NEMICON

Datasheet

35AT-4B1716/4B2316-9G Series

39 Bits Battery Backup Multi-Turn Absolute Encoder

Introduction

35AT-4BXX16-9G series encoder is a high-resolution optical absolute encoder produced by Nemicon, which offers 17 or 23 bits single turn and 16 bits multi-turn counts, hence a combined 33 or 39 bits resolution. The 35AT-4BXX16-9G series encoder is a house encoder consisting of a patterned disk, a light source, and photosensitive elements to translate the mechanical motion into electrical signals. The 35AT-4BXX option of encoders come with RS-485 standard compatible communication protocol, supported by a half-duplex differential line transmissions drive, offering good noise immunity for a robust transmission of data at 2.5Mbps in harsh industrial applications.

The key advantage of 35AT-4BXX16-9G series is its multi-turn tracking employs battery backup technology. Its gearless multi-turn counting method eliminates the gear worn out or acoustics noise issues, which are encountered in conventional geared multi-turn encoders. As the product is intended for industrial applications, ESD protection circuitry has been designed by meeting the industry standard of IEC-61000-4-2 class 4.

Features

- 17 bits or 23 bits single turn counting options available
- 16 bits battery backup multi-turn counting
- Built-in RS-485 half-duplex communication protocol
- Ø37 mm OD and typical mounting height of 29 mm

Benefits

- High resolution and high measurement accuracy for better speed ripple control.
- Immediate position detection upon power up without the need of system homing.
- 9mm (1:10) hollow taper shaft design for China Servo Motor market.
- Small OD and low assembly height for ease of integration to small size motors.

Applications

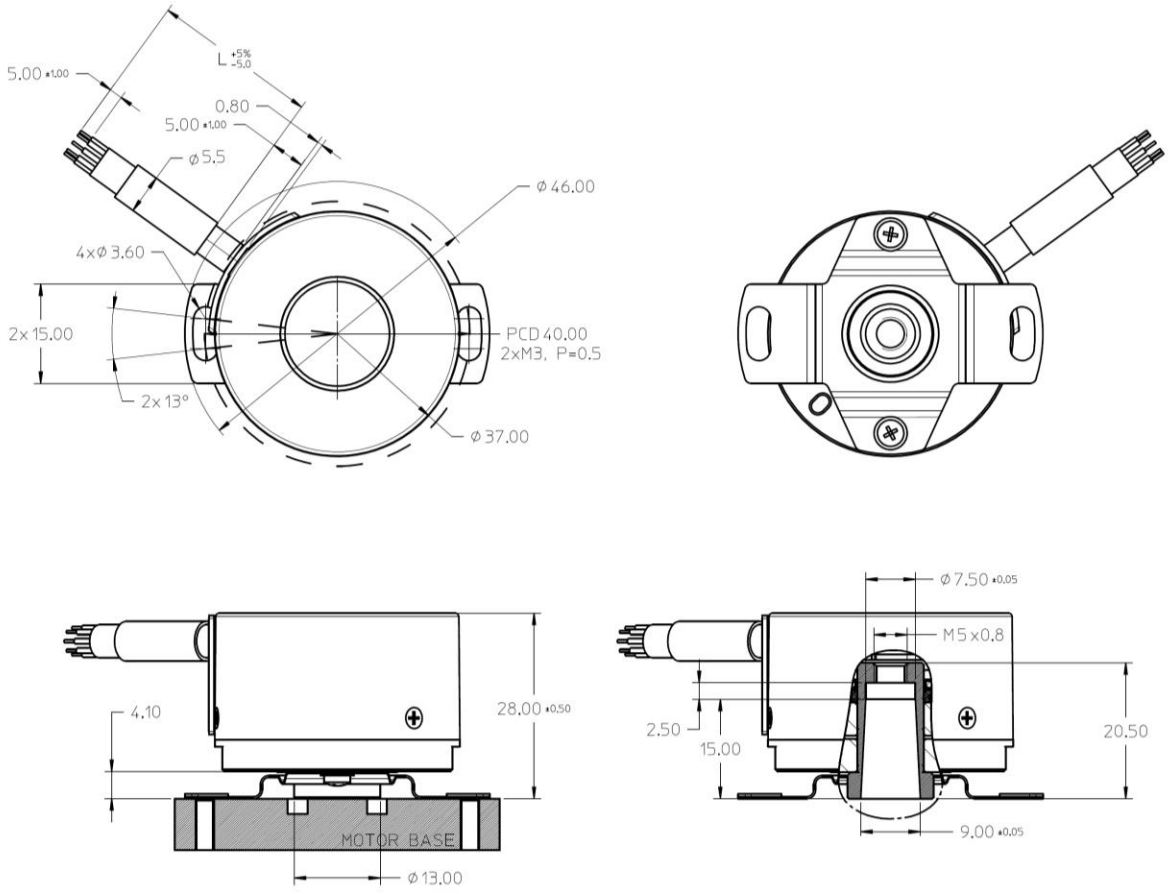
- Robotics
- Factory automation
- CNC machine tool

