EPM50S Series   Ø50mm Shaft Multi-Turn Absolute Type

Diameter Ø50mm Shaft Type Multi-Turn Absolute Rotary Encoder

▣ Features

- **Total 23-bit resolution (8388608-division) of 10-bit single-turn (1024-division) and 13-bit multi-turn (8192-revolution)**
- Compact size of diameter Ø50mm
- Parallel data/SSI data transmission type
- Easy zero adjustment using single-turn/multi-turn data separated reset function
- Memorizing revolution data up to ±90° after blackout without memory back up function
- Possible CW/CCW direction setting with direction function
- Maximizing users convenience with clear, over flow alarm (OVF) function
- Protection structure IP64 (IEC standard) (dust-proof, oil-proof)
- Provides Latch function (parallel output model only)

Radial cable type

▣ Applications

- Precision machine tool, Fabric machinery, Robot, Parking system

⚠ **Please read "Caution for your safety" in operation manual before using.**   CE

Axial cable type

▣ Ordering Information

| EPM50S | 8 | – | 10 | 13 | – | B | – | PN | – | 24 | – | |

Series	Shaft diameter	Single-turn	Multi-turn	Output code	Control output	Power supply	Cable
Diameter Ø50mm Shaft type	Ø8mm	10-bit (1024-division)	13-bit (8192-revolution)	Binary Code	PN: Parallel NPN open collector output S: SSI Line driver output	12-24VDC±5%	No mark: Axial cable type S: Radial cable type

▣ Specifications

Type			Diameter Ø50mm shaft type multi-turn absolute rotary encoder	
Model			EPM50S8-1013-B-S-24	EPM50S8-1013-B-PN-24
Resolution	Single-turn		1024-division (10-bit)	
	Multi-turn		8192-revolution (13-bit)	
Rotation limit when power off ※1			±90°	
Electrical specification	Output	Output code	24-bit, Binary 2 code	Binary 2 code

		Control output	SSI (Synchronous Serial Interface) Line driver
			[Low] - Sink current: Max. 20mA,
			     Residual voltage: Max. 0.5VDC
			[High] - Sink current: Max. -20mA,
			     Output voltage: Min. 2.5VDC
				Parallel NPN open collector output
				Sink current: Max. 32mA,
				Residual voltage: Max. 1VDC

		Output signal	Single-turn data, Multi-turn count, Over flow alarm (OVF)※2	
		Output logic	—	Negative logic output
		Response time (rise, fall)	—	Max. 1µs (cable: 2m, I sink = 32mA)
	Input	Input signal	Single-turn data reset ※3, Multi-turn count reset ※4, Direction, Clear	
			—	Latch
		Input level	0-1VDC (high active: 5-24VDC)	
		Input logic	Low Active※5, Open or High for common use	
		Input time	Single-turn data reset※3, Multi-turn count reset※4, Direction, Clear: Over 100ms	
			—	Latch: Over 500µs
	SSI clock input	Input level	5VDC±5%	—
		Input frequency	100kHz to 1MHz	
	Max. response frequency		—	50kHz
	Power supply		12-24VDC ±5% (ripple P-P: Max. 5%)	
	Current consumption		Max. 150mA (disconnection of the load)	Max. 100mA (disconnection of the load)
	Insulation resistance		Over 100MΩ (at 500VDC megger between all terminals and case)	
	Dielectric strength		750VAC 50/60Hz for 1 minute (between all terminals and case)	
	Connection		Axial/Radial cabel type (cable gland)	

※1: It calibrates the multi-turn counts by comparing single-turn data before/after power off without counting multi-turn counts when power is off. It shall be used on the condition that no overrated revolution occurred since proper multi-turn data may not be available if any revolutions occurred over ±90° from the position when power is off.
※2: OVF alarm is ON when multi-turn count is out of counting range (0 to 8191 revolutions).
※3: Single-turn data will be reset as 「0」 when single-turn data reset is input.
※4: Multi-turn count will be reset as 「0 revolution」 when multi-turn count reset is input.
※5: High Active is optional.

