# MGAM50S Series

Shaft Type Ø50mm Magnetic Multi-turn Absolute Rotary Encoder

◼ Features

● **Higher resistant to vibration and impact by magnetic elements than optical encoder**
● **Total 23-bit resolution (8,388,608-division) of**
  10-bit single-turn (1,024-division) and 13-bit multi-turn (8,192-revolution)
● Compact size of Ø50mm
● Parallel data/SSI data transmission type
● Maximizing users convenience with over flow alarm (OVF) function
● Power supply: 12-24VDC ±5%
● Protection structure IP50 (IEC standard)
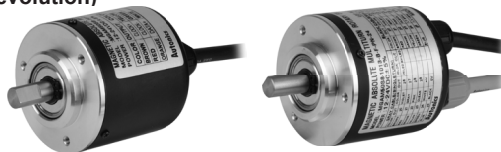
◼ Applications

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

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

◼ Ordering Information

MGAM50S	8	10	13	B	F	PN	24
Series	Shaft diameter	Single-turn	Multi-turn	Output code	Rotation direction	Control output	Power supply
Ø50mm Shaft type	Ø8mm	10-bit (1024 -division)	13-bit (8192 -revolution)	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 output S: SSI Line driver output	12-24VDC±5%

◼ Specifications

Type			Shaft Type Ø50mm Magnetic Multi-turn Absolute Rotary Encoder	
Model			MGAM50S8-1013-B-F-S-24	MGAM50S8-1013-B-F-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	Hysteresis	±0.1°	
		Positioning error[2]	±1-bit (LSB: Least Significant Bit)	
		Output code	24-bit, Binary code	Binary code
		Control output	SSI (Synchronous Serial Interface) Line driver output [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. 20mA, Residual voltage: max. 1VDC=
		Output signal	Single-turn data, multi-turn count, over flow alarm (OVF)[3]	
		Output logic	—	Negative logic output
		Response time (rise, fall)	—	Max. 1μs (cable: 2m, I sink = 20mA)
	Multi-turn count reset input[4]	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		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 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 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 revolutions).
※4: Multi-turn count shall be initialized as「0 revolution」when multi-turn count reset is input.

Absolute Ø50mm Magnetic Multi-turn Shaft Type

◾ Specifications

| Type		Shaft Type Ø50mm Magnetic Multi-turn Absolute Rotary Encoder	
Model		MGAM50S8-1013-B-F-S-24	MGAM50S8-1013-B-F-PN-24
Mechanical specification	Starting torque	Max. 70gf·cm (0.0069N·m)	
	Moment of inertia	Max. 80g·cm^2 (8×10^{-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℃, storage: -25 to 85℃	
	Ambient humid.	35 to 85%RH, storage: 35 to 90%RH	
Protection structure		IP50 (IEC standard)	
Cable		Ø6mm, 10-wire, 2m, Shield cable (AWG 28, core diameter: 0.08mm, number of cores: 19, insulator out diameter: Ø0.8mm)	Ø6mm, 17-wire×2, 2m, Shield cable (AWG 28, core diameter: 0.08mm, number of cores: 17, insulator out diameter: Ø0.8mm)
Accessories		Bracket, coupling	
Approval		CE	
Weight [6]		Approx. 391g (approx. 261g)	Approx. 523g (approx. 393g)

※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.

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

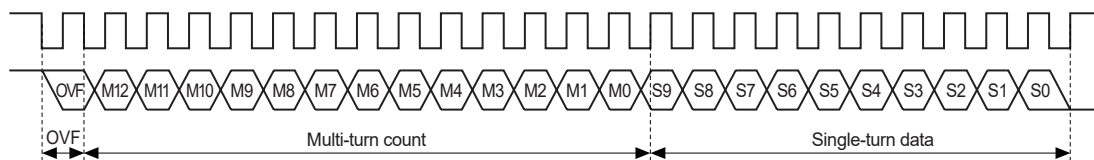※6: The weight includes packaging. The weight in parenthesis is for unit only.

※Environment resistance is rated at no freezing or condensation.

