

Magnetic Encoder

# CE36M Series

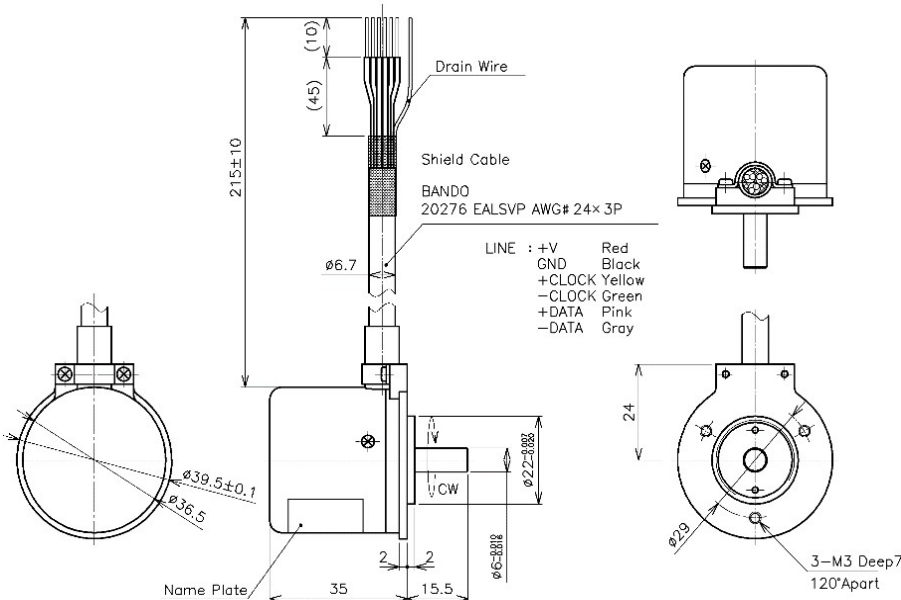


- High Accuracy : Resolution13-bit, Accuracy11-bit
- Excellent Repeatability : ±1 LSB
- Position Data Update Cycle : 6.1kHz/ 12kHz/ 24kHz
- Mechanical Response Time : 10,000 rpm MIN.
- Serial Data Output : RS-422 Format (Interface)  
: ASI, SSI (Format)
- Environmental Protection : IP50 / IP67  
: EMC

