

Shaft Type Ø50mm 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 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



Axial cable type

■ Applications

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

⚠ Please read "Safety Considerations" in the instruction manual before using.



■ Ordering Information

EPM50S	8	-	10	13	-	B	-	PN	-	24	-	
Series	Shaft diameter	Single-turn	Multi-turn	Output code	Control output	Power supply	Cable					
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		Shaft Type Ø50mm 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 code	Binary 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	—	
		Response time (rise, fall)	—	
		Response time (rise, fall)	—	
	Input	Input signal	Single-turn data reset ^{※3} , Multi-turn count reset ^{※4} , Direction, Clear	
		Input level	0-1VDC≒	
		Input logic	Low Active, Open or High for common use	
		Input time	Single-turn data reset ^{※3} , Multi-turn count reset ^{※4} , Direction, Clear: approx. over 100ms	
—				
SSI clock input		Input level	5VDC≒ ±5%	—
SSI clock input	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 min (between all terminals and case)			
Connection	Axial/Radial cable 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.

SENSORS

CONTROLLERS

MOTION DEVICES

SOFTWARE

(A) Photoelectric Sensors

(B) Fiber Optic Sensors

(C) LIDAR

(D) Door/Area Sensors

(E) Vision Sensors

(F) Proximity Sensors

(G) Pressure Sensors

(H) Rotary Encoders

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

EPM50S Series

Specifications

Type		Shaft Type Ø50mm Multi-turn Absolute Rotary Encoder	
Model		EPM50S8-1013-B-S-24-□	EPM50S8-1013-B-PN-24-□
Mechanical specification	Starting torque	Max. 70gf·cm (0.0069N·m)	
	Moment of inertia	Max. 40g·cm ² (4×10 ⁻⁶ kg·m ²)	
	Shaft loading	Radial: max. 10kgf, Thrust: max. 2.5kgf	
	Max. allowable revolution*5	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°C, storage: -25 to 85°C	
	Ambient humi.	35 to 85%RH, storage: 35 to 90%RH	
Protection structure		Axial cable type: IP64 (IEC standard), Radial cable type: IP50 (IEC standard)	
Cable		Ø6mm, 10-wire, 2m, Shield cable (AWG28, core diameter: 0.08mm, number of cores: 19, insulation out diameter: Ø0.8mm)	Ø6mm, 17-wire×2, 2m, Shield cable (AWG28, core diameter: 0.08mm, number of cores: 17, insulation out diameter: Ø0.8mm)
Accessory		Bracket, coupling	
Approval		CE	
Weight*6		Approx. 409g (approx. 324g)	Approx. 560g (approx. 475g)

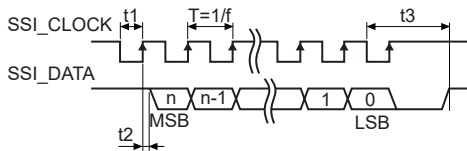
※5: In case of Parallel type model, Make sure that Max. response revolution should be lower than or equal to max. allowable revolution when selecting the resolution.

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

※6: The weight includes packaging. The weight in parenthesis is for unit only.

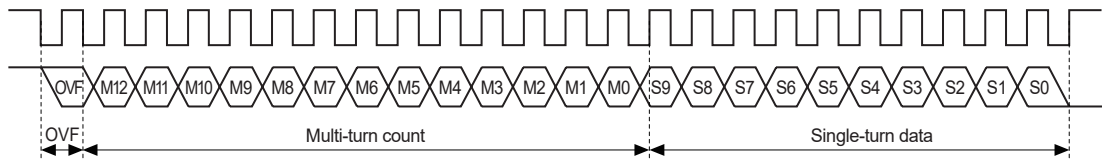
※Environment resistance is rated at no freezing or condensation.

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

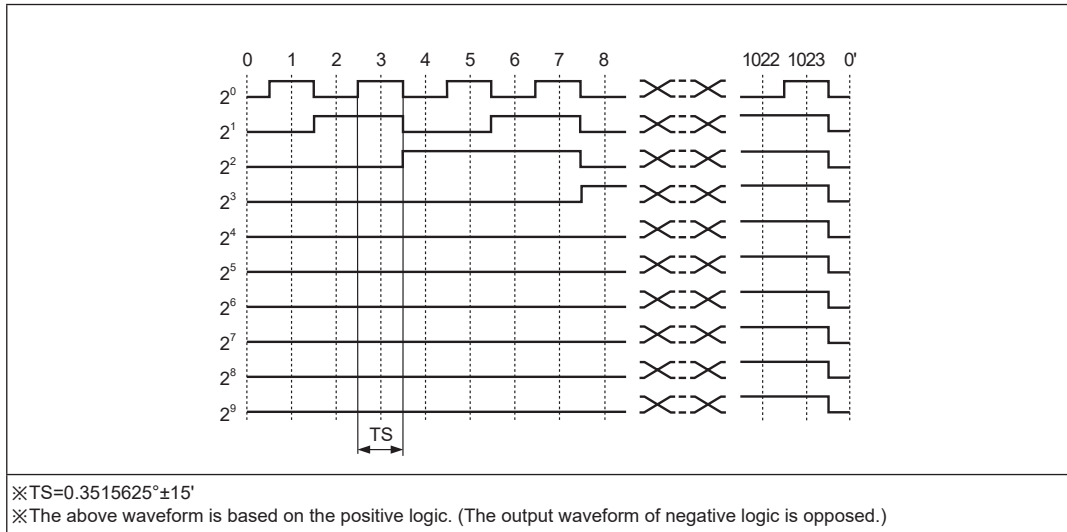
Synchronous Serial Interface (SSI) Data Output