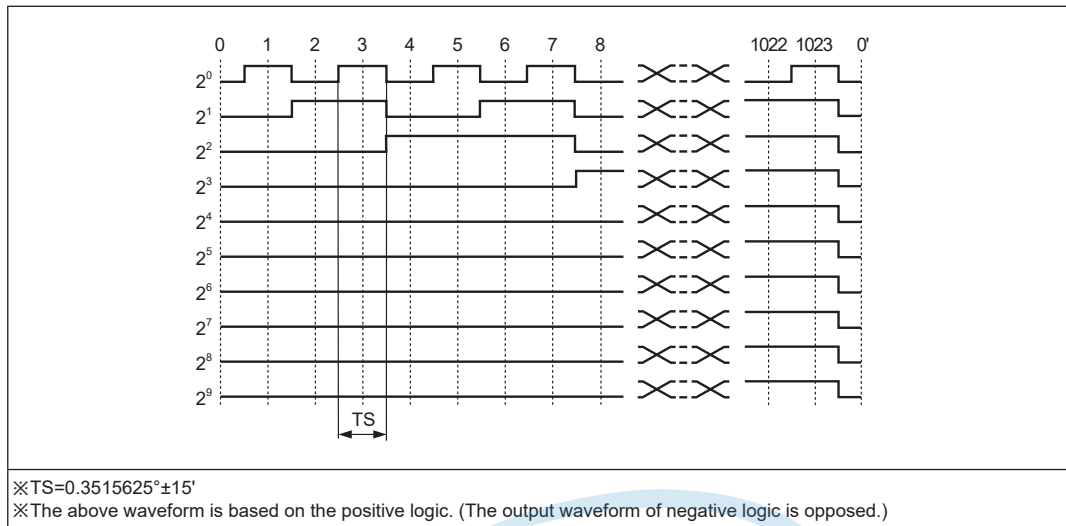## ◾ Synchronous Serial Interface (SSI) Output Timing Diagram
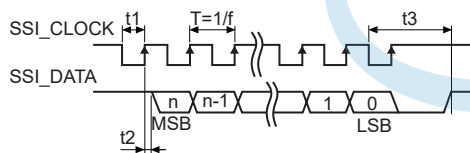
Clock Frequency f	100kHz to 1MHz
T	T: 1 to 10μs
	0.5μs < t1 < 5μs
Time lag t2	t2 < 0.3μs
Monoflop Time t3	15μs < t3 < 30μs

◾ 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		9-bit (MSB)
2		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	Single-turn data	4-bit
7		7-bit	21		3-bit
8	Multi-turn count	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'
※The above 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
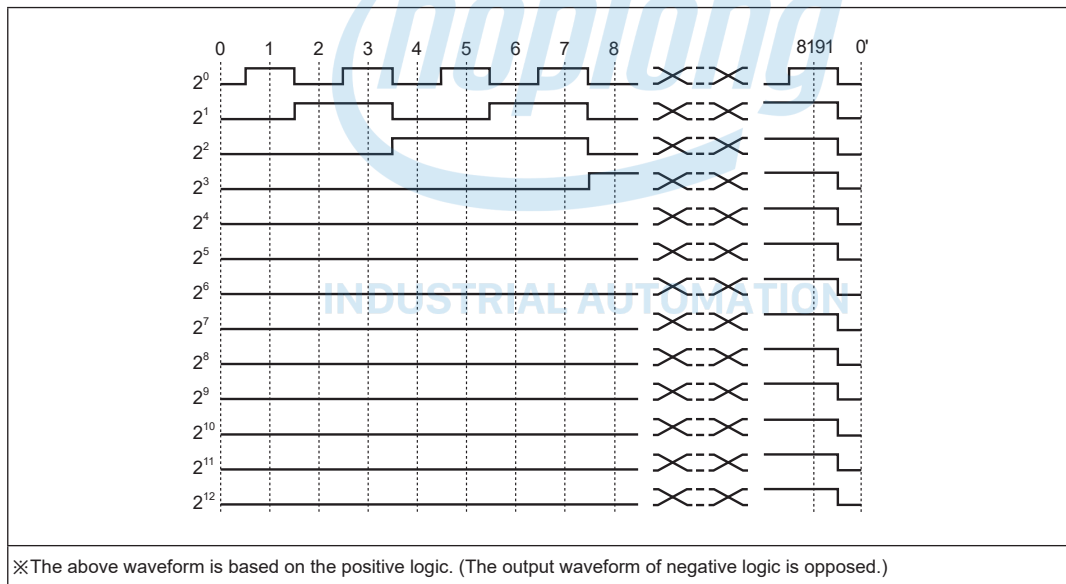
※The above waveform is based on the positive logic. (The output waveform of negative logic is opposed.)

