Autonics

ROTARY ENCODER(Absolute Type)

EPM50 SERIES

M A N U A L

Thank you very much for selecting Autonics products.
For your safety, please read the following before using.

▣ Caution for your safety

※Please keep these instructions and review them before using this unit.

※Please observe the cautions that follow;
⚠ **Warning** Serious injury may result if instructions are not followed.
⚠ **Caution** Product may be damaged, or injury may result if instructions are not followed.

※The following is an explanation of the symbols used in the operation manual.
⚠ Caution:Injury or danger may occur under special conditions.

⚠ Warning

1. **In case of using this unit with machineries(Nuclear power control, medical equipment, vehicle, train, airplane, combustion apparatus, entertainment or safety device etc), it is required to install fail-safe device, or contact us.**
   It may cause a fire, human injury or property loss.

⚠ Caution

1. **Do not drop water or oil on this unit.**
   It may cause damage or miscontrol due to malfunction.
2. **Please observe voltage rating.**
   It may shorten the life cycle or damage to the product.
3. **Please check the polarity of power and wrong wiring.**
   It may cause damage to this unit.
4. **Do not short circuit the load.**
   It may cause damage to this unit.

▣ Outline

EPM 50 series is multi-turn absolute encoder of which single-turn data outputs absolute rotation angle and multi-turn count outputs total number of rotations. It is easy to set zero adjustment using separate single-turn /multi-turn data setting function; in addition, the series requires no backup power due to memory back up function.

▣ Features

- Compact size of external diameter ϕ50mm
- Parallel/SSI data transmission
- 23 bit(8388608) resolution[Single-turn : 10 bit(1024 division), Multi-turn : 13 bit(8192 revolution)]
- Easy zero adjustment with separate single-turn data/multi-turn count setting function
- No backup power required due to memory back up function
- CW, CCW direction setting available with Direction function
- Increasing user's convenience with Clear, OVF alarm function
- Dust-proof, oil-proof by IP64
- Latch function supported (Parallel output model only)

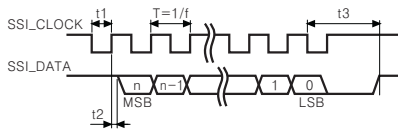
▣ Application

- Precision machine tool
- Fabric machinery
- Robot
- Parking facility

▣ Ordering information

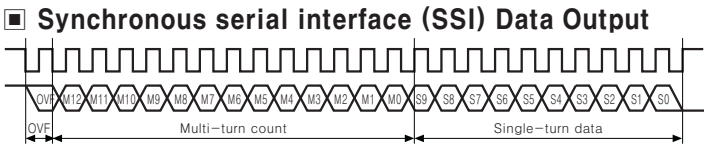
EPM50S	8	10	13	B	PN	24
Series	Shaft diameter	Single-turn	Multi-turn	Output code	Control output	Power supply
Diameter ϕ50mm	ϕ8mm	10bit (1024 division)	13bit (8192 revolution)	Binary Code	PN: Parallel NPN O.C. S: SSI	12-24VDC ±5%

▣ Synchronous serial interface (SSI) Output Timing diagram



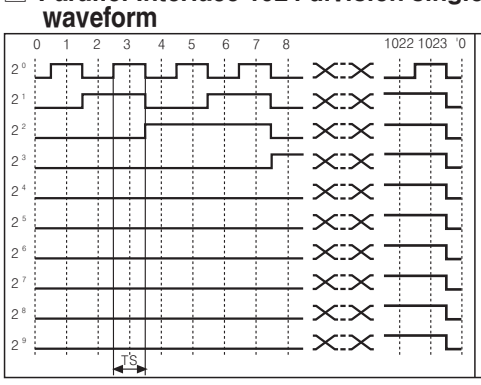
Clock Frequency f	100 ~ 1MHz
T	T : 1 ~ 10us
	0.5us < t1 < 5us
Time lag t2	T2 < 0.3us
Monoflop Time t3	15us < t3 < 30us