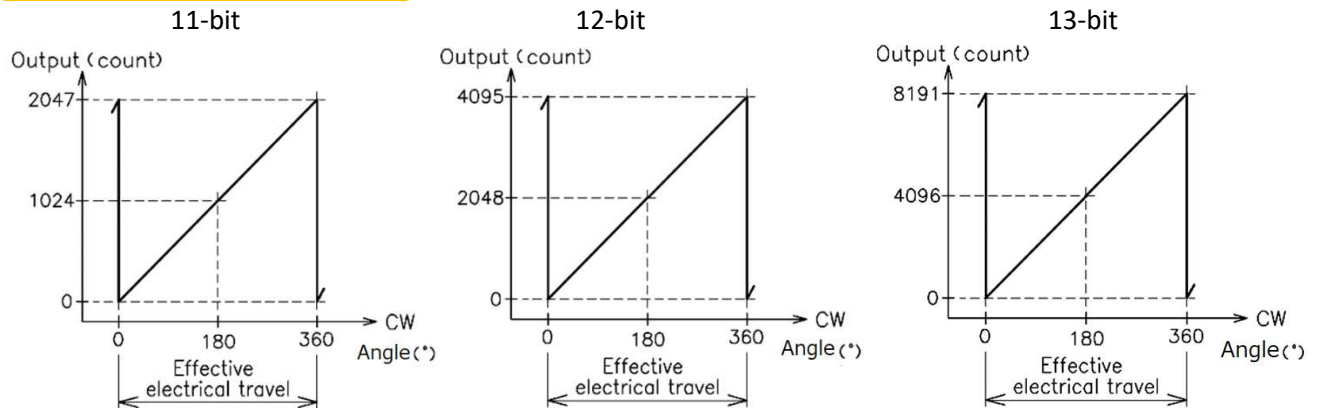
**【Material】**

- Housing : Aluminum
- Shaft : Stainless Steel
- Ball Bearing : Stainless Steel

**■ Dimensions (mm)**



**■ Output Characteristics**

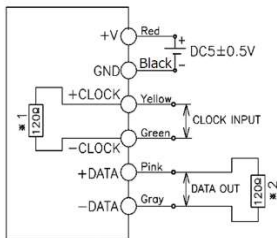


<b>[Resolution]</b>	<b>11-bit per rev.</b>	<b>12-bit per rev.</b>	<b>13-bit per rev.</b>	
Accuracy	±0.2%FS (9bit Equivalent)	±0.1%FS (10bit Equivalent)	±0.05%FS (11bit Equivalent)	
Hysteresis	0.3° MAX.	0.25° MAX.	0.15° MAX.	
Internal Position Update Period	24.4kHz	12.2kHz	6.1kHz	
Input Voltage	DC5±0.5V			
Insulation Resistance	100MΩ MIN. DC500V (Room Temp. and Humidity)			
Dielectric Strength	AC500V 1minute (Room Temp. and Humidity)			
Current Consumption	150mA MAX.			
Output Interface	RS-422			
Output Format	ASI, SSI			
Total Mechanical Travel	360° Endless			
Torque	0.002Nm MAX. (IP50)/ 0.005Nm MAX. (IP67)			
Thrust Load Tolerance	Dynamic load 3.5N, Static Load 70N			
Radial Load Tolerance	Dynamic load 3.5N, Static Load 70N			
Operating Temperature	-20 ~ +80°C			
Storage Temperature	-20 ~ +80°C			
Temperature Drift	0.4° MAX.			
Vibration	200m/s <sup>2</sup> (IEC60068-2-6)			
Shock	1000m/s <sup>2</sup> (IEC60068-2-27)			
EMC	Emissions IEC61000-6-4 (CISPR16-2-3, CISPR22) Immunity IEC61000-6-2 (IEC61000-4-2,3,4,5,6,8) Output Error: ±4count			
Magnetic Field Effect (Reference Value)	±2count at 10mT	±4count at 10mT		
MAX. Physical Speed	10,000 rpm			
IP Level	IP50/ IP67 (ISO 60529)			
Weight	Approx. 100g			

### ■ Model Number Designation

<b>CE 36 M S</b>	<b>1</b>	<b>-</b>	<b>13</b>	<b>-</b>	<b>ASI1</b>
(Part Number)	(IP Level)		(Resolution)		(Output Format)
	0: IP50		13: 13-bit		ASI: ASI1, ASI2, ASI3
	1: IP67		12: 12-bit		SSI: SSI1, SSI2, SSI3
			11: 11-bit		

### ■ Schematic



- Red, Black, Pink, Gray, Yellow, and Green indicate harness colors.
- \* 1 mark shows a internal terminating resistance.
- \* 2 mark shows a terminating resistance for user side.

### Signal and Connection

	Red	Black	Pink	Gray	Yellow	Green
ASI Format	+V	GND	+DATA	-DATA	N.C.	N.C.
SSI Format	+V	GND	+DATA	-DATA	+CLOCK	-CLOCK

### Serial Communication Format

CEM36 Series provides the following output formats:

- 1) Asynchronous Serial Interface (ASI)
- 2) Synchronized Serial Interface (SSI)
  - All interfaces are based on the RS-422 standard.
  - On the CLOCK input line, a terminating resistance is included on the encoder side.
  - Do not forget to add a terminating resistance to the DATA output line.

