## CP-500 Series Housed Rotary Optical Encoders

*Incremental, sine/cosine, or absolute format*

**The CP-500 series hollow shaft encoder is a small, rugged device, with a package form factor identical to that of a 39 mm stepper motor. Commutating versions are specifically designed to commutate brushless DC motors. The light source is a single light emitting diode, servo controlled for constant light output over time and temperature, the sensor is a monolithic silicon array. Up to 2,048 cycles per revolution are available for the incremental models and up to 10 bits for the absolute units.**

### Features & Benefits

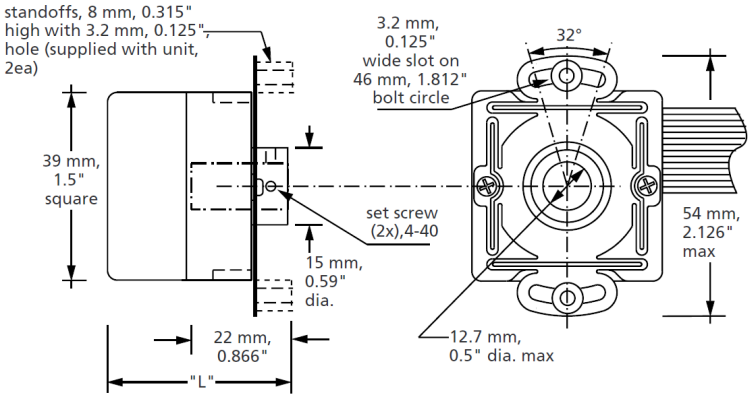
- **39x39x36mm**
- **Long lasting ABEC 5 Bearings**
- **Digital Incremental, commutating, and sine/cosine versions**

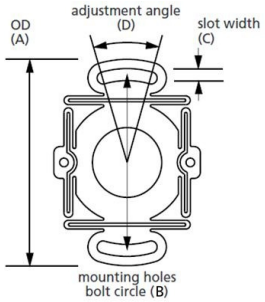
### Options

- **RoHS Compliant**
- **Through Shaft**

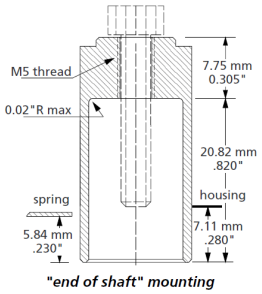
- **Robust hollow-shaft modular optical encoder**
- **Up to 2048 cycles/revolution incremental**
- **Digital Incremental or sine/cosine encoding formats**

## DIMENSIONS — CP-500 SERIES




**Dimensions**
**A: 54mm B: 46mm C: 3.2mm D:**




*"end of shaft" mounting*

## CP-500 SERIES MOUNTING DETAILS

**Default set-screw mounting: Recommended Shaft Length: 9mm min, 22mm max.**

**End of Shaft mounting: M4 screw, hex head recommended for mounting on stepped shaft or directly on the inner race of the motor bearing. M5 threading provided for extraction of encoder. The M4 screw can be inserted through an access hole in the encoder.**

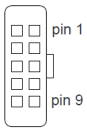
## SPECIFICATIONS — MECHANICAL

| | | | |
|---|---|---|---|
| **Shaft Bore** | **12.7mm, .5" max** | **Housing Material** | **Diecast Aluminum** |
| **Max Shaft Extension** | **6 mm** | **Cover** | **1.5mm Wall, Ryton 4** |
| **Shaft Loading** | **2lbs / 10 N Axial, 4lbs / 20 N Radial** | **Bearing Life** | **Manufacturer's Specifications** |
| **Shaft Runout** | **0.0125 mm T.I.R.** | **Moment of Inertia** | **1.7 gcm²** |
| **Starting Torque** | **0.1 Ncm @ 20°C Max** | **Weight** | **Approximately 0.120 kg** |
| **Shaft Rotation** | **Continuous, Reversible** | **Operating Temperature** | **-20°C to +85°C** |
| **Slew Speed** | **10,000 RPM** | **Shock** | **50 G's @ 11 ms** |
| **Bearings** | **ABEC 5** | **Vibration** | **5 - 2,000 Hz @ 20 G's** |
| **Shaft Material** | **416 Stainless** | **Humidity** | **98% without condensation** |
| **Protection** | **IP 64 with out Shaft Extension** | **Protection** | **IP 40 with Shaft Extension** |

