Autonics

Diameter Ø50mm Shaft type Magnetic Absolute Rotary Encoder

MGA50S 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.
※⚠ symbol represents caution due to special circumstances in which hazards may occur.

⚠ **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.

⚠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 fire, personal injury, or economic loss.
2. **Install on a device panel to use.**
   Failure to follow this instruction may result in fire.
3. **Do not connect, repair, or inspect the unit while connected to a power source.**
   Failure to follow this instruction may result in fire.
4. **Check 'Connections' before wiring.**
   Failure to follow this instruction may result in fire.
5. **Do not disassemble or modify the unit.**
   Failure to follow this instruction may result in fire.

⚠Caution

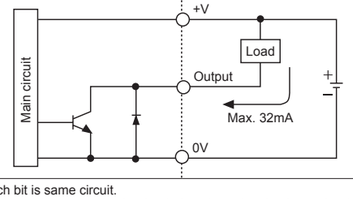
1. **Use the unit within the rated specifications.**
   Failure to follow this instruction may result in fire or product damage.
2. **Do not short the load.**
   Failure to follow this instruction may result in product damage by fire.
3. **Do not use the unit in the place where flammable/explosive/corrosive gas, humidity, direct sunlight, radiant heat, or salinity may be present.**
   Failure to follow this instruction may result in fire or explosion.
4. **Do not use the unit near the place where there is the equipment which generates strong magnetic force or high frequency noise and strong alkaline, strong acidic exists.**
   Failure to follow this instruction may result in product damage.

▣ Ordering Information

MGA50S	8	–	1024	–	1	R	–	N	–	5

Series	Shaft diameter	Pulses/ revolution	Output code	Revolution direction	Control output	Power supply
Diameter Ø50mm shaft type	Ø8mm	Refer to resolution	1: BCD code 2: Binary code 3: Gray code	F: Output value increases at CW direction R: Output value increases at CCW direction	N: NPN open collector output	5: 5VDC ±5% 24: 12-24VDC ±5%

▣ Control Output Circuit

Output type	NPN open collector output	
Type	Rotary encoder	Load connection
Output circuit		

※The output of each bit is same circuit.
※Be sure that when applying excessive load or being short, the circuit may be damaged.

※**The above specifications are subject to change and some models may be discontinued without notice.**
※**Be sure to follow cautions written in the instruction manual, and the technical descriptions (catalog, homepage).**

