Autonics

ROTARY ENCODER(INCREMENTAL TYPE)
E50S/E50SP SERIES

M A N U A L

CE

E50S

E50SP

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 caution 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 machinery(Ex: nuclear power control, medical equipment, ship, vehicle, train, airplane, combustion apparatus, safety device, crime/disaster prevention equipment, etc) which may cause damages to human life or property, it is required to install fail-safe device.**
   It may cause a fire, human injury or damage to property.

⚠Caution

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

▣ Ordering information

E50S - 8 - 8000 - 3 - N - 24 - ☐

Series	Shaft diameter	Pulse/ 1Revolution	Output phase	Output	Power supply	Cable
Diameter ø50mm, shaft type	ø8mm	See resolution	2: A, B 3: A, B, Z 4: A, A̅, B, B̅ 6: A, A̅, B, B̅, Z, Z̅	T: Totem pole output N: NPN open collector output V: Voltage output L: Line driver output	5: 5VDC±5% 24: 12-24VDC±5%	No mark: Normal type C: Cable outgoing connector type(※) CR: Rear connector integrated type CS: Side connector integrated type

※Standard: E50S8-[PULSE]-3-N-24 ※Cable length: 250mm

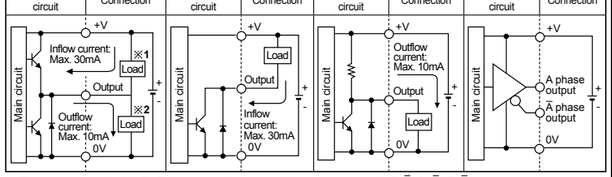
E50S - 6 - P - 600 - 3 - N - 24 - ☐

Series	Shaft diameter	External material	Pulse/ 1Revolution	Output phase	Output	Power supply	Cable
Diameter ø50mm, shaft type	6: ø6mm 8: ø8mm	P: Plastic	See resolution	2: A, B 3: A, B, Z 4: A, A̅, B, B̅ 6: A, A̅, B, B̅, Z, Z̅	T: Totem pole output N: NPN open collector output V: Voltage output L: Line driver output	5: 5VDC±5% 24: 12-24VDC±5%	No mark: Normal type C: Cable outgoing connector type(※)

※Standard: E50S6P-[PULSE]-3-N-24 ※The power of Line driver is only for 5VDC ※Cable length: 250mm

▣ Control output diagram

Totem pole output		NPN open collector output		Voltage output		Line driver output	
Rotary encoder circuit	Connection	Rotary encoder circuit	Connection	Rotary encoder circuit	Connection	Rotary encoder circuit	Connection



※The output circuit of A, B, Z phase are the same. (Line driver output is A, Ā, B, B̅, Z, Z̅)
※Totem pole output can be used for NPN open collector type(※**1**) or voltage output type(※**2**).
※**The above specifications are subject to change without notice.**