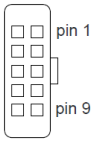
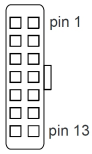
# Optical Encoders

## CP-500 Series Housed Rotary Optical Encoders

### SPECIFICATIONS — INCREMENTAL ENCODERS

| Model | CP-500 | | CP-550 | | | CP-560 | |
|---|---|---|---|---|---|---|---|
| Type | Incremental, sine/cosine | | Incremental, digital | | | Incremental, digital, line driver | |
| Format | A quad B, index | | A quad B, index, inverses | | | A quad B, index, inverses | |
| Resolution (cpr) | 100, 128, 200, 256, 400, 512, 1024, 2048 | | 100, 128, 200, 256, 300, 360, 400, 500, 512, 600, 720, 800, 1000, 1024, 2048 | | | 100, 200, 256, 360, 500, 600, 1000, 1024, 2048 | |
| Frequency Response | 20 kHz | | 100 kHz | | | 100 kHz | |
| Accuracy | ± 12 arc sec (typ.) | | | | | | |
| Repeatability | 1 arc sec | | ± 1 count | | | ± 1 count | |
| Output | Voltage (peak to peak) | | TTL, Line driver, Open 4.7k pull up resistors | | | Line driver | |
| Power Supply (VDC) | ±18 VDC max | | ±5 VDC (50 mA max) | | | ±4.75 to 30 VDC (50 mA max) | |
| Connector | 10-pin, 3-M 3473-6610 | | | | | | |
| 10 pin connector p/n 3M™ 3473-6610   | Signal | Pin | Signal Line Driver | Signal TTL | Pin | Signal | Pin |
| | Ground | 1 | + 5 VDC | Channel A | 1 | + VDC | 1 |
| | Channel A | 2 | + 5 VDC | + Vcc | 2 | Channel A | 2 |
| | N/C | 3 | Channel A Inv | Ground | 3 | Channel A Inv | 3 |
| | - 12 VDC | 4 | Channel A | Ground | 4 | Channel B | 4 |
| | N/C | 5 | Channel B Inv | Ground | 5 | Channel B Inv | 5 |
| | Channel B | 6 | Channel B | Ground | 6 | Index Channel Ground | 6 |
| | N/C | 7 | Index Channel | +Vcc | 7 | Index Channel Inv | 7 |
| | + 12 VDC | 8 | Ground | Channel B | 8 | Ground | 8 |
| | V Ref (servo ground) | 9 | Index Channel Inv | N/C | 9 | N/C | 9 |
| | Index | 10 | Ground | Index Channel | 10 | N/C | 10 |