(A) Photoelectric Sensors
(B) Fiber Optic Sensors
(C) Door/Area Sensors
(D) Proximity Sensors
(E) Pressure Sensors
(F) Rotary Encoders
(G) Connectors/ Connector Cables/ Sensor Distribution Boxes/Sockets
(H) Temperature Controllers
(I) SSRs / Power Controllers
(J) Counters
(K) Timers
(L) Panel Meters
(M) Tacho / Speed / Pulse Meters
(N) Display Units
(O) Sensor Controllers
(P) Switching Mode Power Supplies
(Q) Stepper Motors & Drivers & Controllers
(R) Graphic/ Logic Panels
(S) Field Network Devices
(T) Software

■ Specifications

| Type		Diameter Ø50mm shaft type multi-turn absolute rotary encoder	
Model		EPM50S8-1013-B-S-24	EPM50S8-1013-B-PN-24
Mechanical specification	Starting torque	Max. 40gf·cm (0.004N·m)	
	Moment of inertia	Max. 40g·cm² (4×10⁻⁶kg·m²)	
	Shaft loading	Radial: Max. 10kgf, Thrust: Max. 2.5kgf	
	Max. revolution[※6]	3,000rpm	
Vibration		1.5mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours	
Shock		Approx. Max. 50G	
Environment	Ambient temp.	-10 to 70℃, storage: -25 to 85℃	
	Ambient humid.	35 to 85%RH, storage: 35 to 90%RH	
Protection structure		Axial cabel type: IP64 (IEC standard), Radial cabel type: IP50 (IEC standard)	
Cable		Ø6mm, 10-wire, 2m, Shield cable (AWG28, core diameter: 0.08mm, number of cores: 19, insulation diameter: Ø0.8mm)	Ø6mm, 17-wire×2, 2m, Shield cable (AWG28, core diameter: 0.08mm, number of cores: 17, insulation diameter: Ø0.8mm)
Accessory		Bracket, coupling	
Approval		C€	
Weight[※7]		Approx. 409g (approx. 324g)	Approx. 560g (approx. 475g)

※6: In case of Parallel type model, Make sure that Max. response revolution should be lower than or equal to max. allowable revolution when selecting the resolution.

$$\text{[Max. response revolution (rpm)}= \frac{\text{Max. response frequency}}{\text{Resolution}} \times 60 \text{ sec]}$$

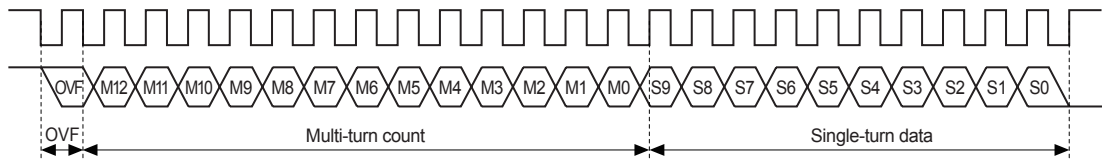※7: The weight includes packaging. The weight in parentheses is for unit only.
※Environment resistance is rated at no freezing or condensation.

