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

Axial cable type

■ Applications

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

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

CE

■ 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.

■ 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^{-6}kg·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		CE	
Weight※7		Approx. 409g (approx. 324g)	Approx. 560g (approx. 475g)

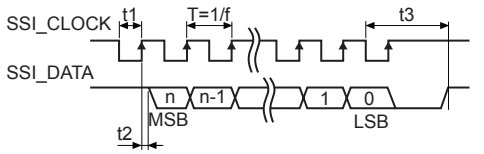
※6: In case of Parallel type model, Make sure that Max. response revolution should be lower than or equal to max. allowable revolution when selecting the resolution.

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

※7: The weight includes packaging. The weight in parentheses is for unit only.

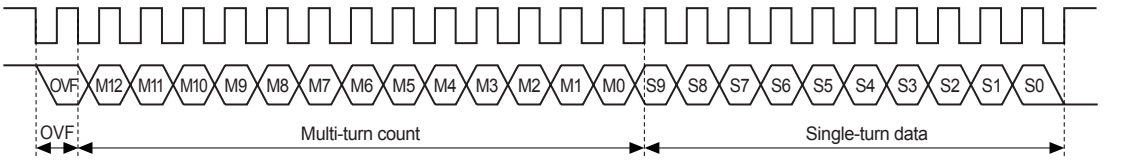
※Environment resistance is rated at no freezing or condensation.

■ Synchronous Serial Interface (SSI) Output Timing Diagram



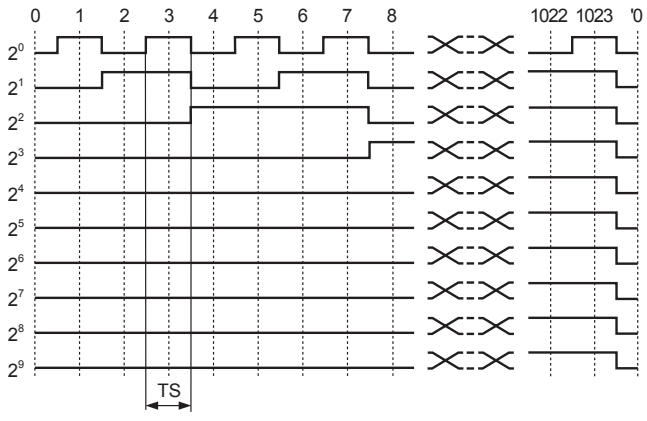
Clock Frequency f	100kHz to 1MHz
T	T: 1 to 10µs
	0.5µs < t1 < 5µs
Time lag t2	t2 < 0.3µs
Monoflop Time t3	15µs < t3 < 30µs

■ Synchronous Serial Interface (SSI) Data Output



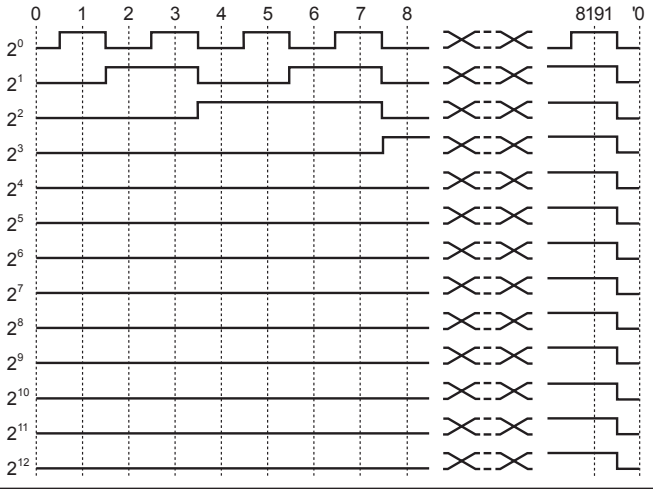
Clock input bit	Data output name	Data output bit	Clock input bit	Data output name	Data output bit
1	Over flow alarm bit	0-bit	15	Single-turn data	9-bit (MSB)
2	Multi-turn count	12-bit (MSB)	16		8-bit
3		11-bit	17		7-bit
4		10-bit	18		6-bit
5		9-bit	19		5-bit
6		8-bit	20		4-bit
7		7-bit	21		3-bit
8		6-bit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

■ 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.)

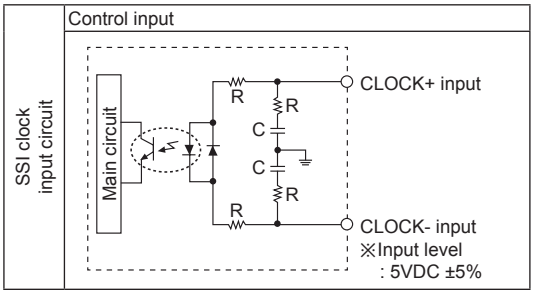
■ Parallel Interface 8192-Revolution Multi-Turn Count Data Output Waveform (Binary code)

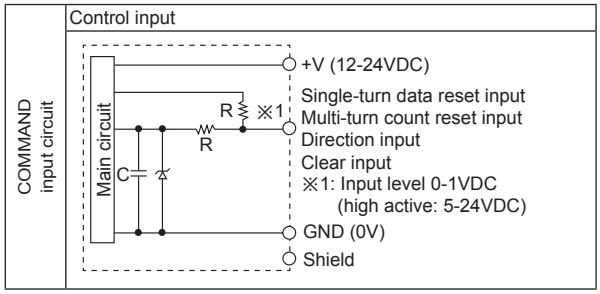


※Above waveform is based on the positive logic. (The output waveform of negative logic is in reverse.)

