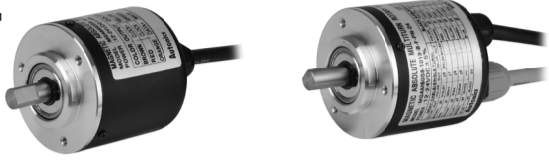


# Autonics

## Diameter Ø50mm Shaft type Magnetic Multi-turn Absolute Rotary Encoder MGAM50S SERIES

### INSTRUCTION MANUAL



Thank you for choosing our Autonics product.

Please read the following safety considerations before use.

#### ■ Safety Considerations

※Please observe all safety considerations for safe and proper product operation to avoid hazards.

※Safety considerations are categorized as follows.

**⚠Warning** Failure to follow these instructions may result in serious injury or death.

**⚠Caution** Failure to follow these instructions may result in personal injury or product damage.

※The symbols used on the product and instruction manual represent the following

⚠ symbol represents caution due to special circumstances in which hazards may occur.

#### ⚠Warning

1. Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss. (e.g. nuclear power control, medical equipment, ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime/disaster prevention devices, etc.)

Failure to follow this instruction may result in personal injury, fire, or economic loss.

#### ⚠Caution

1. Do not drop water or oil on this unit.

Failure to follow this instruction may result in product damage, or mis-control due to malfunction.

2. Use the unit within the rated specifications.

Failure to follow this instruction may result in shortening the life cycle of the unit, or product damage.

3. Please check the polarity of power and wrong wiring.

Failure to follow this instruction may result in product damage by burning.

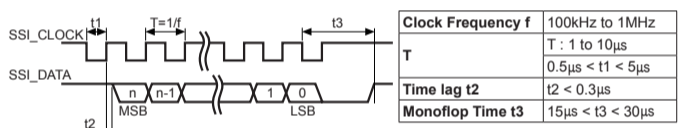
4. Do not short circuit the load.

Failure to follow this instruction may result in product damage by burning.

#### ■ Ordering Information

MGAM50S	8	-	10	13	-	B	-	F	-	PN	-	24
Item	Shaft diameter	Single-turn	Multi-turn	Output code	Rotation direction	Control output	Power supply					
Diameter Ø50mm	Ø8mm	10-bit (1024 -division)	13-bit (8192 -division)	Binary Code	F: Output increases by CW rotation direction at the shaft R: Output increases by CCW rotation direction at the shaft	PN: Parallel NPN open collector S: SSI Line driver output	12-24VDC ±5%					

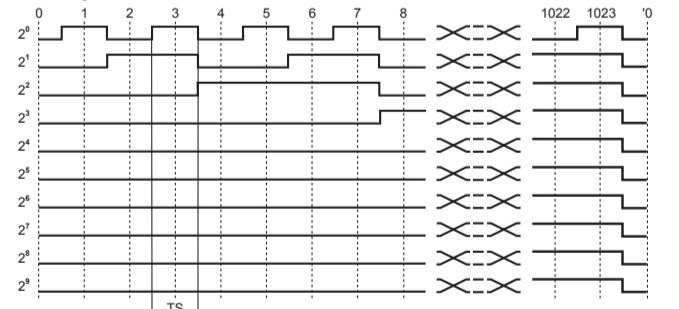
#### ■ Synchronous Serial Interface (SSI) Output Timing Diagram



#### ■ 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	9-bit (MSB)	2 <sup>9</sup>
2	Multi-turn count	12-bit (MSB)	16	8-bit	2 <sup>8</sup>
3		11-bit	17	7-bit	2 <sup>7</sup>
4		10 bit	18	6-bit	2 <sup>6</sup>
5	Single-turn data	9-bit	19	5-bit	2 <sup>5</sup>
6		8-bit	20	4-bit	2 <sup>4</sup>
7		7-bit	21	3-bit	2 <sup>3</sup>
8		6-bit	22	2-bit	2 <sup>2</sup>
9	Multi-turn count	5-bit	23	1-bit	2 <sup>1</sup>
10		4-bit	24	0 bit (LSB)	2 <sup>0</sup>
11		3-bit			
12		2-bit			
13		1-bit			
14		0 bit (LSB)			