▣ Synchronous serial interface (SSI) Data Output



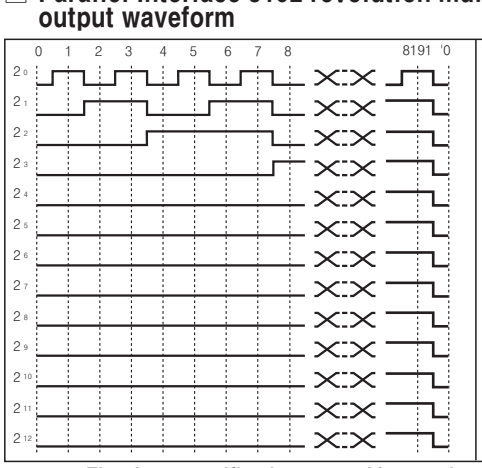
Clock input bit	Data output name	Data output bit	Clock input bit	Data output name	Data output bit
1	Over flow error bit	0 bit	15	Single-turn data	9 bit(MSB)
2	Multi-turn count	12 bit(MSB)	16		8 bit
3		11 bit	17		7 bit
4		10 bit	18		6 bit
5		9 bit	19		5 bit
6		8 bit	20		4 bit
7		7 bit	21		3 bit
8		6 bit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



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

▣ Parallel Interface 8192 revolution multi-turn count data output waveform



※Left waveform is based on the positive logic.
(The output waveform of negative logic is opposed.)

※The above specifications are subject to change without notice.

▣ Speicifications

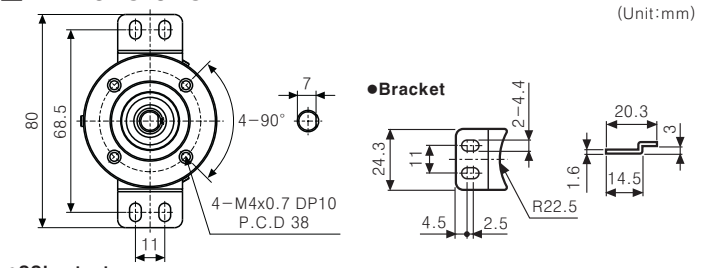
Type		ϕ50mm Multi-turn absolute encoder	
Model		**EPM50S8-1013-B-S-24**	**EPM50S8-1013-B-PN-24**
Resolution	Single-turn	1024 division(10Bit)	
	Multi-turn	8192 revolution(13Bit)	
Rotation limit when power is off		**(★1)** ±90°	
Electrical specification: Output	Output code	24bit, Binary 2 code	Binary 2 code
	Output Interface	SSI(Synchronous Serial Interface)	Parallel
	Output type	Line driver	NPN open collector output
	Output signal	Single-turn data, Multi-turn count, **(★2)** OVF alarm	
	Line driver output	• Low: Sink current - max. 20mA, Residual voltage - max. 0.5VDC • High: Sink current - max. -20mA, Output voltage - max. 2.5VDC	———
	NPN open collector output	———	Sink current : Max. 32mA, Residual voltage : Max. 1VDC
	Logic	———	Negative logic output
	Response time	———	Max. 1㎲(Cable: 2m, I sink = 32mA)
Input	Input signal	**(★3)** Single-turn data reset, **(★4)** Multi-turn count reset, Direction, Clear	
		———	Latch
	Input level	High : 5-24VDC, Low : 0-1.2VDC	
	Input logic	**(★5)** Low Active, HIGH or OPEN for common use	
	Input time	Direction : Over 100ms	
		Single-turn data reset : Over 100ms	
		Multi-turn count reset : Over 100ms	
		Clear : Over 100ms	
		No Latch function	Latch : Over 500㎲
	SSI Clock Input Frequency	100kHz~1MHz	———
Max. Response frequency		———	50kHz
Power supply		12-24VDC, ±5%(Ripple P-P : Max. 5%)	
Current consumption		Max. 150mA(Disconnection of the load)	Max. 70mA(Disconnection of the load)
Insulation resistance		Min. 100MΩ(At 500VDC between all terminals and case)	
Dielectric strength		750VAC 50/60Hz for 1 minute(Between all terminals and case)	
Connection		Cable outgoing type(Cable gland)	
Mechanical specification	Starting torque	Max. 40gf · cm(0.004N · m)	
	Moment of inertia	Max. 40g · cm²(4×10⁻⁶ kg · m²)	
	Shaft loading	Radial : 10kgf, Thrust : 2.5kgf	
	Max. revolution	**(★6)** 3000rpm	
Vibration		1.5mm amplitude at frequency of 10 to 55Hz (for one minute cycle) in each of X, Y, Z direction for 2 hours	
Shock		Max. 50G	
Ambient temperature		-10 to 70℃(At non-freezing status), Storage: -25 to 85℃	
Ambient humidity		35 ~ 85%RH	
Protection		IP64	
Cable		ϕ6mm 10P, Length:2m, Shield cable	ϕ6mm 17P, LengthX2:2m, Shield cable
Accessories		Mounting bracket, coupling	
Approval		CE	
Unit weight		Approx. 322g	Approx. 475g

※**(★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 over-rated 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 (0~8191 revolution). It shall be initialized by changing the setting of Direction or applying multi-turn count reset or Clear signals.
※**(★3)**Single-turn data shall be initialized as 「0」 when single-turn data reset is input.
※**(★4)**Multi-turn count shall be initialized as 「0 revolution」 when multi-turn count reset is input.
※**(★5)**High Active is optional.
※**(★6)**In case of Parallel type model, select the resolution to make max. Response revolution is lower than max. Allowable revolution.