■ Synchronous Serial Interface (SSI) Output Timing Diagram
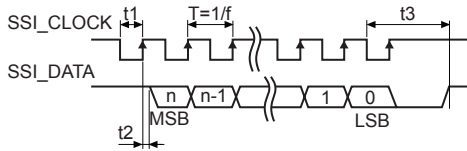
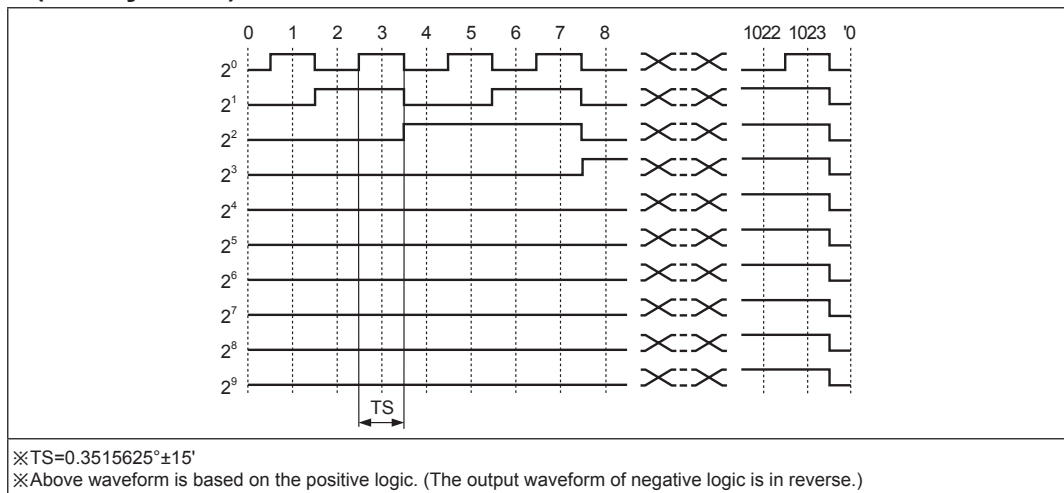| Clock Frequency f	100kHz to 1MHz
T	T: 1 to 10μs
	0.5μs < t1 < 5μs
Time lag t2	t2 < 0.3μs
Monoflop Time t3	15μs < t3 < 30μs

■ Synchronous Serial Interface (SSI) Data Output

Clock input bit	Data output name	Data output bit	Clock input bit	Data output name	Data output bit
1	Over flow alarm bit	0-bit	15	Single-turn data	9-bit (MSB)
2	Multi-turn count	12-bit (MSB)	16		8-bit
3		11-bit	17		7-bit
4		10-bit	18		6-bit
5		9-bit	19		5-bit
6		8-bit	20		4-bit
7		7-bit	21		3-bit
8		6-bit	22		2-bit
9		5-bit	23		1-bit
10		4-bit	24		0-bit (LSB)
11		3-bit			
12		2-bit			
13		1-bit			
14		0-bit (LSB)			

Ø50mm Shaft Multi-Turn Absolute Type

(A)
Photoelectric
Sensors

(B)
Fiber
Optic
Sensors

(C)
Door/Area
Sensors

(D)
Proximity
Sensors

(E)
Pressure
Sensors

(F)
Rotary
Encoders

(G)
Connectors/
Connector Cables/
Sensor Distribution
Boxes/Sockets

(H)
Temperature
Controllers

(I)
SSRs / Power
Controllers

(J)
Counters

(K)
Timers

(L)
Panel
Meters

(M)
Tacho /
Speed / Pulse
Meters

(N)
Display
Units

(O)
Sensor
Controllers

(P)
Switching
Mode Power
Supplies

(Q)
Stepper Motors
& Drivers
& Controllers

(R)
Graphic/
Logic
Panels

(S)
Field
Network
Devices

(T)
Software

■ Parallel Interface 1024-Division Single-Turn Data Output Waveform (Binary code)

※TS=0.3515625°±15'
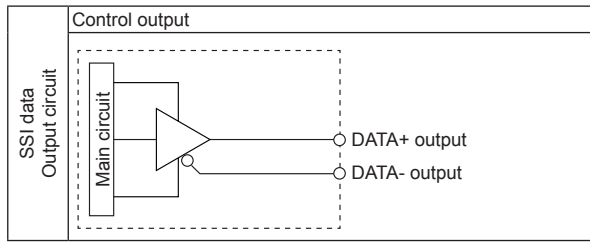※Above waveform is based on the positive logic. (The output waveform of negative logic is in reverse.)