▣ Specifications

Item				
Model	Totem pole output		**E50S8-□□□□-3-T-□**	**E50S□P-□□□□-3-T-□**
	NPN open collector output		**E50S8-□□□□-3-N-□**	**E50S□P-□□□□-3-N-□**
	Voltage output		**E50S8-□□□□-3-V-□**	**E50S□P-□□□□-3-V-□**
	Line driver output		**E50S8-□□□□-6-L-□**	**E50S□P-□□□□-6-L-5**
Resolution(P/R)※**1**			*1, *2, *5, 10, 12, 15, 20, 23, 25, 30, 35, 40, 45, 50, 60, 75, 100, 120, 125, 150, 192, 200, 240, 250, 256, 300, 360, 400, 500, 512, 600, 800, 1000, 1024, 1200, 1500, 1800, 2000, 2048, 2500, 3000, 3600, 5000, 6000, 8000	*1, *2, *5, 10, 12, 15, 20, 23, 25, 30, 35, 40, 45, 50, 60, 75, 100,120, 125, 150, 192, 200, 240, 250, 256, 300, 360, 400, 500, 512, 600
Electrical specification	Output phase		A, B, Z phase(Line driver output : A, A̅, B, B̅, Z, Z̅ phase)	
	Phase difference of output		Phase difference between A and B: $\frac{T}{4} \pm \frac{T}{8}$ (T=1cycle of A phase)	
	Control output	Totem pole output	•Low ☞ Load current: Max. 30mA, Residual voltage : Max. 0.4VDC •High ☞ Load current: Max. 10mA, Output voltage(Power voltage 5VDC): Min. (Power voltage-2.0)VDC, Output voltage(Power voltage 12-24VDC): Min. (Power voltage-3.0)VDC	
		NPN open collector output	Load current : Max. 30mA, Residual voltage : Max. 0.4VDC	
		Voltage output	Load current : Max. 10mA, Residual voltage : Max. 0.4VDC	
		Line driver output	•Low ☞ Load current: Max. 20mA, Residual voltage : Max. 0.5VDC •High ☞ Load current: Max. -20mA, Output voltage(Power voltage 5VDC): Min. 2.5VDC, Output voltage(Power voltage 12-24VDC): Min. (Power voltage-3.0)VDC	•Low ☞ Load current: Max. 20mA, Residual voltage: Max. 0.5VDC •High ☞ Load current: Max. -20mA, Output voltage: Min. 2.5VDC
	Response time (Rise/ Fall)	Totem pole output	Max. 1μs(Cable length: 2m, I sink=20mA)	
		NPN open collector output		
		Voltage output		
		Line driver output	Max. 0.5μs(Cable length:2m, I sink=20mA)	
	Max. Response frequency		300kHz	180kHz
	Power supply		•5VDC ±5%(Ripple P-P: Max. 5%) •12-24VDC ±5%(Ripple P-P: Max. 5%)	
	Current consumption		Max. 80mA(disconnection of the load), Line driver output: Max. 50mA(disconnection of the load)	
	Insulation resistance		Min. 100MΩ(at 500VDC megger between all terminals and case)	
	Dielectric strength		750VAC 50/60Hz for 1 minute(Between all terminals and case)	
	Connection		Cable outgoing type, Cable outgoing connector type, Connector integrated type(rear, side)	Cable outgoing type, Cable outgoing connector type
Mechanical specification	Starting torque		Max. 70gf·cm(0.007N·m)※**2**, Max. 800gf·cm(0.08N·m)※**3**	Max. 100gf·cm(0.01N·m)
	Moment of inertia		Max. 80g·cm²(8×10⁻⁶kg·m²)※**2**, Max. 400g·cm²(4×10⁻⁵kg·m²)※**3**	Max. 40g·cm²(4×10⁻⁶kg·m²)
	Shaft loading		Radial: Max. 10kg·f, Thrust: Max. 2.5kg·f	Radial: Max. 2kg·f, Thrust: 1kg·f
	Max. allowable revolution※**4**		5,000rpm	
Vibration			1.5mm amplitude at frequency of 10 to 55Hz in each of X, Y, Z directions for 2 hours	
Shock			Max. 75G	
Environment	Ambient temperature		-10 to 70°C, Storage: -25 to 85°C	
	Ambient humidity		35 to 85% RH, Storage: 35 to 90%RH	
Protection			Normal type, Cable outgoing connector type: IP50(IEC standard)※**5**, Connector integrated type: IP65(IEC standard)	IP50(IEC standard)
Cable			ø5mm, 5P, Length: 2m, Shield cable(Line driver output: ø5mm, 8P) (AWG 24, Core wire diameter: 0.08mm, No. of core wire: 40, Insulator out diameter: ø1mm)	
Accessory			ø8mm coupling, Bracket	ø8(ø6)mm coupling, Bracket
Approval			Normal type ☞ CE (Except Line driver output)	–
Unit weight			Approx. 275g, Connector integrated type : Approx. 180g	Approx. 235g

※**1:** 1, 2, 5 P/R are output A and B phase only.(But Line driver output : A, A̅, B, B̅ phase)
※**2:** This value is for normal type, cable outgoing connector type (Protection: IP50). ※**3:** This value is for normal type, cable outgoing connector type (Protection: IP64)/connector integrated type (Protection: IP65)

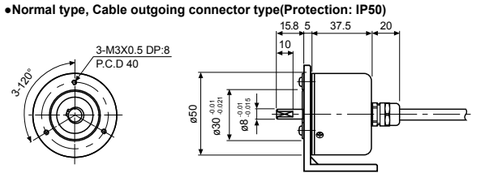
※**4:** Max. allowable revolution ≥ Max. response revolution [Max. response revolution(rpm) = $\frac{\text{Max. response frequency}}{\text{Resolution}}$ × 60 sec.] Please select the resolution to make lower max. revolution than max. allowable revolution.