<Communication mode and Data Format>

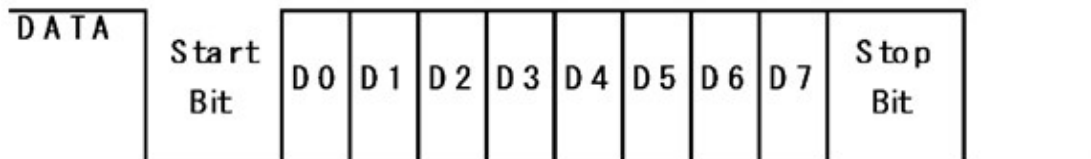
Communicate mode	ASI1	ASI2	ASI3	SSI1	SSI2	SSI3
Data Length [Byte]	13	13	13	2	3	4
Data Length [bit]	130*	130*	130*	16	24	32
ER	1 Byte	1 Byte	1 Byte	---	---	---
PV [bit]	---	---	---	---	---	1
PVI [bit]	---	---	---	---	---	1
PD [bit]	7 Byte	7 Byte	7 Byte	---	---	22
VD [bit]	---	---	---	---	---	---
AD [bit]	---	---	---	---	---	---
TS [bit]	---	---	---	---	---	---
CRC [bit]	2 Byte	2 Byte	2 Byte	---	---	---
Received Code	ASCII	ASCII	ASCII	Binary	Binary	Binary
First Out (first)	LSB	LSB	LSB	MSB	MSB	MSB

\* Data length of ASI is included start bit and stop bit.

#### ◆ Interface: RS-422

Format: ASI

Mode Format	ASI 1	ASI 2	ASI 3
Communication Speed [kbps]	19.2	230.4	921.6
Thin-out Rate	1/256	1/32	1/8
Frame Rate [ms] Update Cycle: 6.1kHz	41.96	5.24	1.32
Frame Rate [ms] Update Cycle: 12.2kHz	20.98	2.62	0.66
Frame Rate [ms] Update Cycle: 24.4kHz	10.49	1.31	0.33
Start bit	1bit		
Data Length	8bit		
Parity	---		
Stop Bit	1bit		



**Data Format**

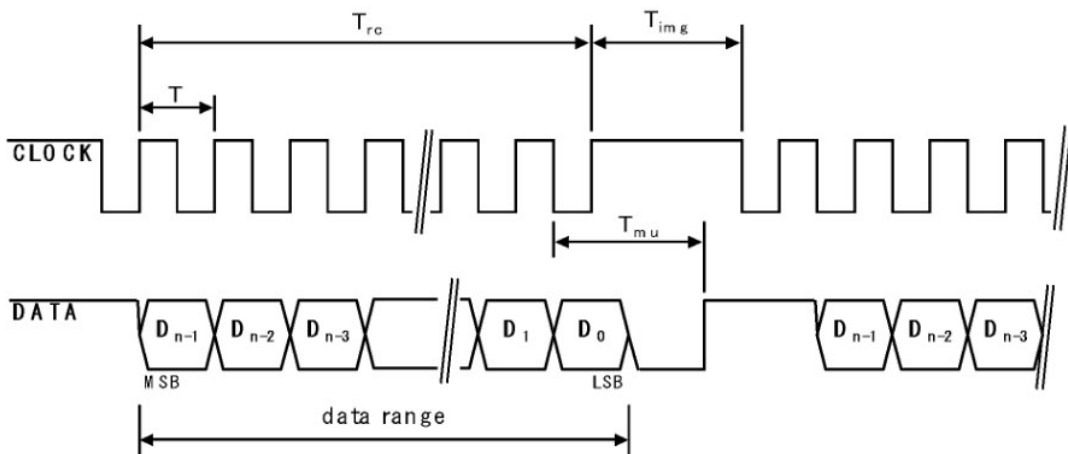
ASI1, ASI2, ASI3 (Common) (13Byte)

1st Byte	ER [1Byte]	Error Flag: Hexadecimal ASCII code 0: Valid data 1~F: Error
2nd Byte	SP [1Byte]	Space: (0x20)
3rd-9th Byte	PD [7Byte]	ASCII Position Data Convert binary position data into decimal and transmit on ASCII code. Example: 12bit: 0 ~ 4096 22bit: 0 ~ 4194304 If resolution of the device is less than 22bit, replenish the 「 0 」 from MSB. When ER is 1 ~ F, PD value is not defined.
10th Byte	SP [1Byte]	Space: (0x20)
11th-12th Byte	CRC [2Byte]	CRC-8: Convert 8bit into hexadecimal and transmit on ASCII code. <ul style="list-style-type: none"> <li>Calculation Range: ER, SP, PD, SP</li> <li>Polynomial: <math>0x97 \quad X^8+X^7+X^4+X^2+X+1</math></li> <li>Initial Data: 0x00</li> <li>MSB First (non-inversion)</li> <li>Not be calculated the final XOR</li> </ul>
13th Byte	DLM [1byte]	Delimiter: CR(0x0D)