■ Parallel Interface 8192-Revolution Multi-Turn Count Data Output Waveform (Binary code)
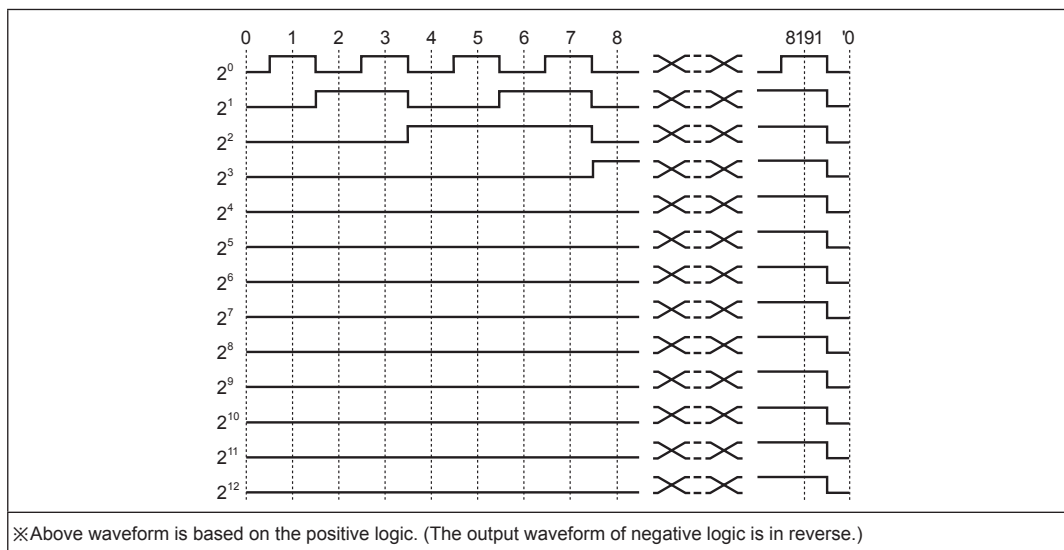
※Above waveform is based on the positive logic. (The output waveform of negative logic is in reverse.)

■ Control Output I/O Circuit
● SSI input
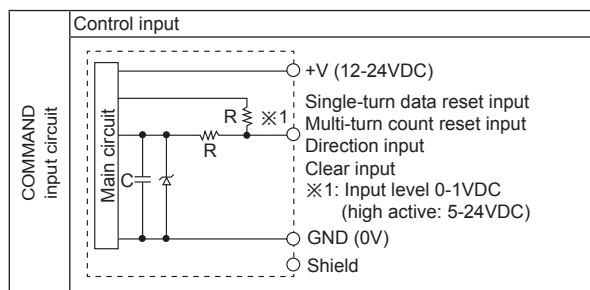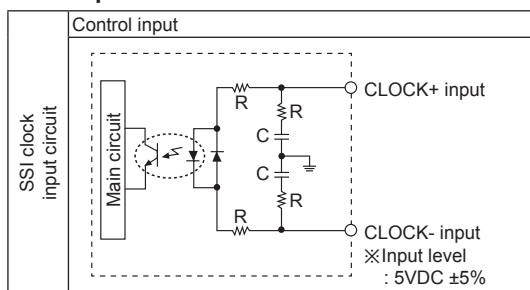
Control input — CLOCK+ input / CLOCK- input
※Input level : 5VDC ±5%

Control input
+V (12-24VDC)
Single-turn data reset input
Multi-turn count reset input ※1
Direction input
Clear input
※1: Input level 0-1VDC
(high active: 5-24VDC)
GND (0V)
Shield

EPM50S Series

◼ Control Output I/O Circuit

● SSI output

SSI data Output circuit

Control output

Main circuit → DATA+ output / DATA- output

● Parallel input/output

COMMAND Input circuit

Control input

Main circuit

- +V (12-24VDC)
- Single-turn data reset input
- Multi-turn count reset input
- Direction input
- Clear input
- Latch input
- ※1: Input level 0-1VDC (high active: 5-24VDC)
- GND (0V)
- Shield