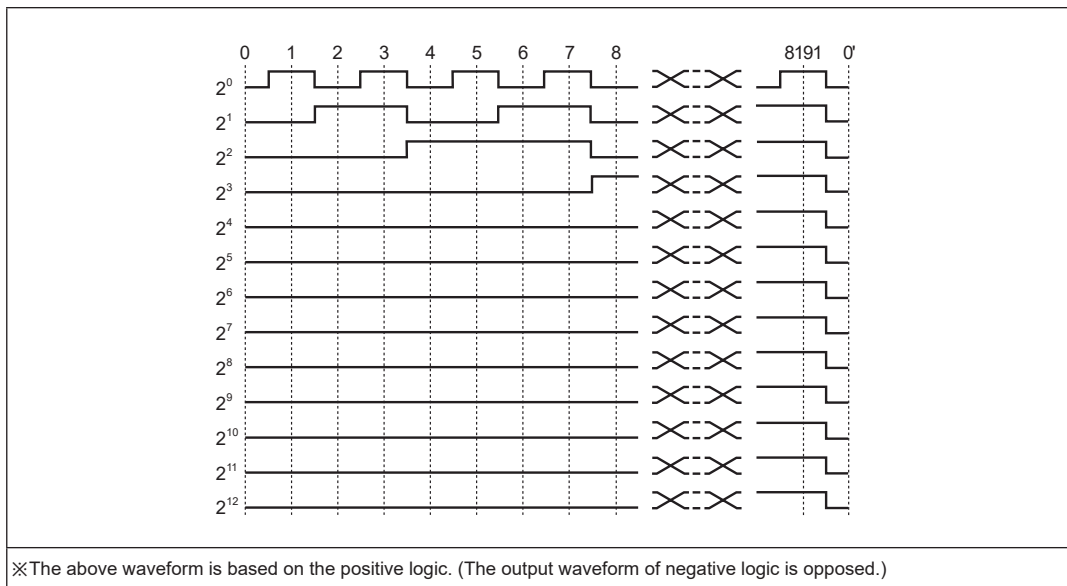
Clock input bit	Data output name	Data output bit	Clock input bit	Data output name	Data output bit
1	Over flow alarm bit	0-bit	15	Single-turn data	9-bit (MSB)
2	Multi-turn count	12-bit (MSB)	16		8-bit
3		11-bit	17		7-bit
4		10-bit	18		6-bit
5		9-bit	19		5-bit
6		8-bit	20		4-bit
7		7-bit	21		3-bit
8		6-bit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

Absolute Ø50mm Multi-turn Shaft Type

Parallel Interface 1024-Division Single-turn Data Output Waveform

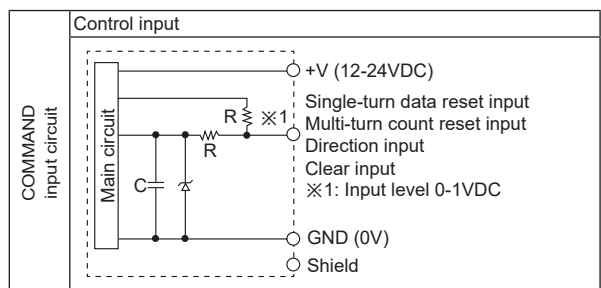
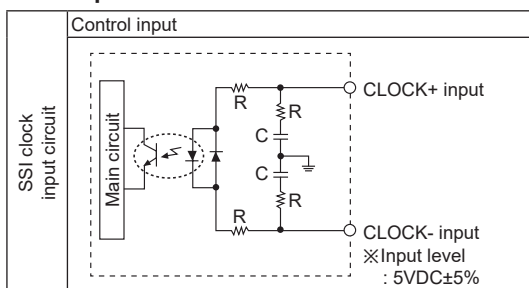