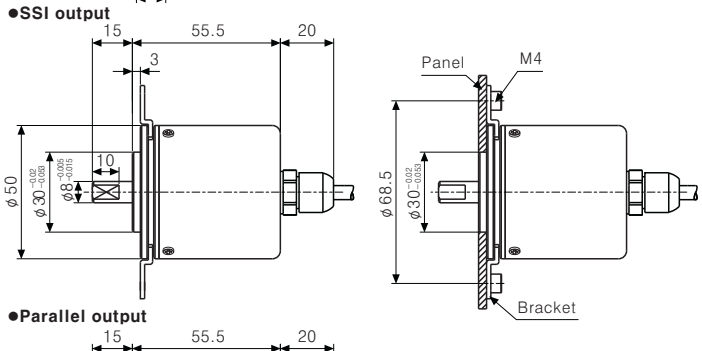
【Max. Response Revolution (rpm) = $\frac{\text{Max. Allowable Revolution}}{\text{Resolution}} \times 60$ sec】

▣ Dimensions

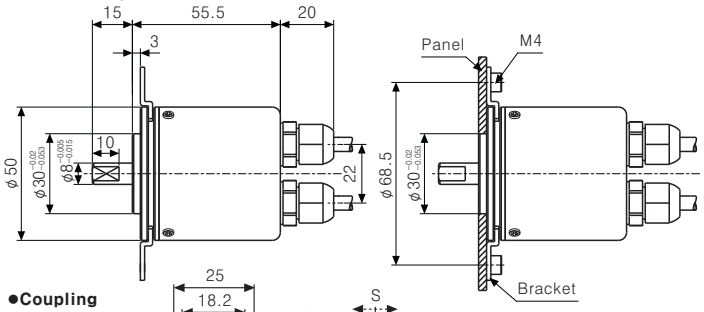
(Unit:mm)



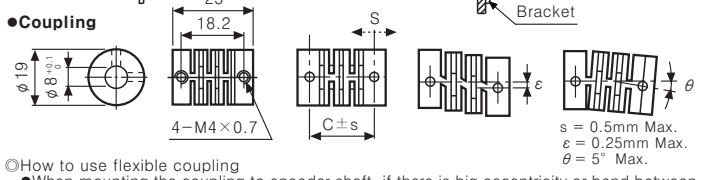
●SSI output



●Parallel output



●Coupling



◎How to use flexible coupling
- When mounting the coupling to encoder shaft, if there is big eccentricity or bend between rotating encoder shaft and mate shaft, it may cause encoder and coupling's life cycle to shorten.
- Do not load overweight on the shaft.

▣ Functions

◎**Single-turn data reset**
Single-turn data will be initialized as 「0」 when GND(low level) is input over 100ms on single-turn data reset line. In case of not using single-turn data reset line, connect the line to OPEN or + V (High level).

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

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

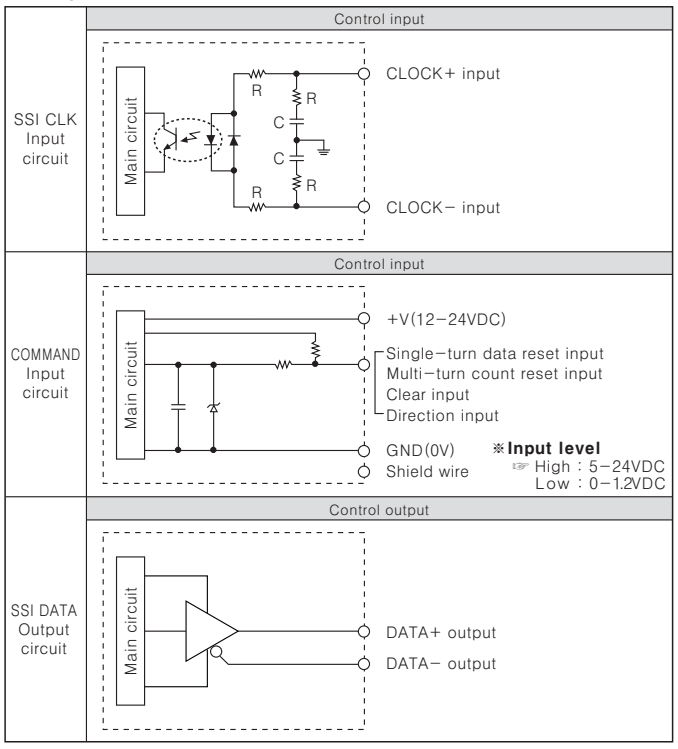
◎**Direction**
Connect Direction line to OPEN or +V (High level) and turn on the power. Output will increase when rotation direction is CW from shaft axis. In case of connecting to GND(Low level), output will increase when rotation direction is CCW. If direction setting is reset, single-turn data, multi-turn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