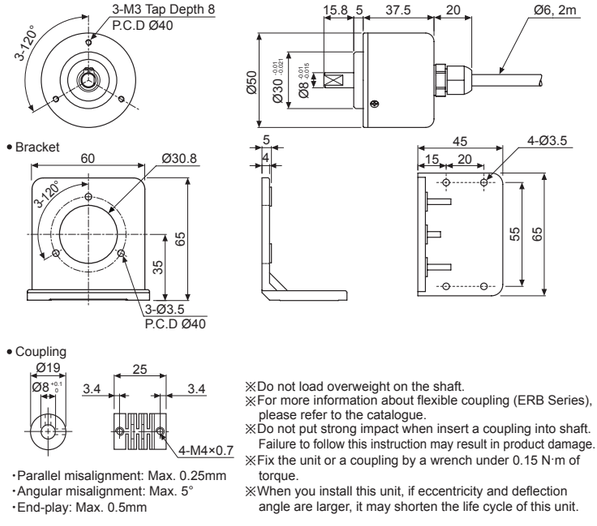
▣ Specifications

Type			Diameter Ø50mm shaft type magnetic absolute rotary encoder		
Model			**MGA50S8-□□-N-□**		
Resolution※1			32, 40, 45, 48, 64, 90, 128, 180, 256, 360, 512, 720, 1024-division		
Electrical specification	Output	Hysteresis	±0.1°		
		Positioning error※2	±1bit (LSB: Least Significant Bit)		
		Output code		BCD code	Binary code	Gray code
		Output phase/ Output angle※3	1024-division	TS: 0.3515°±15' (13-bit)	TS: 0.3515°±15' (10-bit)	TS: 0.703°±15' (10-bit)
			720-division	TS: 0.5°±25' (11-bit)	TS: 0.5°±25' (10-bit)	TS: 1°±25' (10-bit)
			512-division	TS: 0.703°±25' (11-bit)	TS: 0.703°±25' (9-bit)	TS: 1.406°±25' (9-bit)
			360-division	TS: 1°±25' (10-bit)	TS: 1°±25' (9-bit)	TS: 2°±25' (9-bit)
			256-division	TS: 1.406°±25' (10-bit)	TS: 1.406°±25' (8-bit)	TS: 2.8125°±25' (8-bit)
			180-division	TS: 2°±25' (9-bit)	TS: 2°±25' (8-bit)	TS: 4°±25' (8-bit)
			128-division	TS: 2.8125°±25' (9-bit)	TS: 2.8125°±25' (7-bit)	TS: 5.625°±25' (7-bit)
			90-division	TS: 4°±25' (8-bit)	TS: 4°±25' (7-bit)	TS: 8°±25' (7-bit)
			64-division	TP1: 4.5°±60' (1-bit) TP2: 1.125°±60' (1-bit) TS: 5.625°±60' (7-bit) EP: 5.625°±60' (1-bit)	TP1: 4.5°±60' (1-bit) TP2: 1.125°±60' (1-bit) TS: 5.625°±60' (6-bit) EP: 5.625°±60' (1-bit)	TP1: 4.5°±60' (1-bit) TP2: 1.125°±60' (1-bit) TS: 11.25°±60' (6-bit) EP: 5.625°±60' (1-bit)
			48-division	TP1: 6°±60' (1-bit) TP2: 1.5°±60' (1-bit) TS: 7.5°±60' (7-bit) EP: 7.5°±60' (1-bit)	TP1: 6°±60' (1-bit) TP2: 1.5°±60' (1-bit) TS: 7.5°±60' (6-bit) EP: 7.5°±60' (1-bit)	TP1: 6°±60' (1-bit) TP2: 15°±60' (1-bit) TS: 1.5°±60' (6-bit) EP: 7.5°±60' (1-bit)
			45-division	TP1: 6.4°±60' (1-bit) TP2: 1.6°±60' (1-bit) TS: 8°±60' (7-bit) EP: 8°±60' (1-bit)	TP1: 6.4°±60' (1-bit) TP2: 1.6°±60' (1-bit) TS: 8°±60' (6-bit) EP: 8°±60' (1-bit)	TP1: 6.4°±60' (1-bit) TP2: 1.6°±60' (1-bit) TS: 16°±60' (6-bit) EP: 8°±60' (1-bit)
			40-division	TP1: 7.2°±60' (1-bit) TP2: 1.8°±60' (1-bit) TS: 9°±60' (6-bit) EP: 9°±60' (1-bit)	TP1: 7.2°±60' (1-bit) TP2: 1.8°±60' (1-bit) TS: 9°±60' (6-bit) EP: 9°±60' (1-bit)	TP1: 7.2°±60' (1-bit) TP2: 1.8°±60' (1-bit) TS: 18°±60' (6-bit) EP: 9°±60' (1-bit)
			32-division	TP1: 9°±60' (1-bit) TP2: 2.25°±60' (1-bit) TS: 11.25°±60' (6-bit) EP: 11.25°±60' (1-bit)	TP1: 9°±60' (1-bit) TP2: 2.25°±60' (1-bit) TS: 11.25°±60' (5-bit) EP: 11.25°±60' (1-bit)	TP1: 9°±60' (1-bit) TP2: 2.25°±60' (1-bit) TS: 22.5°±60' (5-bit) EP: 11.25°±60' (1-bit)
		Output type	NPN open collector output			
		Output capacity	Load current max. 32mA, Residual voltage max. 1VDC⎓			
		Output logic	Negative logic output			
		Response time (rise, fall)	Max. 1μs (cable length: 2m, I sink=32mA)			
	Max. response frequency		30kHz			
	Power supply		5VDC⎓ ±5% (ripple P-P: max. 5%), 12-24VDC⎓ ±5% (ripple P-P: max. 5%)			
	Current consumption		Max. 60mA (disconnection of 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 cable type (cable gland)			
Mechanical specification	Starting torque		Max. 70gf·cm (0.007N·m)			
	Moment of inertia		Max. 80g·cm² (8×10⁻⁶kg·m²)			
	Shaft loading		Radial: 10kgf, Thrust: 2.5kgf			
	Max. allowable revolution※4		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. 75G			
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, 17-wire, 2m, Shield cable (AWG28, Core diameter: 0.08mm, Number of cores: 17, Insulator diameter: Ø0.8mm)			
Accessory			Bracket, Coupling			
Approval			CE			
Weight※5			Approx. 400g (approx. 270g)			