Parallel Interface 8192-Revolution Multi-turn Count Data Output Waveform



Control Output I/O Circuit

SSi input



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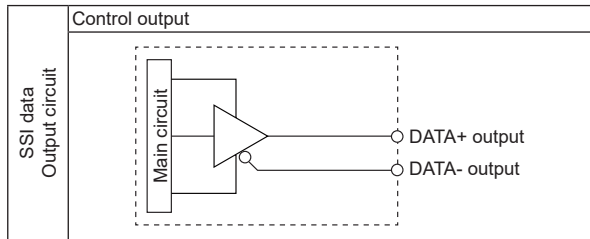
(H) Rotary Encoders

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

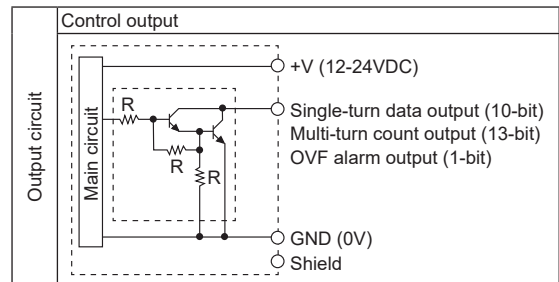
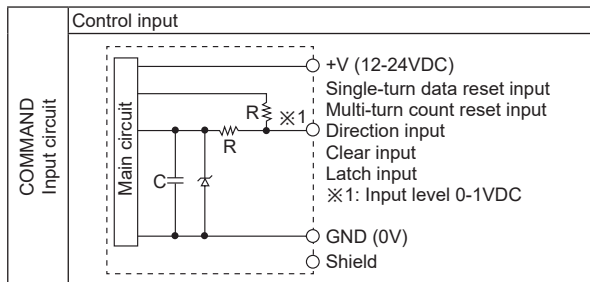
EPM50S Series

Control Output I/O Circuit

SSI output



Parallel input/output



※ Each bit of output has the same circuit.

※ Please be aware of the fact that overload and short circuit may cause circuit break.

Connections

SSI Line driver output type

Cable		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.)	

※ Unused wires must be insulated.

※ Do the wiring properly.

※ Encoder metal case and shield cable must be grounded (F.G.).

※ Please use caution to avoid short circuit when connecting output cables because I/O circuit uses the dedicated driver IC.

※ As for Parallel output, it is recommended to connect +V and GND of both multi-turn count cable and single-turn data cable.

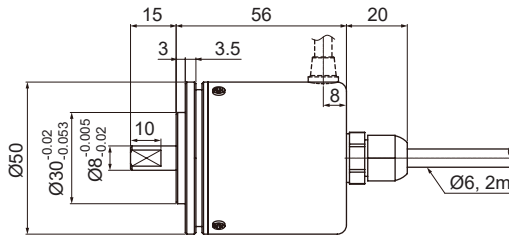
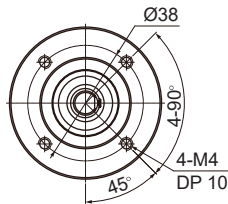
※ Do not apply tensile strength over 30N to the cable.

Absolute Ø50mm Multi-turn Shaft Type

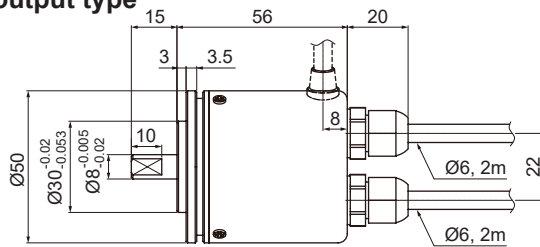
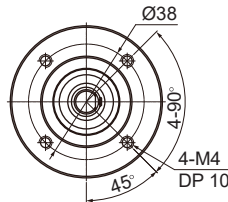
■ Dimensions

(unit: mm)

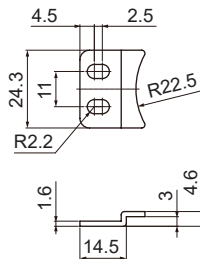
◎ SSI Line driver output type



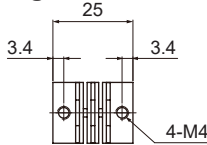
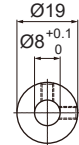
◎ Parallel NPN open collector output type



◎ Bracket



◎ Coupling



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

- ※ Do not load overweight on the shaft.
- ※ Do not put strong impact when insert a coupling into shaft.
Failure to follow this instruction may result in product damage.
- ※ Fix the unit or a coupling by a wrench under 0.15N·m of torque.
- ※ When you install this unit, if eccentricity and deflection angle are larger, it may shorten the life cycle of this unit.
- ※ For parallel misalignment, angular misalignment, end-play terms, refer to the "Glossary" section of Technical Description.
- ※ For flexible coupling (ERB series) information, refer to the ERB series section.

■ 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 multi-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 1V (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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