NOTE

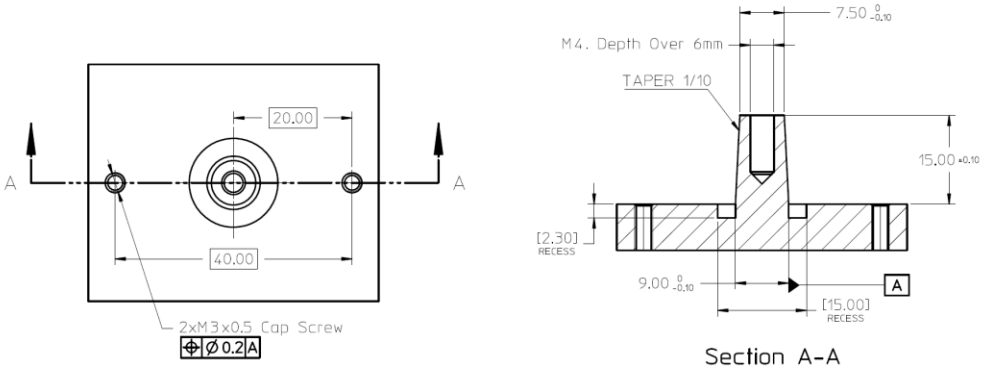
Nemicon encoders are not recommended for use in safety critical applications. E.g. ABS braking systems, power steering, life support systems and critical care medical equipment. Please contact Nemicon sales representative if more clarification is needed.

Mechanical Outlines

Standard Taper Shaft Option (Φ9-Φ7.5mm; 1:10) [Cable length= L]; Coupling PCD= 40mm



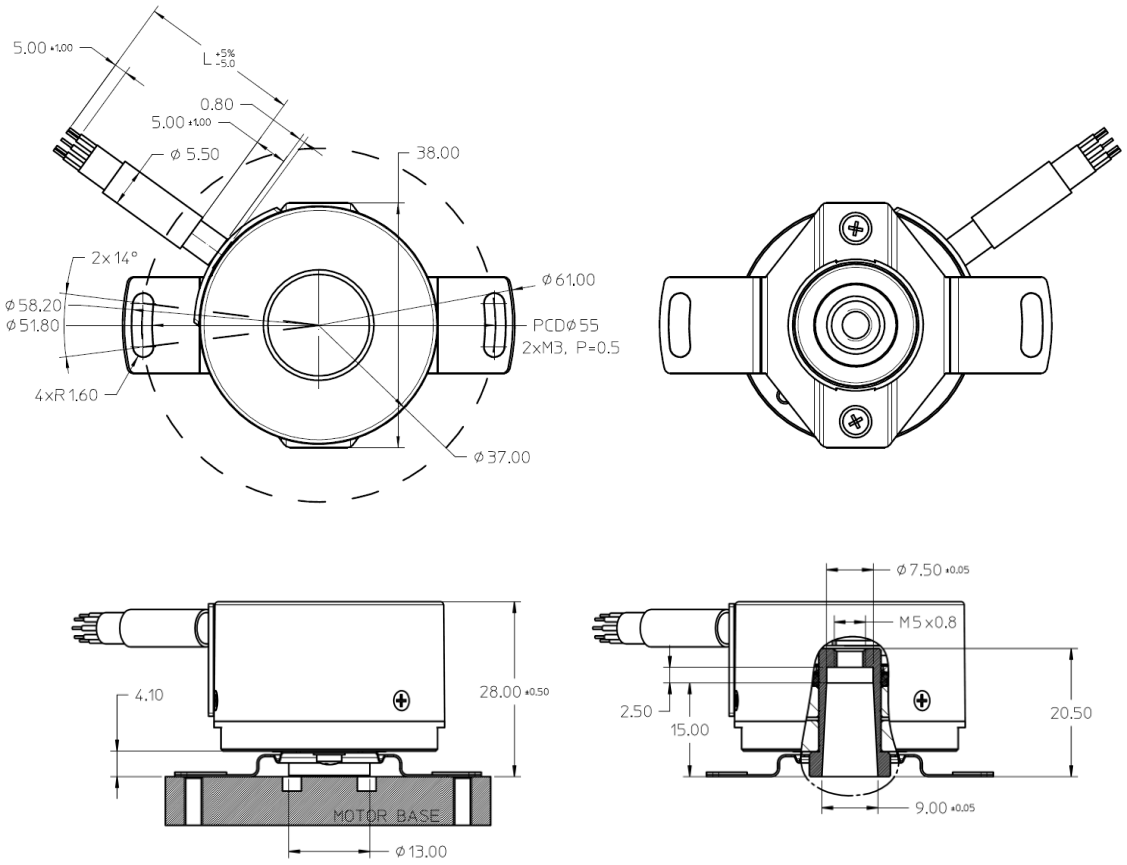
Recommended Shaft and Mounting Requirements