※1: Not indicated resolutions are customizable.
※2: When turning ON/OFF the unit, there may be ±1-bit(LSB) error at present position by hysteresis.
※3: TP1, TP2 other output angles are available as option.
※4: 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】
※5: The weight includes packaging. The weight in parenthesis is for unit only.
※Environment resistance is rated at no freezing or condensation.

▣ Dimensions

(unit: mm)

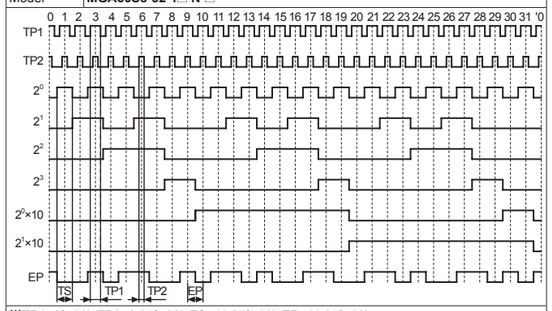


・Parallel misalignment: Max. 0.25mm
・Angular misalignment: Max. 5°
・End-play: Max. 0.5mm

※Do not load overweight on the shaft.
※For more information about flexible coupling (ERB Series), please refer to the catalogue.
※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 0.15 N·m of torque.
※When you install this unit, if eccentricity and deflection angle are larger, it may shorten the life cycle of this unit.

▣ 32-Division Output Waveform (BCD Code Output)

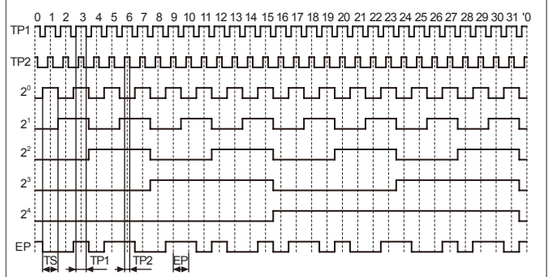
Model: **MGA50S8-32-1□-N-□**



※TP1=9°±60', TP2=2.25°±60', TS=11.25°±60', EP=11.25°±60'
※The above waveform is based on the positive logic.
(The output waveform of negative logic is opposed.)

▣ 32-Division Output Waveform (Binary Code Output)

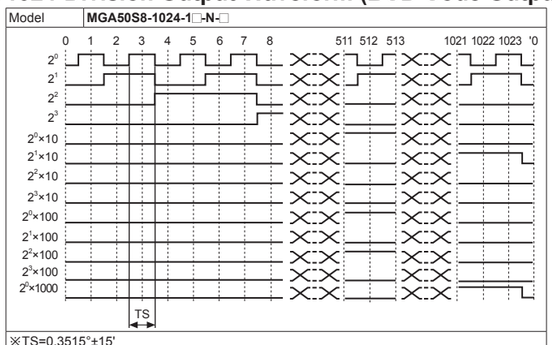
Model: **MGA50S8-32-2□-N-□**



※TP1=9°±60', TP2=2.25°±60', TS=11.25°±60', EP=11.25°±60'
※The above waveform is based on the positive logic.
(The output waveform of negative logic is opposed.)

▣ 1024-Division Output Waveform (BCD Code Output)

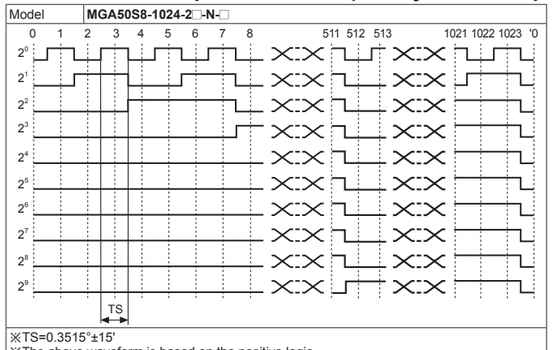
Model: **MGA50S8-1024-1□-N-□**



※TS=0.3515°±15'
※The above waveform is based on the positive logic.
(The output waveform of negative logic is opposed.)