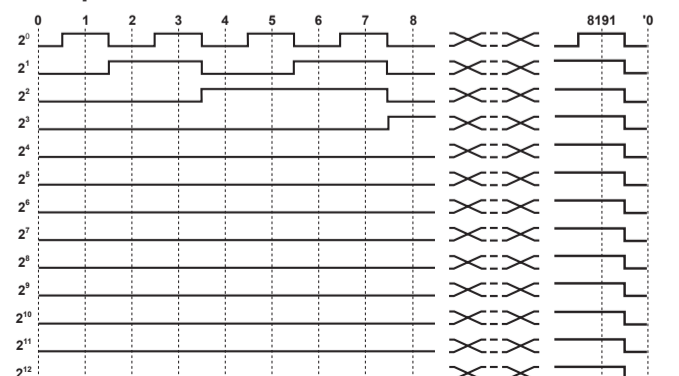
#### ■ Parallel Interface 1024-division Single-Turn Data Output Waveform



※TS=0.3515625\*±15'

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

#### ■ Parallel Interface 8192-division Multi-Turn Count Output Waveform



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

※The above specifications are subject to change and some models may be discontinued without notice.

#### ■ Specifications

Type	Diameter Ø50mm shaft type magnetic multi-turn absolute rotary encoder	
Model	MGAM50S8-1013-B-F-S-24	MGAM50S8-1013-B-F-PN-24
Resolution	Single-turn Multi-turn	1024-division (10-bit) 8192 revolution (13-bit)
Rotation limit when power off <sup>※1</sup>	±90°	
Hysteresis	±0.1°	
Positioning error <sup>※2</sup>	±1-bit (LSB: Least Significant-bit)	
Output code	24-bit, Binary 2 code	Binary 2 code
Output	Control output	SSI (Synchronous Serial Interface) Line driver -Low: Sink current - Max. 20mA, Residual voltage - Max. 0.5VDC -High: Sink current - Max. -20mA, Residual voltage - Max. 1VDC
	Output signal	Single-turn data, Multi-turn count, over flow alarm (OVF) <sup>※3</sup>
	Output logic	Negative logic output
	Response time (rise/fall)	Max. 1µs (cable: 2m, I sink = 20mA)
Electrical specification	Multi-turn count reset input <sup>※4</sup>	Input level: 0-1VDC Input logic: Low Active, OPEN for common use Input time: Over 100ms
	SSI Clock input	Input level: 5VDC±5% Input frequency: 100kHz to 1MHz
	Max. response frequency	30kHz
Power supply	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	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	Connection	Axial cable type (cable gland)
	Starting torque	Max. 70gf·cm (0.007N·m)
Mechanical specification	Moment of inertia	Max. 80g·cm <sup>2</sup> (8×10 <sup>-6</sup> kg·m <sup>2</sup> )
	Shaft loading	Radial: 10kgf, Thrust: 2.5kgf
Vibration	Max. revolution <sup>※5</sup>	3000rpm
	Vibration	1.5mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours
Shock	Shock	Approx. Max. 50G
	Environment	Ambient temperature: -10 to 70°C, storage: -25 to 85°C Ambient humidity: 35 to 85%RH, storage: 35 to 90%RH
Protection structure	Protection structure	IP50 (IEC standard)
	Cable	Ø6mm 10-wire, 2m, Shield cable (AWG 28, Core diameter: 0.08mm, Number of cores: 19, Insulator diameter: Ø0.8mm) / Ø6mm 17-wire×2, 2m, Shield cable (AWG 28, Core diameter: 0.08mm, Number of cores: 17, Insulator diameter: Ø0.8mm)
Accessories	Accessories	Mounting bracket, coupling
	Approval	CE
Weight <sup>※6</sup>	Weight	Approx. 391g (approx. 261g) / Approx. 523g (approx. 393g)

※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 counts may not be available if any revolutions occurred over ±90° from the position when power is off.

※2: When turning ON/OFF the unit, there may be ±1-bit (LSB) error at present position by hysteresis.

※3: OVF alarm is ON when multi-turn count is out of counting range (0 to 8191 revolution).

※4: Multi-turn count shall be initialized as '0 revolution' when multi-turn count reset is input.

