# E6C-N

CSM F6C-N DS F 7 1

# **Multi-turn Absolute Rotary Encoder**

- External diameter of 50 mm.
- Resolution: Single turn: 500 divisions, Multi-turn: -128 to 127 turns
- Easy origin alignment using origin reset function when building into equipment.
- Need for backup power supply eliminated by multi-turn data storage function.
- Product lineup includes both Solid-shaft and Hollow-shaft Models.





Be sure to read *Safety Precautions* on page 4.

# **Ordering Information**

# Encoders [Refer to Dimensions on page 5.]

Shaft	Connection method	Model
Shaft model	Pre-wired Model	E6C-NN5C 2M
Shaft model	Pre-wired Connector Model	E6C-NN5C-C 2M
Hollow shaft	Pre-wired Model	E6C-NN5CA 2M
Hollow shaft	Pre-wired Connector Model	E6C-NN5CA-C 2M

# **Accessories (Order Separately)**

[Dimensions: Refer to Accessories for dimensions.]

Name	Model	Remarks		
	E69-C06B			
Couplings	E69-C68B	Different end diameter		
Couplings	E69-C610B	Different end diameter		
	E69-C06M	Metal construction		
	E69-FCA			
Flanges	E69-FCA02	Servo Mounting Bracket E69-2 Servo Mounting Bracket pro vided.		
Servo Mounting Bracket	E69-2	Three brackets in a set.		

Refer to Accessories for details.

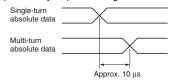
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# **Ratings and Specifications**

Item	Model	E6C-NN5C         E6C-NN5C-C           E6C-NN5CA         E6C-NN5CA-C							
Power supply voltage		12 VDC -10% to 24 VDC +10%, ripple (p-p): 5% max.							
Current consumption*1		80 mA max.							
Resolu- Single-turn absolute		500 divisions							
tion	Multi-turn absolute	-128 to 127 turns*2, *3							
Rotational power failu	limitation at re	±80°*4							
	Output code	Binary							
	Alarm output	Counter overflow output*5							
	Output configuration	NPN open-collector output							
Output	Output capacity	Applied voltage: 30 VDC max. Sink current: 10 mA max. (counter overflow output: 30 mA) Residual voltage: 0.4 V max.							
	Logic	Negative logic	Negative logic						
	Direction	Code increases for CW (when viewed from end of shaft)							
	Input signals	Single-turn data reset, multi-turn data reset*6							
Input	Input current	1 mA max.							
	Input logic	Low active, normally open							
	Input time	100 ms min.							
Maximum response frequency		12.5 kHz							
Rise and fall times of output		1 μs max.*7							
Starting to	rque	2.9 mN·m max.							
Moment of	inertia	$1.5 \times 10^{-6} \text{ kg} \cdot \text{m}^2 \text{ max}.$							
Shaft	Radial	30 N							
loading	Thrust	20 N							
Maximum p speed	permissible	1,500 r/min							
Ambient te	mperature range	Operating: -10 to 55°C (with no icing), Storage: -25 to 65°C (with no icing) *8							
Ambient hu	umidity range	Operating/Storage: 35% to 85% (with no condensation)							
Insulation resistance		20 $\text{M}\Omega$ 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 re	esistance	Destruction: 10 to 500 Hz, 150 m/s² or 2-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 IP50							
Connection	n method	Pre-wired Models (Standard cable length: 2 m)  Connector Models (Standard cable length: 2 m)							
Material		Case: ABS, Main unit: PPS, Pressboard panel: SUS304, Shaft: SUS420J2							
Weight (pa	cked state)	Approx. 400 g							
Accessorie	es	Instruction manual Note: Coupling, mounting bracket and hex-head spanner are sold separately.							

Note: The data outputs will all turn OFF as soon as the main power supply turns OFF. Data is not saved.

- \*1. An inrush current of approximately 8 A will flow for approximately 6.5 ms when the power is turned ON.
- \*2. Negative values for multi-turn absolute values are express as two's complements (see code at right).
- \*3. Multi-turn data will change approximately 10 μs after single-turn data. Allow for this when reading data.



- \*4. When the power supply is interrupted, multi-turn detection is not performed and multi-turn data is compensated by comparison to the data that existed before the power supply was interrupted. If a rotation operation exceeding ±80° is performed from the position when the main power supply turns OFF, correct multi-turn data will be lost. The application must be set up so that no rotation operations are performed that exceed this stipulation.
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  \*5. Output when the multi-turn counter exceeds the –128 to 127 counting range. This error flag will be reset if the count data returns to within the counting range.
- \*6. The single-turn data and multi-turn data reset signals can be input independently to reset the single-turn data to address 0 and the multi-turn data to 0 rotations.
- \*7. Use an Encoder cable length of 10 m max. When using a cable of 10 m or less, read the code 10 μs or more after the LSB (20) of the code changes.
- after the LSB (2°) of the code changes.
  \*8. The device coupled to the Encoder shaft must also satisfy the ambient temperature condition.