▣ 1024-Division Output Waveform (Binary Code Output)

Model: **MGA50S8-1024-2□-N-□**



※TS=0.3515°±15'
※The above waveform is based on the positive logic.
(The output waveform of negative logic is opposed.)

▣ Connection

• BCD Code

Color \ Resolution	32 -division	40 -division	45 -division	48 -division	64 -division	90 -division	128 -division	180 -division	256 -division	360 -division	512 -division	720 -division	1024 -division
Power White	+V												
Power Black	0V												
Output cable Brown	2^0												
Output cable Red	2^1												
Output cable Orange	2^2												
Output cable Yellow	2^3												
Output cable Green	2^0×10												
Output cable Blue	2^1×10												
Output cable Purple	N·C	N·C	N·C	N·C	2^2×10								
Output cable Gray	TP1				2^3×10								
Output cable Pink	TP2				N·C	N·C	2^2×100						
Output cable Transparent	EP				N·C	N·C	2^3×100						
Output cable Light Brown	N·C						2^2×100						
Output cable Light Yellow	N·C										2^3×100		
Output cable Light Green	N·C										2^0×1000		
Output cable Light Blue	N·C												
Output cable Light Purple	N·C												
Output cable Shield cable	Signal shield cable (F.G.)												

• Binary Code/Gray Code

Color \ Resolution	32 -division	40 -division	45 -division	48 -division	64 -division	90 -division	128 -division	180 -division	256 -division	360 -division	512 -division	720 -division	1024 -division
Power White	+V												
Power Black	0V												
Output cable Brown	2^0												
Output cable Red	2^1												
Output cable Orange	2^2												
Output cable Yellow	2^3												
Output cable Green	2^4												
Output cable Blue	N·C	2^5											
Output cable Purple	N·C				2^6								
Output cable Gray	TP1			N·C	2^7								
Output cable Pink	TP2			N·C	2^8								
Output cable Transparent	EP			N·C	2^9								
Output cable Light Brown	N·C												
Output cable Light Yellow	N·C												
Output cable Light Green	N·C												
Output cable Light Blue	N·C												
Output cable Light Purple	N·C												
Output cable Shield cable	Signal shield cable (F.G.)												

※Non-using wires must be insulated.
※Encoder case and shield cable must be grounded.
※N.C (Not Connected) : Not using.
※Please make sure not to short when wiring output cables because the dedicated driver IC is used at output circuit.
※Do not apply tensile strength over 30N to the cable.

▣ Cautions during Use

1. Follow instructions in 'Cautions during Use'. Otherwise, It may cause unexpected accidents.
2. 5VDC, 12-24VDC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
3. For using the unit with the equipment which generates noise (switching regulator, inverter, servo motor, etc.), ground the shield wire to the F.G. terminal.
4. Ground the shield wire to the F.G. terminal.
5. When using switching mode power supply, frame ground (F.G.) terminal of power supply should be grounded.
6. Wire as short as possible and keep away from high voltage lines or power lines, to prevent inductive noise.
7. Check the wire type and response frequency when extending wire because of distortion of waveform or residual voltage increment etc by line resistance or capacity between lines.
8. This unit may be used in the following environments.
   ①Indoors (in the environment condition rated in 'Specifications')
   ②Altitude max. 2,000m
   ③Pollution degree 2
   ④Installation category II

▣ Major Products

- Photoelectric Sensors
- Fiber Optic Sensors
- Door Sensors
- Door Side Sensors
- Area Sensors
- Proximity Sensors
- Pressure Sensors
- Rotary Encoders
- Connector/Sockets
- Switching Mode Power Supplies
- Control Switches/Lamps/Buzzers
- I/O Terminal Blocks & Cables
- Stepper Motors/Drivers/Motion Controllers
- Graphic/Logic Panels
- Field Network Devices
- Laser Marking System (Fiber, CO_2, Nd: YAG)
- Laser Welding/Cutting System
- Temperature Controllers
- Temperature/Humidity Transducers
- SSRs/Power Controllers
- Counters
- Timers
- Panel Meters
- Tachometer/Pulse (Rate) Meters
- Display Units
- Sensor Controllers

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