■ Control Output I/O Circuit

◎ SSI Line driver output type

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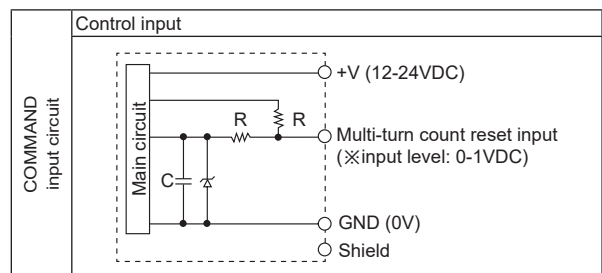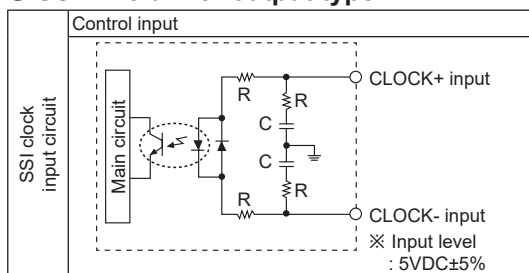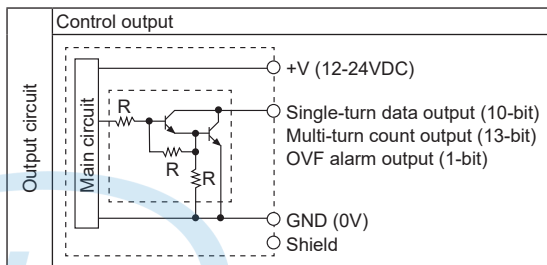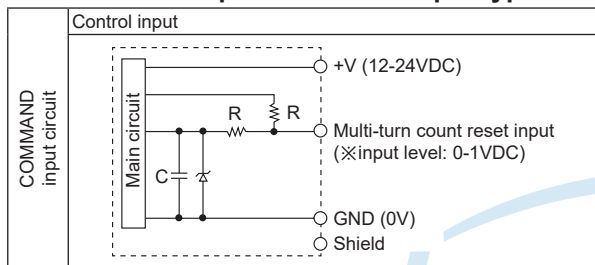
Absolute Ø50mm Magnetic Multi-turn Shaft Type

■ Control Output I/O Circuit

◎ SSI Line driver output type
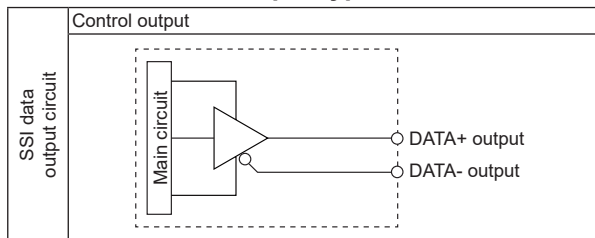
◎ Parallel NPN open collector output type