Output circuit

Control output

Main circuit

- +V (12-24VDC)
- Single-turn data output (10-bit)
- Multi-turn count output (13-bit)
- OVF alarm output (1-bit)
- GND (0V)
- Shield
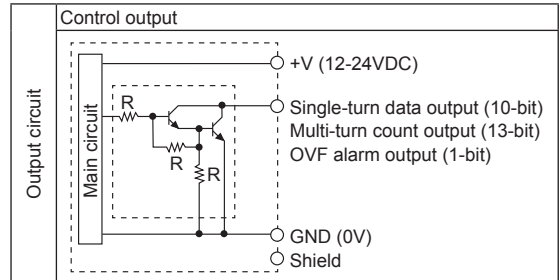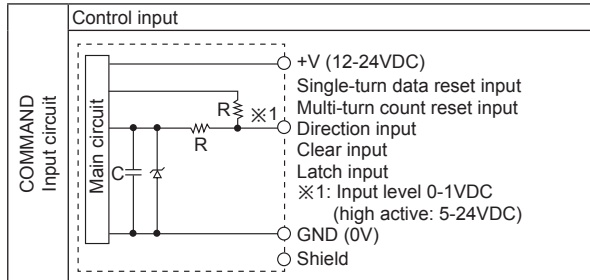
※Output of each bit is the same circuit.
※Be sure that overload or short may cause circuit break.

◼ Connections

● SSI Line driver output type

Cable					
Cable color	Description		Cable color	Description	
Brown	SSI	CLOCK+	Gray	COMMAND	Single-turn data reset
Red		CLOCK-	Blue		Multi-turn count reset
Orange		DATA+	Green		Direction
Yellow		DATA-	Purple		Clear
White	+V (12-24VDC)		Shield	Signal shield cable (F.G.)	
Black	GND (0V)		—		

● Parallel NPN open collector output type

Multi-turn count cable (sheath color: black)		
Cable color	Description	
Brown	Multi-turn count	2^0
Red		2^1
Orange		2^2
Yellow		2^3
Green		2^4
Blue		2^5
Purple		2^6
Gray		2^7
Pink		2^8
Clear		2^9
Light brown		2^{10}
Light yellow		2^{11}
Light green		2^{12}
Light blue	OVF	
Light purple	Multi-turn count reset	
White	+V (12-24VDC)	
Black	GND (0V)	
Shield	Signal shield cable (F.G.)	

Single-turn data cable (sheath color: gray)		
Cable color	Description	
Brown	Single-turn data	2^0
Red		2^1
Orange		2^2
Yellow		2^3
Green		2^4
Blue		2^5
Purple		2^6
Gray		2^7
Pink		2^8
Clear		2^9
Light brown	N.C.	
Light yellow	Direction	
Light green	Latch	
Light blue	Clear	
Light purple	Single-turn data reset	
White	+V (12-24VDC)	
Black	GND (0V)	
Shield	Signal shield cable (F.G.)	

※Not used cables should be insulated.
※Do the wiring properly.
※Encoder's metal case and shield cable must be grounded (F.G.).
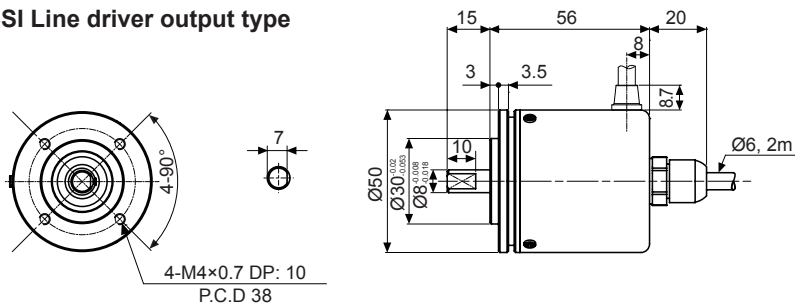※Do the wiring with care for short since dedicated Driver IC is used for I/O circuit.
※As for Parallel output, it is recommended to connect +V and GND of both multi-turn count cable and single-turn data cable.