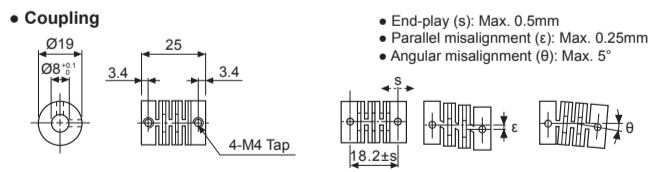
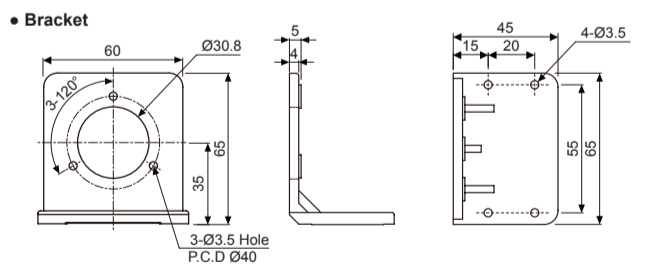
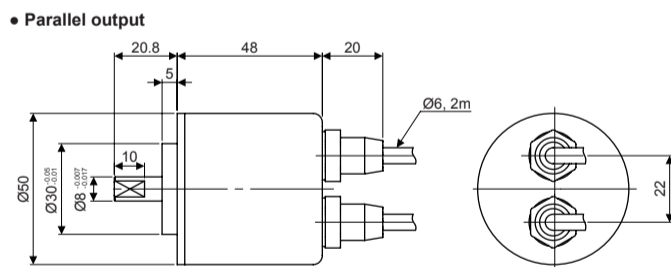
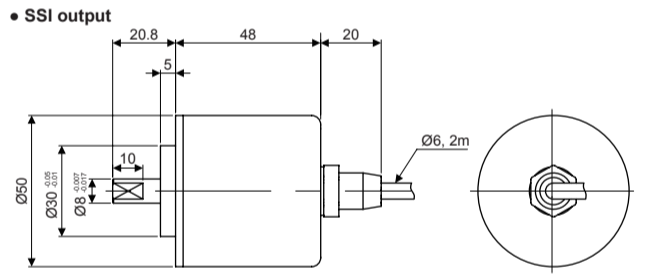
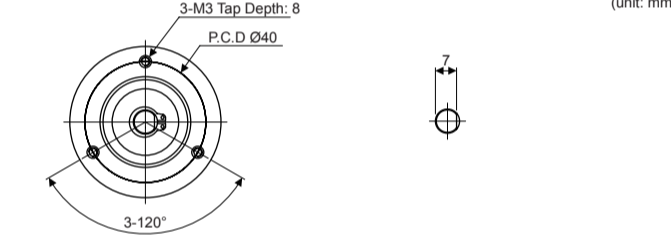
※5: In case of Parallel type model, Make sure that Max. response revolution should be lower than or equal to max. allowable revolution when selecting the resolution.

[Max. response revolution (rpm) = Max. response frequency × 60 sec / Resolution]

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

※Environment resistance is rated at no freezing or condensation.

#### ■ Dimensions



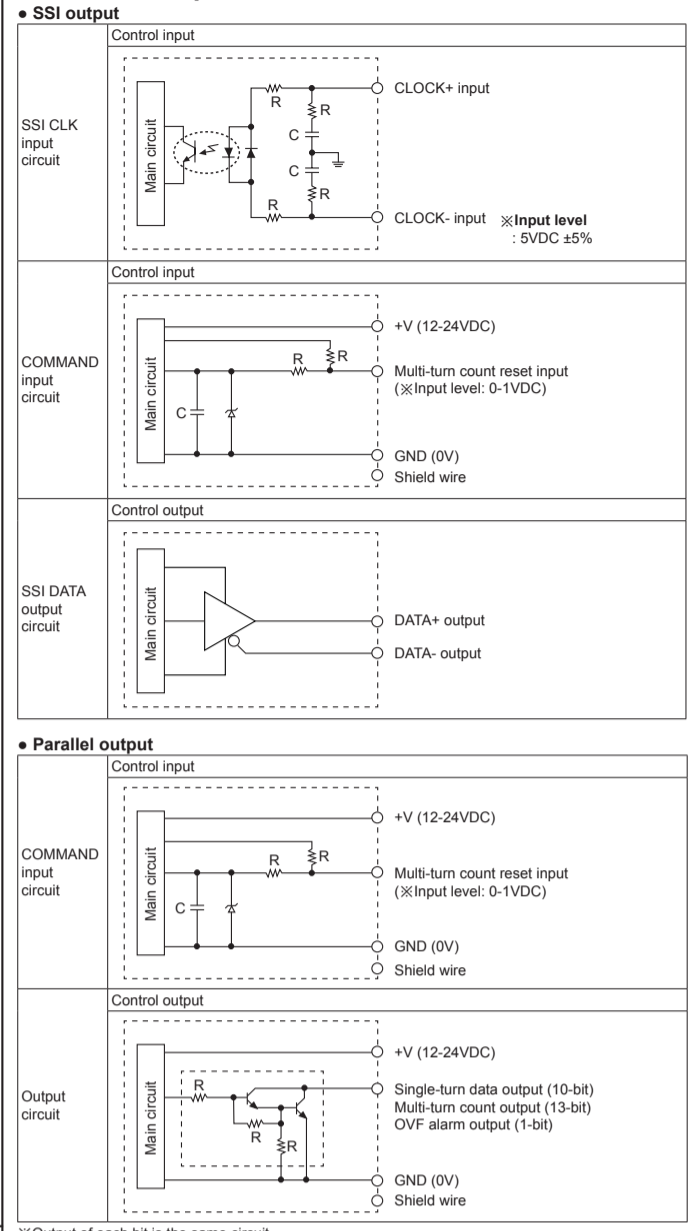
- When mounting the coupling to encoder shaft, if there is combined misalignment (parallel, angular misalignment) between rotating encoder shaft and mate shaft, it may cause encoder and coupling's life cycle to be shorten.
- Do not load overweight on the shaft.
- For more information about flexible coupling (ERB Series), please refer to the catalogue.