### SPECIFICATIONS — ABSOLUTE ENCODERS

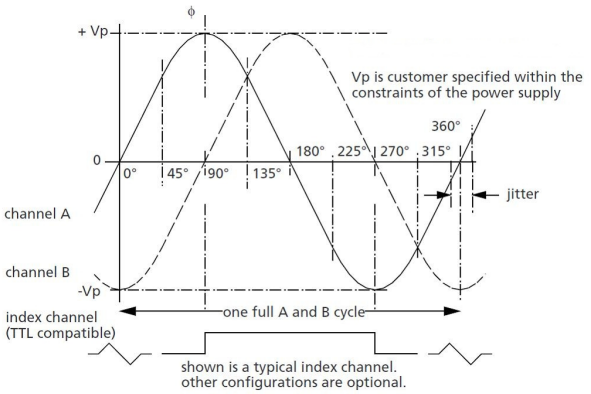
| Model | CP-550-08GC | | CP-550-08NB | | CP-550-08AN | | CP-550-10GC | |
|---|---|---|---|---|---|---|---|---|
| Type | Grey Code, 8-bit | | Natural Binary, 8-bit | | Analog, 8-bit | | Grey Code, 10-bit | |
| Format | Parallel Grey Code | | Parallel Natural Binary | | Analog | | Parallel Grey Code | |
| Freq. Response | 100 kHz | | 100 kHz | | n/a | | 50 kHz | |
| Output | TTL or LM339 (Optional Pull Up Resistors) | | TTL or LM339 (Optional Pull Up Resistors) | | 0-10V Standard (4-20mA Optional) | | TTL or LM339 (Optional Pull Up Resistors) | |
| Power Supply | ±5, 12, 24 VDC | | ±5, 12, 24 VDC | | 12.6VDC to 16.6VDC @100 mA max | | ±5 VDC | |
| Connector | 10-pin, 3-M 3473-6610 | | | | | | 14-pin, 3-M 3473-6614 | |
| 10 pin connector p/n 3M™ 3473-6610   | Signal | Pin | Signal | Pin | Signal | Pin | Signal | Pin |
| | G4 | 1 | B4 | 1 | N/C | 1 | G1 | 1 |
| | G6 | 2 | B6 | 2 | + VDC | 2 | G8 | 2 |
| | G0 (lsb) | 3 | B0 (lsb) | 3 | N/C | 3 | G6 | 3 |
| | G3 | 4 | B3 | 4 | N/C | 4 | G7 | 4 |
| | Ground | 5 | Ground | 5 | Direction Control | 5 | Ground | 5 |
| | G2 | 6 | B2 | 6 | Power Ground | 6 | G5 | 6 |
| 14 pin connector p/n 3M™ 3473-6614   | + 5 VDC | 7 | + 5 VDC | 7 | Current output | 7 | + 5 VDC | 7 |
| | G5 | 8 | B5 | 8 | N/C | 8 | G0 (lsb) | 8 |
| | G7 (msb) | 9 | B7 (msb) | 9 | Voltage Output | 9 | G9 (msb) | 9 |
| | G1 | 10 | B1 | 10 | Return (I or V) | 10 | G3 | 10 |
| | | | | | | | G4 | 11 |
| | | | | | | | G2 | 12 |
| | | | | | | | N/C | 13 |
| | | | | | | | G9 inverted | 14 |