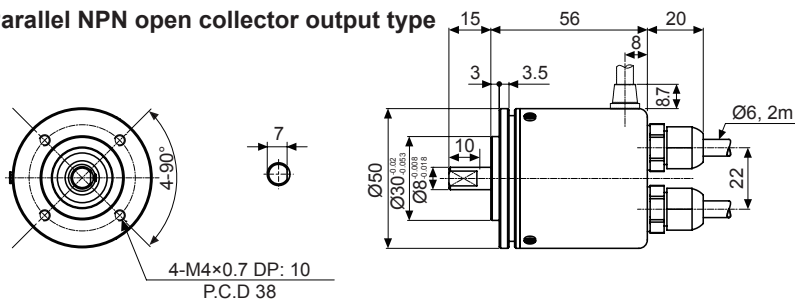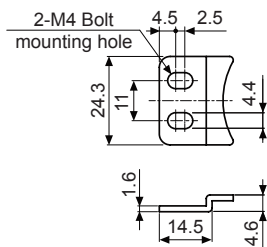Autonics

Ø50mm Shaft Multi-Turn Absolute Type

▣ Dimensions
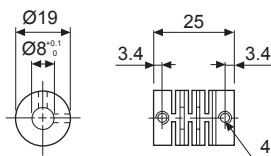
(unit: mm)

● **SSI Line driver output type**

4-M4×0.7 DP: 10
P.C.D 38

● **Parallel NPN open collector output type**

4-M4×0.7 DP: 10
P.C.D 38

● **Bracket**

2-M4 Bolt mounting hole

● **Coupling (EPM50S)**

4-M4×0.7

• Parallel misalignment: Max. 0.25mm
• Angular misalignment: Max. 5°
• End-play: Max. 0.5mm

※When mounting the coupling to encoder shaft, if there is combined misalignment (parallel, angular misalignment) between rotating encoder shaft and mate shaft, it may cause encoder and coupling's life cycle to be
※Do not load overweight on the shaft.
※For parallel misalignment, angular misalignment, end-play terms, refer to the F-71.
※For flexible coupling (ERB Series) information, refer to the F-64.

▣ Functions

◎ **Single-turn data reset**
Single-turn data will be reset as 「0」 when single-turn data reset cable is inputted 0 to 1V (over 100ms). In case of not using single-turn data reset cable, connect the line to OPEN or + V.

◎ **Multi-turn count reset**
Multi-turn data will be reset as 「0 revolution」 when multi-turn count reset cable is inputted 0 to 1V (over 100ms). In case of not using multi-turn count reset cable, connect the line to OPEN or + V.
OVF alarm will be reset with muli-turn count reset input.

◎ **Direction**
Connect the direction cable to OPEN or +V and turn on the power. Output will increase when rotation direction is CW from shaft axis. In case of connecting 0 to 1 V (over 100ms), output will increase when rotation direction is CCW. If direction setting is reset, single-turn data, multi-turn count and OVF will be reset together since direction setting is initial setting which is set with Power ON.

◎ **Clear**
Single-turn data will be reset as 「0」 and multi-count will be also reset as 「0 revolution」 when clear cable is inputted 0 to 1V (over 100ms). In case of not using clear cable, connect the cable to OPEN or + V. OVF alarm will be reset with clear input.

◎ **Latch (Parallel output model only)**
When the latch cable is inputted 0 to 1V (over 500μs), outputs for single-turn data, multi-turn count and OVF at latch point will be remained. When latch cable is connected to OPEN or +V, output will be returned to operating mode output.

◎ **Over flow alarm (OVF)**
It is an alarm function when multi-turn count is out of rotation ranges (0 to 8191 revolutions).
Over flow alarm is also reset with multi-turn count value when multi-turn count reset signal is inputted.

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