※**5:** Normal type, cable outgoing connector type is option as IP64 protection.
※Environment resistance is rated at no freezing or condensation.

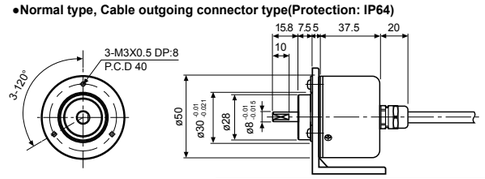
▣ Dimensions

◎**E50S Series** (Unit: mm)

●**Normal type, Cable outgoing connector type(Protection: IP50)**

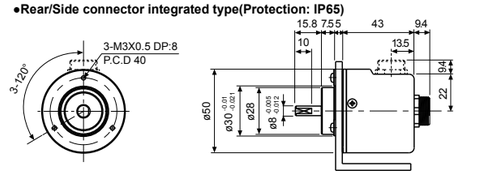


●**Normal type, Cable outgoing connector type(Protection: IP64)**

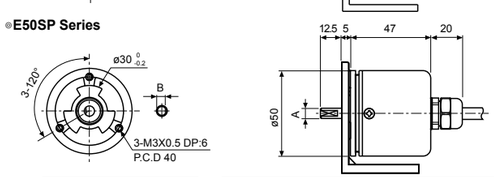


Cable for normal type	Cable for Cable outgoing connector type
ø5, 5P(Line driver output: 8P), Length: 2000, Shield cable	ø5, 5P(Line driver output: 8P), Length: 250, Shield cable

●**Rear/Side connector integrated type(Protection: IP65)**



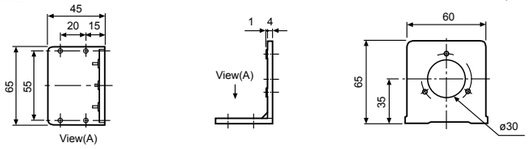
◎**E50SP Series**



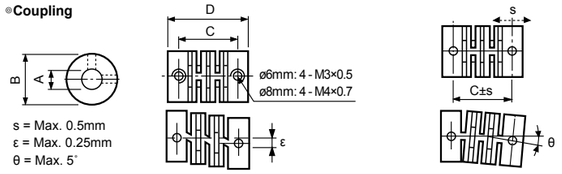
Model	A	B
E50S6P	ø6 -0.01 -0.016	5 0 -0.1
E50S8P	ø8 -0.01 -0.02	7 0 -0.1

Cable for normal type	Cable for Cable outgoing connector type
ø5, 5P(Line driver output: 8P), Length: 2000, Shield cable	ø5, 5P(Line driver output: 8P), Length: 250, Shield cable

◎**Bracket** (Unit: mm)



◎**Coupling**

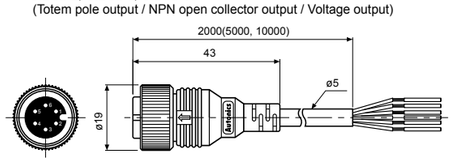


Type \ Item	A	B	C	D
ø6mm coupling	ø6 +0.1 0	ø15	16.5	22
ø8mm coupling	ø8 +0.1 0	ø19	18.2	25

※When mounting the coupling to encoder shaft, if there is big eccentricity or declination between rotating encoder shaft and mate shaft, it may shorten life cycle of the encoder or the coupling.
※Do not load overweight on the shaft.

