MD-SC-2048

SIN-COS Photoelectric Encoder

User Guide

19012259A00

Preface

Thank you for purchasing the SIN-COS photoelectric encoder developed by MONADRIVE.
The SIN-COS photoelectric encoder produces sine waves. Through the changes of sine and cosine waves, the subdivided voltage can be obtained. Then, output signals of the encoder is subdivided as required to improve resolution. The SIN-COS photoelectric encoder adopts the new-type conical shaft and expanders for easy fixture. This further simplifies the motor control system structure. The SIN-COS photoelectric encoder is applicable to elevators, servos, machine tools, and automatic control equipment. It is mainly applied to control systems of permanent magnet synchronous elevators.
Before using the encoder, read this guide thoroughly.

1. Product Information

■ Technical Specifications

Electrical Parameters		Mechanical and Environmental Parameters	
Power supply voltage	5 V±5%	Shaft hole diameter	Φ9.25 mm (conical shaft 1:10)
Current consumption	Max. 200 mA	Connection method	Expander
Response frequency	Max. 50 kHz	Max. speed	2000 rpm
Transmission distance	15 m	Startup torque	5×10^{-3} N·m
Insulation resistance	>200 MΩ (500 VAC)	Axial load	10N
Output sne and cosine differential signal Aamplitude (Vpp)	Vpp=1 V±0.2 V	Radial Load	10N
Output Z-code signal amplitude (Vz)	⩾200 mV	Shock resistance	10 G, 11 ms, 2 hours each in directions X, Y, and Z
DC offset voltage	Vd=2.5 V±20 mV	Vibration resistance	50 m/S², 40–200 Hz, 2 hours each in directions X, Y, and Z
THD	⩽2%	MOI	4×10 N·ms²
Resolution	2048 P/R	IP rating	IP40
Output waveform	Sine wave analog signal	Ambient temperature	–20°C to +100°C
Output signal	A, A-, B, B-, C, C-, D, D-	Storage temperature	–40°C to +100°C
Signal phase relationship	Phase A advancing phase B and phase C advancing phase D by 90° clockwise according to the conical shaft's direction	Humidity	95% RH (non-condensing)

2. Application Circuits and Wiring

■ Application Circuits

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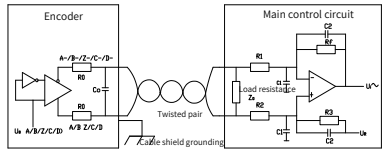
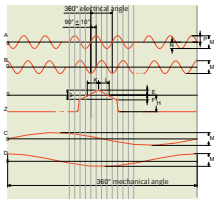


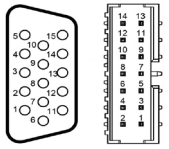
Recommended ABZ signal load resistance Zo: 120 Ω
Recommended CD signal load resistance Zo: 1 kΩ
Ro ⩽ 50 Ω

☞ Waveform (A, B, Z, C, and D signals are differentially measured by the oscilloscope.)



Sinusoidal Signal
Signal amplitude M: 0.45 V to 0.55 V, typical: 0.5 Vpp Symmetric tolerance: |P-N|/2: ⩽ 0.065 V Phase difference between A and B/C and D: 90° ±10°
Z Signal
Effective component G: 0.20 to 0.85 Static level: ⩽ 1.7 V Switching threshold: 0.04 V to 0.68 V Z signal width: K, L: 180° ±90°

■ Wiring Description



2*7 socket	3	12	9	6	7	8	1
DB15 socket	5	6	8	1	3	4	11
Description	A	A-	B	B-	Z	Z-	C
2*7 socket	14	11	4	2/13	5/10	Housing	-
DB15 socket	10	12	13	9	7	Housing	-
Description	C-	D	D-	+5V	0 V	Shield	-

Note: You need to purchase cables for the DB15 socket separately. The standard length of the cable is 7.5 m. Check that the sequence of pins of different PG cards is consistent, and connect cables by referring to the table above.