◆ **Interface: RS-422**

Format: SSI

Mode Format	SSI 1		SSI 2		SSI 3	
Data Size [bit]	16		24		32	
Clock Frequency [Khz]	100	2000	100	2000	100	2000
Inter-message Gap	0.021	0.021	0.021	0.021	0.021	0.021
Frame Rate [ms]	0.18	0.03	0.26	0.03	0.34	0.04
Frame Rate [kHz]	5.5	34.5	3.8	30.3	2.9	27



**Data Format**

T	Clock Cycle: 100kHz ~ 2MHz
Trc	Read cycle time: it is defined as $(n \times T) + (0.5 \times T)$
Tmu	Message update time. The time count from the falling edge of the last CLOCK $Tmu = 20 \pm 1 \mu s$ DATA Line will become HIGH after this time and a new read cycle will start.
Timg	The time gap between messages. In principle, $Timg > 21 \mu s$ In the case of $Timg < 19 \mu s$ , the same data will be transmitted.
n	The bit number of the message. During idle state, both CLOCK and DATA are HIGH.

**SSI 1 (n=16)**

D15	PV	Position Valid Flag: Data valid "1" / Data invalid "0"
D14	PVI	Position Valid Flag Invert: Invert PVI: Data valid "1" / Data invalid "0"
D13-D0	PD[13:0]	Binary Position Data: If resolution of the device is less than 14bit, replenish the 「0」 from MSB.

**SSI 2 (n=24)**

D23	PV	Position Valid Flag: Data valid "1" / Data invalid "0"
D22	PVI	Position Valid Flag Invert: Invert PVI: Data valid "1" / Data invalid "0"
D21-D0	PD[21:0]	Binary Position Data: If resolution of the device is less than 22bit, replenish the 「0」 from MSB.

**SSI 3 (n=32)**

D31	PV	Position Valid Flag: Data available "1" / Data unavailable "0"
D30	PVI	Position Valid Flag Invert: Invert PVI: Data available "1" / Data unavailable "0"
D29-D8	PD[21:0]	Binary Position Data: If resolution of the device is less than 22bit, replenish the 「0」 from MSB. In case of PV "0", measured position data is set.
D7-D0	CRC[7:0]	CRC-8: <ul style="list-style-type: none"> <li>▪ Calculation Range: D31-D8</li> <li>▪ Polynomial : <math>0x97 \quad X^8 + X^7 + X^4 + X^2 + X + 1</math></li> <li>▪ Initial Data: 0x00</li> <li>▪ MSB First (Not invert)</li> <li>▪ Do not calculate final XOR</li> </ul>

## ■ Shaft

A mounting error between the encoder shaft and the shaft's counterpart might cause a deterioration in the lifetime of the encoder bearing. Please use a flexible coupling between both shafts.

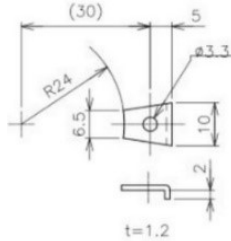
### Recommended Flexible Coupling

Maker	Model	Size	Angular Misalignment	Parallel Misalignment
MKI PULLEY	SFC-010DA2	Φ19	±1° MAX.	±0.11mm MAX.
	SFC-010DA2	Φ26	±1° MAX.	±0.15mm MAX.
	SFC-025DA2	Φ29	±1° MAX.	±0.16mm MAX.

- Prevent a shock or impact to the encoder shaft when the coupling is installed on the shaft.
- Do not apply a load on the encoder shaft larger than the allowed value. --- Refer to the spec. sheet on Page 2

## ■ Accessories

Mounting Cleats : 3 pieces



## ■ Handling Instruction

- This product can not be used for measurements of resistance value.
- This product may be influenced by an external magnetic field.
- Use this product in an environment protected from ESD.
- Do not apply a heavy load to the shaft.