#### Multi-turn absolute value code

Multi-turn absolute value	Code
10	00001010
9	00001001
8	00001000
7	00000111
6	00000110
5	00000101
4	00000100
3	00000011
2	0000010
1	00000001
0	0000000
<b>–1</b>	11111111
–2	11111110
-3	11111101
-4	11111100
<b>–</b> 5	11111011
-6	11111010
<b>-7</b>	11111001
-8	11111000
-9	11110111
-10	11110110
-11	11110101

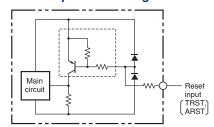
The expressions for negative values given above can be achieved by reversing 1's and 0's and then adding 1.

# I/O Circuit Diagrams

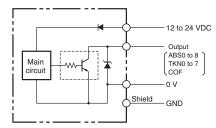
# E6C-NN5C, E6C-NN5CA

# E6C-NN5C-C, E6C-NN5CA-C

# **Input Circuit diagram**



# **Output Circuit Diagram**

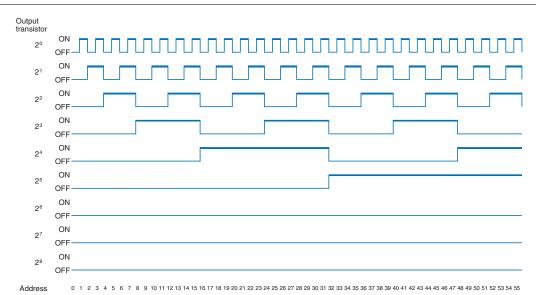


Note: The circuit is the same for all bit outputs.

Each Rotary Encoder has one main circuit.

# **Output Mode**

Direction of rotation: CW (as viewed from end of shaft)



# Connections

# E6C-NN5C(A)

Wire color: grey					Wire color: Black			
Sig- nal	Meaning		Color		Sig- nal Meaning		ng	
ABS0		20	Brown		TKN0		20	
ABS1		2 <sup>1</sup>	Orai	nge	TKN1		2 <sup>1</sup>	
ABS2		<b>2</b> <sup>2</sup>	Yell	ow	TKN2	Multi-	<b>2</b> <sup>2</sup>	
ABS3	Single-	2 <sup>3</sup>	Gre	en	TKN3	turn ab-	2 <sup>3</sup>	
ABS4	turn ab-	2 <sup>4</sup>	Blu	ıe	TKN4	solute	24	
ABS5	solute data	<b>2</b> <sup>5</sup>	Pur	ple	TKN5	data	2 <sup>5</sup>	
ABS6		2 <sup>6</sup>	Gra	ay	TKN6		2 <sup>6</sup>	
ABS7		2 <sup>7</sup>	Wh	ite	TKN7		27	
ABS8		28	Pir	nk	COF	Counter overflow alarm		
ARST	Single-turn data reset		Lig blu		TRST	Multi-turn data reset		
GND	0 V*		Bla	ck	GND	0 V*		
Vcc	12 to 24 VDC*		Re	d	Vcc	12 to 24 VDC*		
SHIELD	Shield		_	_	SHIELD	Shield		

#### **Connections**

# E6C-NN5C(A)-C

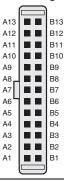
Pin No.	Sig- nal	Meaning		Pin No.	Sig- nal	Meani	ng
A1	ABS0		20	B1	TKN0	Multi- turn absolute data	20
A2	ABS1		2 <sup>1</sup>	B2	TKN1		2 <sup>1</sup>
А3	ABS2		2 <sup>2</sup>	В3	TKN2		<b>2</b> <sup>2</sup>
A4	ABS3	Single-	<b>2</b> <sup>3</sup>	B4	TKN3		<b>2</b> <sup>3</sup>
A5	ABS4	turn	24	B5	TKN4		2 <sup>4</sup>
A6	ABS5	absolute	<b>2</b> <sup>5</sup>	B6	TKN5		2 <sup>5</sup>
A7	ABS6	data	2 <sup>6</sup>	B7	TKN6		2 <sup>6</sup>
A8	ABS7	·	27	B8	TKN7		27
A9	ABS8		<b>2</b> <sup>8</sup>	В9	COF	Counter overflow a	alarm
A10	ARST	Single-turn data reset		B10	TRST	Multi-turn data reset	
A11	GND	0 V*		B11	GND	0 V*	
A12	Vcc	12 to 24 VDC*		B12	Vcc	12 to 24 \	/DC*
A13	SHIELD	Shield		B13	SHIELD	Shield	

\* We recommend connecting both Vcc and GND. Note: Connector Model PS-D4C26

(Hood: PS-HD26)
(Japan Aviation
Electronics Industry, Ltd.)
Connector:
PS-26PE-D4T□-M□
(Straight Model)
PS-26PE-D4LT□-M□

(Angle Model) (Japan Aviation Electronics Industry, Ltd.)