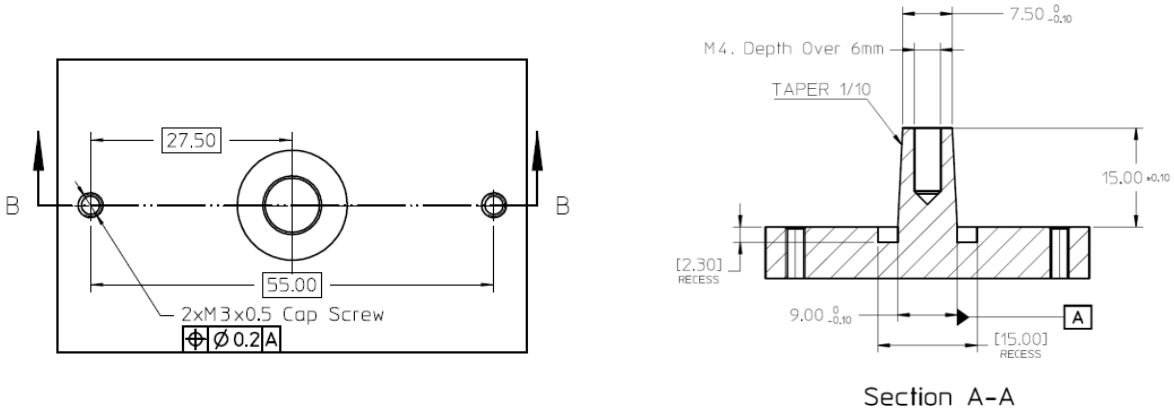
NOTE

1. Dimensions are in millimeters.
2. 3rd Angle Projection.
3. Unless otherwise specified, all tolerances are within ±0.5 mm.
4. Recommended to have a recess on motor mounting surface to prevent encoder shaft interference with motor base.

Standard Taper Shaft Option (Φ9-Φ7.5mm; 1:10) [Cable length= L]; Coupling PCD= 55mm



Recommended Shaft and Mounting Requirements



NOTE

1. Dimensions are in millimeters.
2. 3rd Angle Projection.
3. Unless otherwise specified, all tolerances are within ±0.5 mm.
4. Recommended to have a recess on motor mounting surface to prevent encoder shaft interference with motor base.

Product Specifications

Electrical Specifications

Parameters	Conditions	Min	Typ	Max	Units
Current Consumption	Without load, Tamb = 25˚C		110		mA
Supply Voltage		4.5	5	5.5	V
Electrically Permissible Speed				6,000	min^{-1}
Electrically Permissible Acceleration	Normal mode (1)			$8.0x10^4$	rad/s^2
	Battery mode (2)			$4.0x10^4$	
External Battery Supply Voltage	V_{cc} >4.5V		3.6	4.5	V
	V_{cc} >4.75V		3.6	4.75	V
Battery Mode Current Consumption	Tamb = 25˚C		95		µA
Encoder ready upon power up				500	ms

NOTE

1. Normal mode: Encoder operates on encoder main power supply.
2. Battery mode: Encoder operates in “OFF” State, while multi-turn data is tracked by battery circuitry.