■ Control Output I/O Circuit

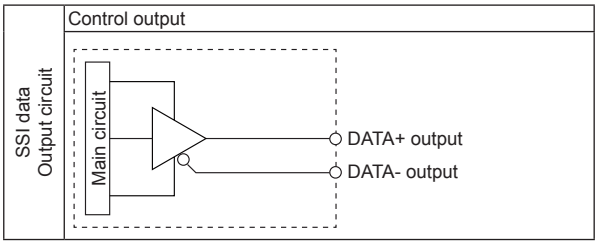
• SSI input



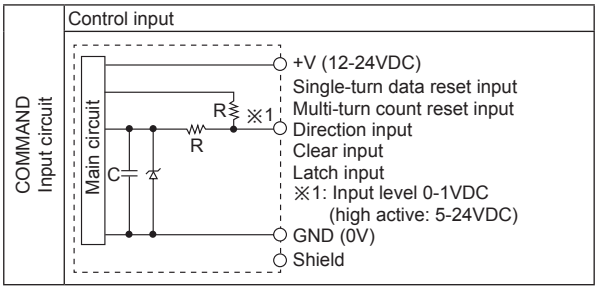


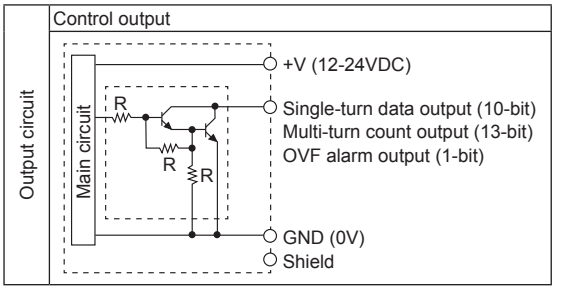
▣ Control Output I/O Circuit

● SSI output



● Parallel input/output





※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.)	

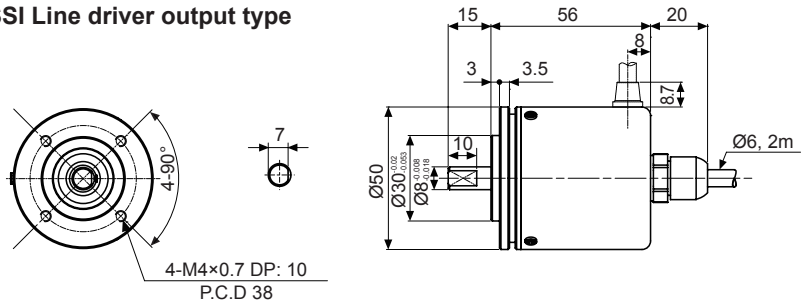
Single-turn data cable (sheath color: gray)		
Cable color	Description	
Brown	Single-turn data	2^0
Red		2^1
Orange		2^2
Yellow		2^3
Green		2^4
Blue		2^5
Purple		2^6
Gray		2^7
Pink		2^8
Clear		2^9
Light brown	N.C.	
Light yellow	Direction	
Light green	Latch	
Light blue	Clear	
Light purple	Single-turn data 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.

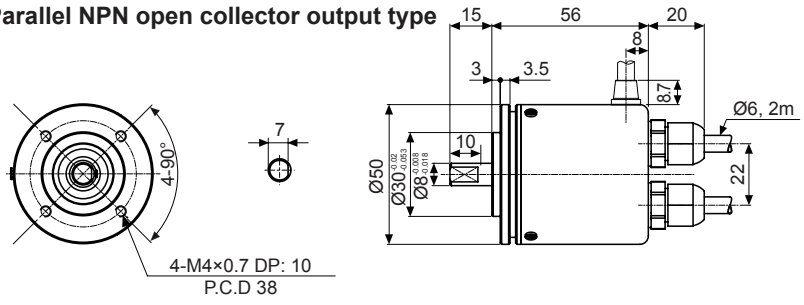
▣ Dimensions

(unit: mm)

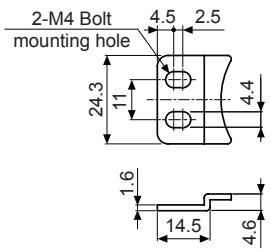
● SSI Line driver output type



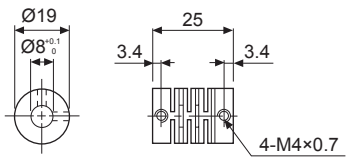
● Parallel NPN open collector output type



● Bracket



● Coupling (EPM50S)



- 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.