◎**Connector cable(Sold separately)**

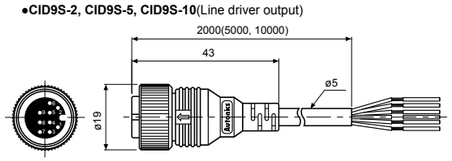
●**CID6S-2, CID6S-5, CID6S-10**
(Totem pole output / NPN open collector output / Voltage output)



※Ordering information

C I D 6 S - 2
- Cable length (m)
- Socket type
- Number of connector pin
- DC power type
- I-type
- Connector

●**CID9S-2, CID9S-5, CID9S-10**(Line driver output)

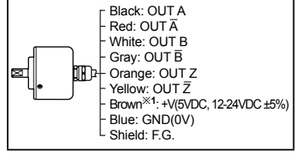


▣ Connections

◎**Normal type**

· Totem pole output
· NPN open collector output
· Voltage output

· Line driver output



※**1:** E50SP series is only for 5VDC ± 5%.
※Unused wires must be insulated.
※The shield cable and metal case of encoder must be grounded(F.G.).

◎**Cable outgoing connector type/ Connector integrated type**

· Totem pole output
· NPN open collector output
· Voltage output

Pin No.	Cable color	Function
1	Black	OUT A
2	White	OUT B
3	Orange	OUT Z
4	Brown	+V
5	Blue	GND
6	Shield	F.G.

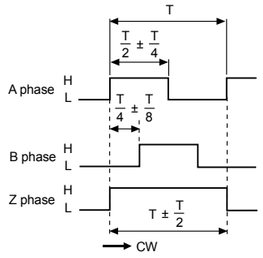
· Line driver output

Pin No.	Cable color	Function
1	Black	OUT A
2	Red	OUT A̅
3	Brown	+V
4	Blue	GND
5	White	OUT B
6	Gray	OUT B̅
7	Orange	OUT Z
8	Yellow	OUT Z̅
9	Shield	F.G.

※It must be isolation grounded.

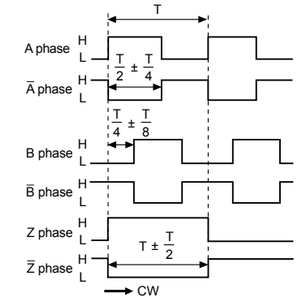
▣ Output waveform

• Totem pole output / NPN open collector output / Voltage output



※Clockwise(CW): Right turn as from the shaft

• Line driver output



▣ Caution for using

1. **Installation**
   ①This unit consists of precision components. If you drop this unit, it may lose the function. Please treat this product carefully.
   ②When you install this unit, if eccentricity and deflection angle are larger, load is applied to the shaft. It may shorten the life cycle of this unit.
   ③Do not put strong impact with hammer, etc when insert coupling into shaft.
2. **For using**
   ①Please use attached Sil Twist pair wire and use proper receiver for RS-422A communication.
   ②Do not cut or connect circuit when power is ON. It may cause damage to the unit.
   ③When the power source is Switching Power, it may cause surge. Install a surge absorber in power line. Wire should be shorter in order not to be influenced by noise.
3. **Environment**
   Please do not use this unit with below environment, or it may cause malfunction.
   ①Place where this unit or component may be damaged by strong vibration or impact.
   ②Place where there is a lot of flammable or corrosive gases.
   ③Place where strong magnet field or electric noise occurs.
   ④Place where is beyond of the rated temperature or humidity.
   ⑤Place where strong acids or alkali near by.
   ⑥Place where there is the direct ray of the sun.
4. **Vibration and Impact**
   ①If a big impact or strong vibration applies to the product it may cause pulse errors. Be sure that when installing this unit.
   ②Encoder with high resolution can be easily affected by vibration, therefore tighten fixing bracket when installing this unit.
5. **Wire connection**
   ①Do not pull out the wire with over 30N strength after fixing the unit and wiring the cable.
   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
- Area sensors
- Display units
- Rotary encoders
- Power controllers
- Photoelectric sensors
- Door/Door side sensors
- 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
- Counters
- Timers
- Panel meters
- Pressure sensors
- Fiber optic sensors
- Sensor controllers

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