Power Supply Considerations

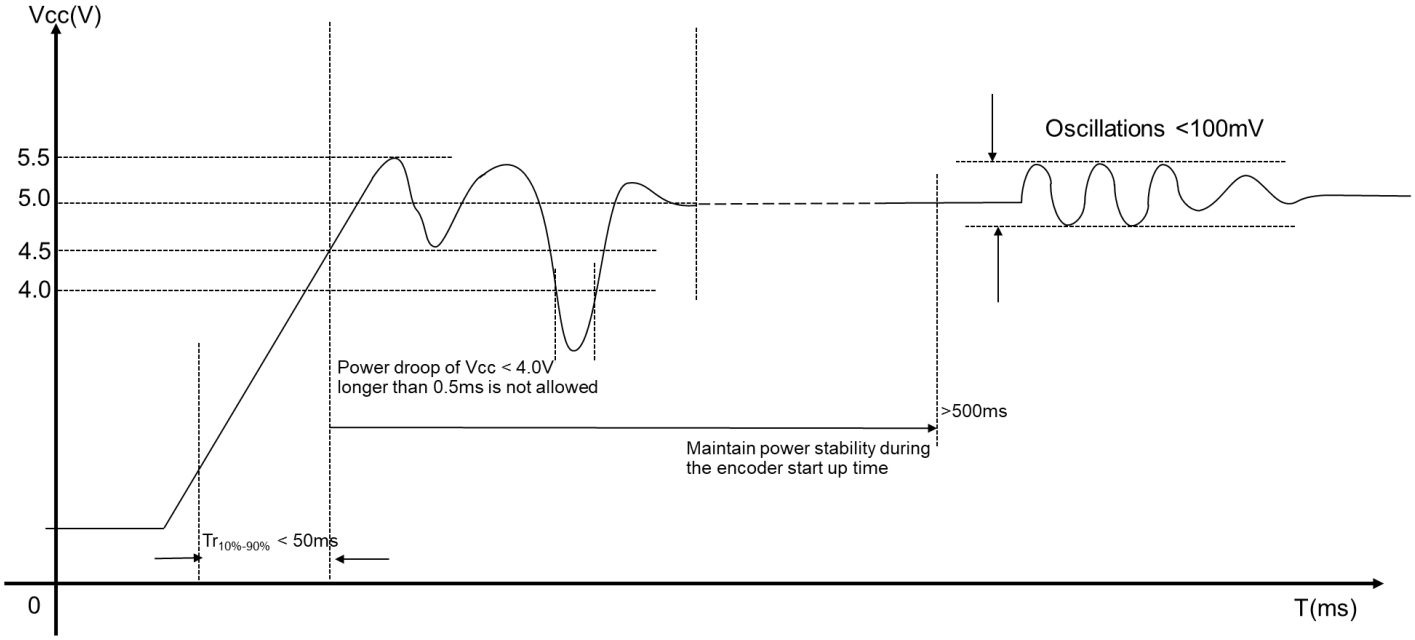


Figure 1 Encoder power up considerations

NOTE

1. Power droop during the initial power up is not allowed.
2. Power up rise time of <50ms is recommended.
3. Encoder communication ready after 500ms.

Mechanical Specifications

Parameters	Conditions	Min	Typ	Max	Units
System Accuracy	With electrical correction, Tamb = 25˚C		±80		Arc-sec
Mechanical Permissible Speed				6,000	min^{-1}
Shaft Radial Play				+/-0.05	mm
Shaft Axial Play				+/- 0.1	mm
Starting torque	Tamb = 25˚C			$9.8x10^{-3}$	N.m

Environmental Specifications

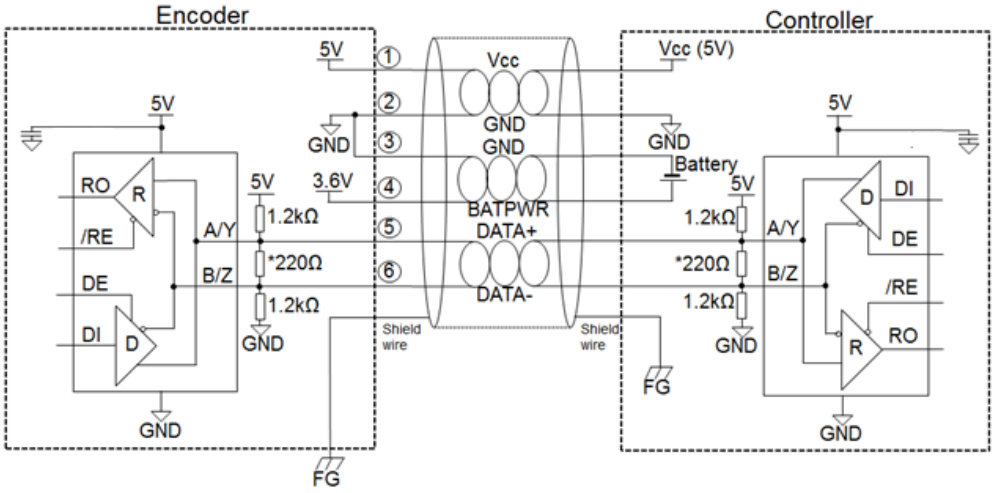
Parameters	Conditions	Min	Typ	Max	Units
Storage Temperature		-20	-	105	°C
Operating Temperature		-20	-	105	°C
Relative Air Humidity (Non-Condensing)	Tamb = 40˚C, Per IEC 61800-2	-	-	90	RH%
Ingress Protection		-	IP50	-	
Vibration	Per IEC 60068-2-6	10G; 10~2000Hz			
Shock	Per IEC 60068-2-27	6ms; Half Sine; 200G			
Discharge of Static Electricity (ESD)	Per IEC 61000-4-2	± 8kV contact discharge, ± 12kV air discharge			-
Electrical Fast Transient / Burst Immunity	Per IEC 61000-4-4, Capacitive Coupling	± 2 kV / 5 kHz / 15ms			-
Dielectric Resistance	AC 500V, 1Min	Leakage <0.3			mA
Insulation Resistance	DC 500V	20			MΩ