◎**Latch((Parallel output model only)**
When connecting latch line to GND(Low level) over 500㎲, outputs for single-turn data, multi-turn count and OVF at latch point will be remained. When latch line is connected to OPEN or +V (High level), output will be returned to operating mode output.

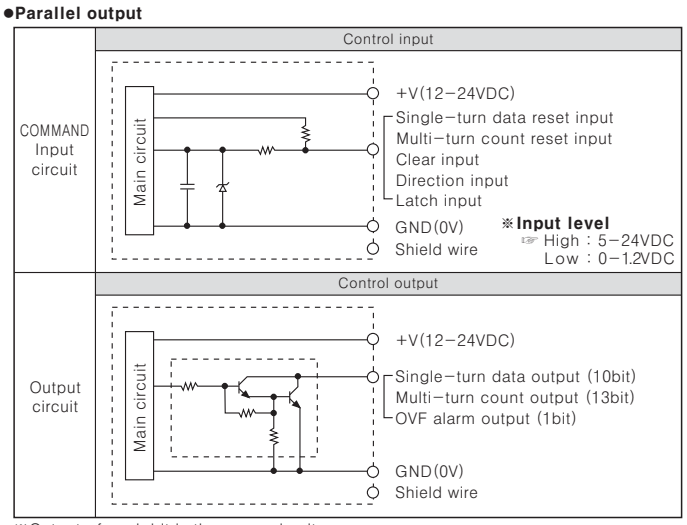
◎**OVF**
It is an alarm function providing output when multi-turn count is out of rotation ranges(0~8191 revolutions). OVF will be initialized through direction setting change, multi-turn count reset or clear input.

▣ Control output I/O Circuit

●**SSI output**



●**Parallel output**



※Output of each bit is the same circuit.
※Overload or short may cause circuit break.

▣ Connections

●**SSI output**

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

●**Parallel output**

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

※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.

▣ Caution for using

1. Installation
   ①Handle the unit with care since it consists of precision components.
   ②Be careful not to make eccentricity and deflection angle larger, it may shorten the life cycle.
   ③Do not put strong impact when insert coupling into shaft.
2. For using
   ①Please connect shield wire to F.G terminal.
   ②Do not connect and cut circuit during power on, or it may cause damage to the unit.
   ③When use switching power, install the surge absorber on power line and make the wire as short as possible to avoid noise.
3. Environment
   Please do not use this unit with below environment, it may cause malfunction.
   ①Place where this unit or component may be damaged by strong vibration or impact.
   ②Place where there are lots of flammable or corrosive gases.
   ③Place where strong magnet field or electric noise occurs.
   ④Place where is beyond of rating temperature or humidity.
   ⑤Place where strong acids or alkali near by.
4. Vibration and Impact
   ①When the strong impact loads on this unit, it may cause an error.
   ②Please use Bracket for more stable unit mounting.
   ③Please use metallic coupling when the application needs severe acceleration or deceleration frequently.
5. Wire connection
   ①Do not draw the wire with over strength 30N after wiring.
   ②If wire encoder cable with high voltage line or power cable in the same conduit, it may cause a malfunction or mechanical problem. Please wire it separately or use separated conduit.

※It may cause malfunction if above instructions are not followed.

▣ Major products

- Proximity sensors
- Photoelectric sensors
- Area sensors
- Fiber optic sensors
- Door/Door side sensors
- Pressure sensors
- Counters
- Timers
- Rotary encoders
- Display units
- Power controllers
- Sensor controllers
- Panel meters
- Graphic/Logic panels
- Temperature controllers
- Tachometer/Pulse(Rate) meters
- Temperature/Humidity transducers
- Switching power supplies
- Stepping motors/drivers/motion controllers
- Field network devices
- Laser marking system(CO_2, Nd:YAG)
- Laser welding/soldering system

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EP-KE-09-0150A