#### ■ Functions

○ Multi-turn count reset  
Multi-turn data will be reset as '0 revolution' when multi-turn count reset cable (light purple) is inputted 0 to 1V (over 100ms)

○ 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 (light purple) is inputted.

#### ■ Control Output I/O Circuit



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

#### ■ Connections

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

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

#### ■ Cautions During Use

1. Installation
    - ① Handle the unit with care since it consists of precision components.
    - ② Be careful not to make eccentricity and deflection angle larger, it may shorten the life cycle.
    - ③ Do not put strong impact when inserting coupling into shaft.
  2. For using
    - ① Please connect shield wire to F.G. terminal.
    - ② Do not connect and cut circuit during power on, or it may cause damage to the unit.
    - ③ When using a switching mode power supply, install the surge absorber on power line for absorbing surge and make the wire as short as possible to avoid noise.
  3. Environment
    - ① Please do not use this unit with below environment, it may cause malfunction.
    - ② Place where this unit or component may be damaged by strong vibration or impact.
    - ③ Place where there are lots of flammable or corrosive gases.
    - ④ Place where strong magnet field or electric noise occurs.
    - ⑤ Place where is beyond of rating temperature or humidity.
    - ⑥ Place where strong acids or alkali near by.
  4. Vibration and Impact
    - ① When the strong impact loads on this unit, it may cause an error.
    - ② Please use Bracket for more stable unit mounting.
    - ③ Please use metallic coupling when the application needs severe acceleration or deceleration frequently.
  5. Wire connection
    - ① Do not draw the wire with over strength 30N after wiring.
    - ② If 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.
- ※Failure to follow these instructions may result in product damage.

#### ■ Major Products

<ul style="list-style-type: none"> <li>■ Photoelectric Sensors</li> <li>■ Fiber Optic Sensors</li> <li>■ Door Sensors</li> <li>■ Door Side Sensors</li> <li>■ Area Sensors</li> <li>■ Proximity Sensors</li> <li>■ Pressure Sensors</li> <li>■ Rotary Encoders</li> <li>■ Connector/sockets</li> <li>■ Switching Mode Power Supplies</li> <li>■ Control Switches/Lamps/Buzzers</li> <li>■ I/O Terminal Blocks &amp; Cables</li> <li>■ Stepper Motors/Drivers/Motion Controllers</li> <li>■ Graphic/Logic Panels</li> <li>■ Field Network Devices</li> <li>■ Laser Marking System (Fiber, Co., Nd: YAG)</li> <li>■ Laser Welding/Cutting System</li> </ul>	<ul style="list-style-type: none"> <li>■ Temperature Controllers</li> <li>■ Temperature/Humidity Transducers</li> <li>■ SSR/Power Controllers</li> <li>■ Counters</li> <li>■ Timers</li> <li>■ Panel Meters</li> <li>■ Tachometer/Pulse (Rate)Meters</li> <li>■ Display Units</li> <li>■ Sensor Controllers</li> </ul>
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**Autonics Corporation**  
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