and E6F-AB3C-C can be extended to a maximum of 30 m including the length of the cable provided with the Encoder. The cable length between the H8PS and E6F-AB5C-C can be extended to a maximum of 100 m including the length of the cable provided with the Encoder. The E69-DF5 (5 m) is also available with the following cable lengths: 10 m, 15 m, 20 m, and 98 m.

E6C-N

E6CP-A

E6C3-A

E6F-A

Couplings

E69-C10B
E69-C610B
E69-C10M

For details, refer to *Accessories* on page 1082.

Cat. No. F824-E1-01

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

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

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