# Pin Arrangement

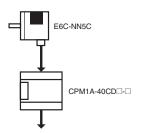


Note: Normally connect GND to 0 V or to an external ground.

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# **Programmable Controller Connection Example**

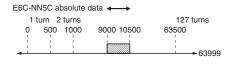
#### Connection to the CPM1A



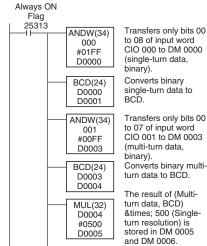
# Wiring between the E6C-NN5C and CPM1A

E6C-NN5C	CPM1A input signal		
		Brown (20)	00000
	Code Cable color: Gray	Orange (21)	00001
		Yellow (22)	00002
Circula tours		Green (23)	00003
Single-turn data		Blue (24)	00004
data		Purple (2 <sup>5</sup> )	00005
		Gray (2 <sup>6</sup> )	00006
		White (27)	00007
		Pink (28)	00008
		Brown (20)	00100
	Code Cable color: Black	Orange (21)	00101
N.A112 A		Yellow (22)	00102
Multi-turn data		Green (23)	00103
data		Blue (24)	00104
		Purple (2 <sup>5</sup> )	00105
		Gray (26)	00106
Sign $+ = 0 - = 1$		White (27)	00107

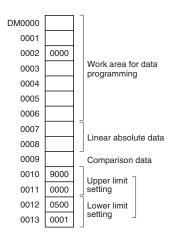
#### **Output Timing**



#### **Ladder Programming Example**



#### **DM Area Settings**



CMPL(60) D0010 000 25505 10000 (=)25506 CMPL(60) D0012 (<) 25507 — I I—

- 10001

ADDL(54)

D0001 D0005

D0007

A range comparison is made and if the linear absolute data is between the value in DM 0010 and DM 0011 and the value in DM 0012 and DM 0013. output CIO 01000 is turned ON (comparison is made only for forward rotation).

The single-turn data

and multi-turn data

are added to get the linear absolute data

1000010001 Note: The above ladder programming is only for reference. Data may not always be input properly depending on the data read timing of the Programmable Controller. If data is missed and there is a large difference, e.g., 100 or more, between the current data and the previous data, discard the data the add ladder programmed to re-read the data. (If both the single-turn data and multi-turn data are read at the same time when the multi-turn data changed, the data will be incorrect. Refer to "\*3" under Ratings and Specifications.

CPM1A

For details, refer to the SYSMAC CPM1/CPM1A/CPM2A/CPM2C/SRM1(-V2) Programming Manual (W353).

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# **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.

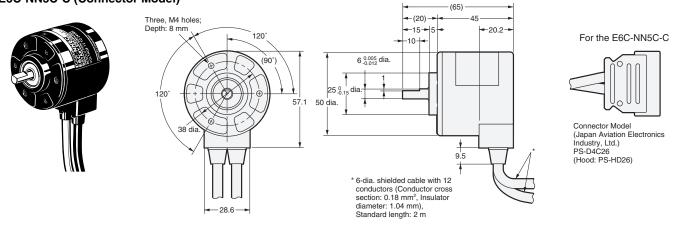
#### Wiring

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.

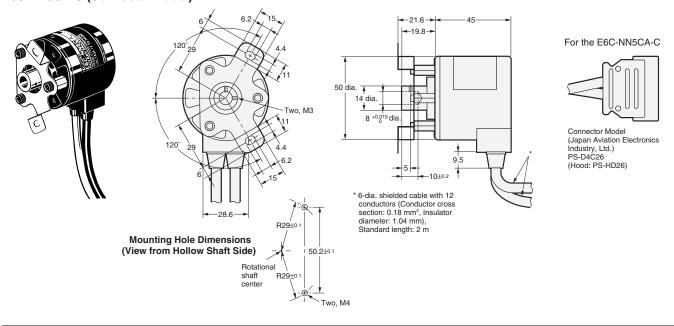
(Unit: mm)

# **Encoder**

# E6C-NN5C (Pre-wired Model) E6C-NN5C-C (Connector Model)



# E6C-NN5CA (Pre-wired Model) E6C-NN5CA-C (Connector Model)



# **Accessories (Order Separately)**

Couplings **Flanges Servo Mounting Bracket** E69-2

E69-C06B E69-FCA E69-C68B E69-FCA02

E69-C610B E69-C06M

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

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# Website:

Welcome to visit www.ameya360.com

# Contact Us:

# Address:

401 Building No.5, JiuGe Business Center, Lane 2301, Yishan Rd Minhang District, Shanghai , China

# Sales:

Direct +86 (21) 6401-6692

Email amall@ameya360.com

QQ 800077892

Skype ameyasales1 ameyasales2

# Customer Service :

Email service@ameya360.com

# Partnership :

Tel +86 (21) 64016692-8333

Email mkt@ameya360.com