※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		Cable color	Description	
Brown		CLOCK+	Green		Multi-turn count reset
Red	SSI	CLOCK-	Blue	COMMAND	N·C
Orange		DATA+	Purple		N·C
Yellow		DATA-	Gray		N·C
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)			Single-turn data cable (sheath color: gray)		
Cable color	Description		Cable color	Description	
Brown		2^0	Brown		2^0
Red		2^1	Red		2^1
Orange		2^2	Orange		2^2
Yellow		2^3	Yellow		2^3
Green		2^4	Green	Single-turn	2^4
Blue		2^5	Blue	data	2^5
Purple	Multi-turn	2^6	Purple		2^6
Gray	count	2^7	Gray		2^7
Pink		2^8	Pink		2^8
Clear		2^9	Clear		2^9
Light brown		2^{10}	Light brown	N.C.	
Light yellow		2^{11}	Light yellow	N.C.	
Light green		2^{12}	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	Signal shield cable (F.G.)		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.
※Do not apply tensile strength over 30N to the cable.

(A) Photoelectric Sensors

(B) Fiber Optic Sensors

(C) LiDAR

(D) Door/Area Sensors

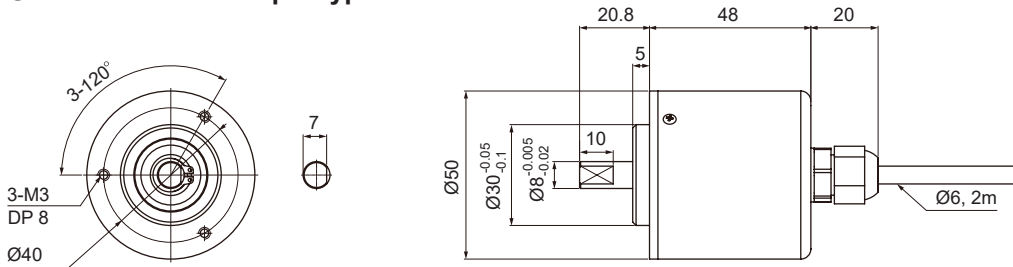(E) Vision Sensors

(F) Proximity Sensors

(G) Pressure Sensors

(H) Rotary Encoders

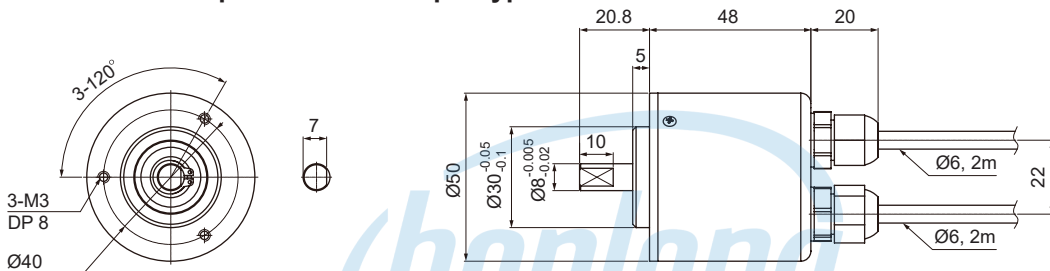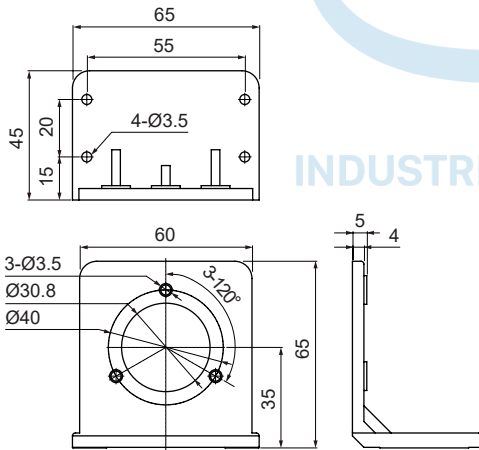(I) Connectors/ Connector Cables/ Sensor Distribution Boxes/ Sockets

MGAM50S Series

▣ Dimensions

(unit: mm)

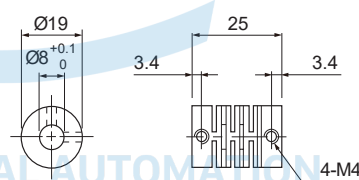### ◎ SSI Line driver output type

◎ 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

◎ 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 is inputted.