Encoder Specifications

Parameter	Remarks
Resolution	Single Turn: 17 Bits (131071 counts) or 23 Bits (8388607 counts). Multi Turn: 16 Bits (65535 counts)
Counting Direction	Increase with counter clockwise shaft rotation, view from coupling end (Figure 1)
User accessible Memory size	5K bits

Figure 2 Counting direction

Typical Electrical Connection



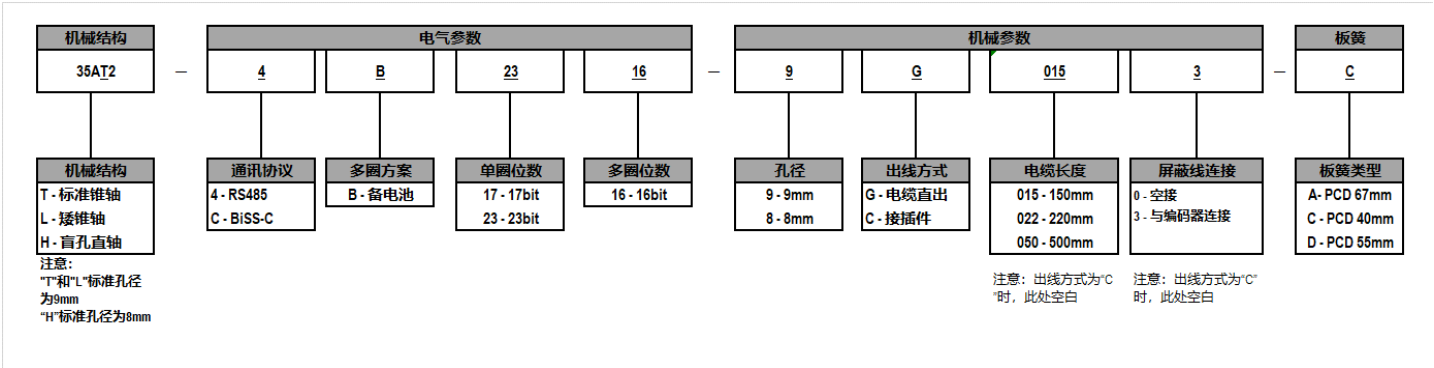
NOTE

1. It is strongly recommended to provide encoder power supply, Vcc within 4.5V ~ 5.5V. Typical value is 5V.
2. For best noise immunity, it is recommended to use twisted-pairs shielded cable for connection to controller (servo driver).
3. It is recommended to connect encoder chassis and cable shield to frame ground (FG) in application for enhanced noise immunity in harsh operating condition.
4. To prevent undesirable signal reflections, the termination resistor is needed. Termination resistor, *220ohm 1/4W is recommended but may depends on the characteristic impedance of cable used.
5. Recommended Differential Transceiver P/N: ISL8485E, or equivalent.

Cable Output Assignment

Wire	Color	Description
1	Red	VCC, Encoder Supply
2	Black	GND, Ground
3	Brown/Black	GND (External Battery)
4	Brown	BATPWR(External Battery)
5	White	Data +
6	White/Black	Data -
7	Cable Shield Strand	Cable Shield, Connect to Chassis

Ordering Information



NOTE Refer to the factory for sample order and lead time