3. Installation

■ Mounting Dimensions

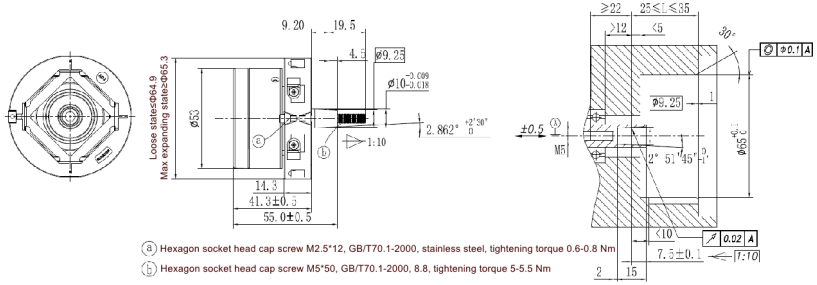


Figure 3-1 Mounting dimensions

Figure 3-2 Recommended traction machine dimensions for the encoder

■ Installation and Uninstallation Description

☞ Installation diagram

1) Remove the front cover of the encoder to expose the conical shaft, as shown in Figure 3-3.
2) Put the encoder into the location hole of the traction machine until the conical shaft is stuck. Put the M5*50 inner

hexagon screw through the center hole of the conical shaft, and tighten the screw into the hole of the traction machine. The required tightening torque is 5 N·m to 5.5 N·m. Ensure that the conical shaft and hole are concentric, as shown in Figure 3-4.

3) Tighten the screw clockwise to fix the expander. The required tightening torque ranges from 0.6 N·m to 0.8 N·m. Ensure that the expander is tightened properly, as shown in Figure 3-5.

4) Install the front cover of the encoder. The installation is complete, as shown in Figure 3-6.

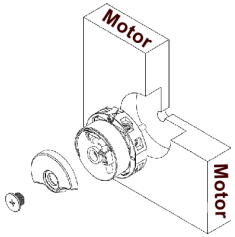


Figure 3-3

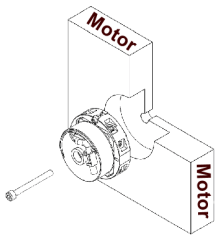


Figure 3-4

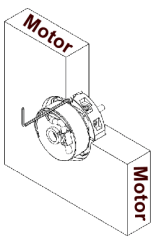


Figure 3-5

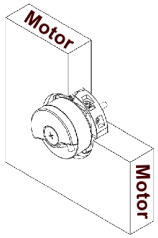


Figure 3-6

☞ Uninstallation diagram

1) Remove the front cover of the encoder to expose the conical shaft, as shown in Figure 3-7.
2) Unscrew the screw counterclockwise to loosen the expander, as shown in Figure 3-8.
3) Unscrew the M5*50 screw counterclockwise for two to three turns. Then, screw the M10*20 screw clockwise into the center hole of the conical shaft to jack up the M5*50 screw until the conical shaft leaves the hole, as shown in Figure 3-9.
4) Remove the M10*20 screw and the M5*50 screw in sequence, then take off the encoder, as shown in Figure 3-10.

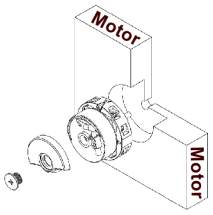


Figure 3-7

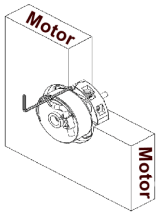


Figure 3-8

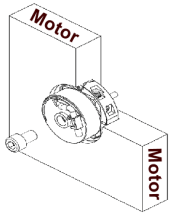


Figure 3-9

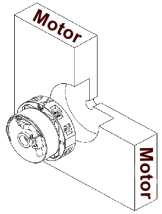


Figure 3-10

4. Cable Shielding

1) Connect the shielded cable to the ground through the housing of the encoder.

2) Before removing the shielded cable from the traction machine, remove the housing cover, and isolate the grounded shielding ring and the encoder housing, as shown in Figure 4-1.

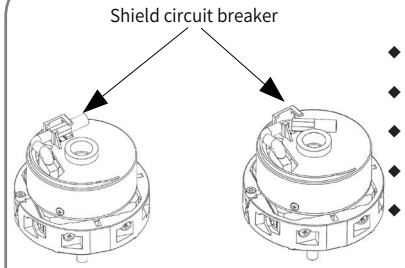


Figure 4-1 Shield cable interface diagram

☞ Precautions

- If the stall occurs, the encoder may be installed improperly. Remove the encoder and install it again.
- Connect cables by strictly following the wiring list to connect only correct signals, avoiding encoder failures.
- When pushing the encoder into the hole of the traction machine, ensure that the conical shaft and hole are concentric.
- The encoder is a precise optical component. Therefore, avoid knock, beat, and collision during installation and uninstallation.
- To avoid interference, do not connect the encoder cables in the same trunking with the power cable. The shielded cable must be well grounded. If the grounding is unreliable onsite, take out the shield short-circuiter.