# CP-500 Series Housed Rotary Optical Encoders

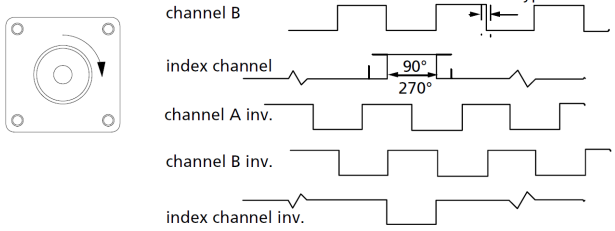
## OUTPUT WAVEFORMS

**Note: All waveforms shown for CW rotation viewed from encoder**

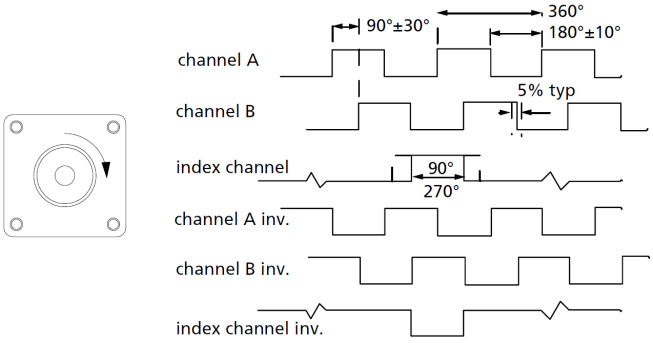
### CP-500



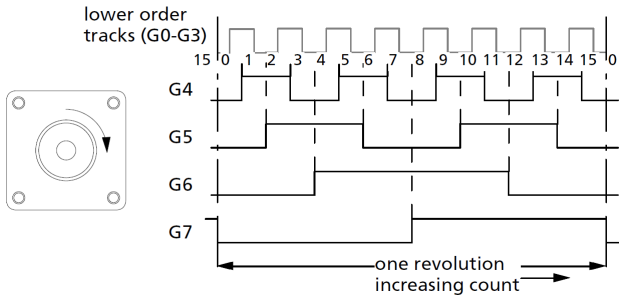

### CP-550



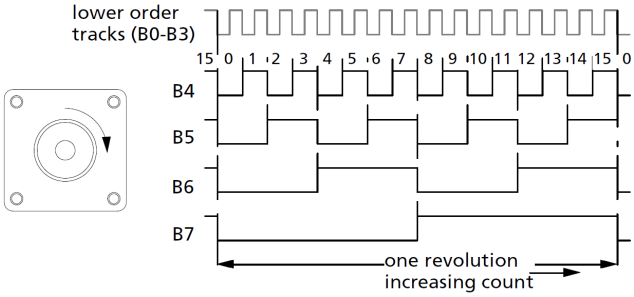

### CP-560



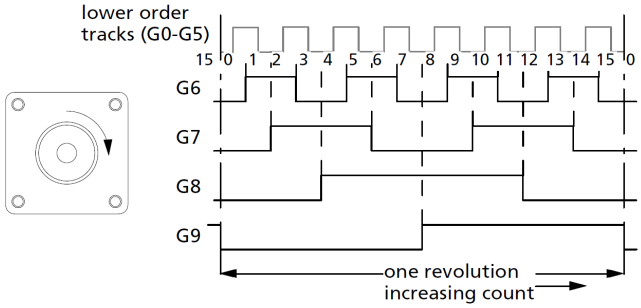

### CP-550-08GC



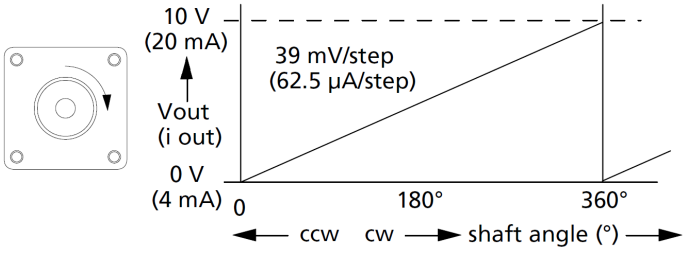

### CP-550-08NB




### CP-550-10GC



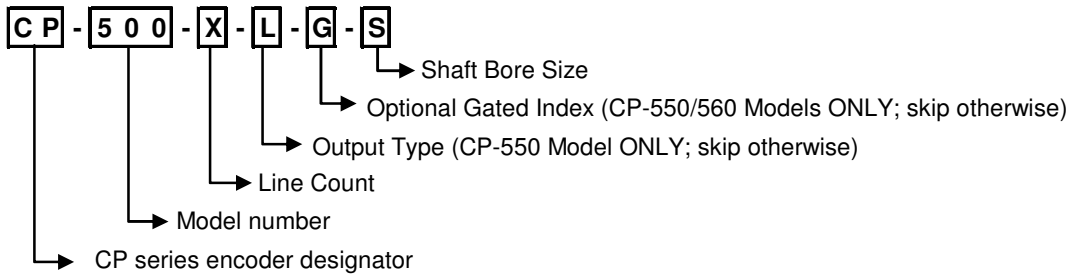

### CP-550-08AN



# Optical Encoders

## CP-500 Series Housed Rotary Optical Encoders

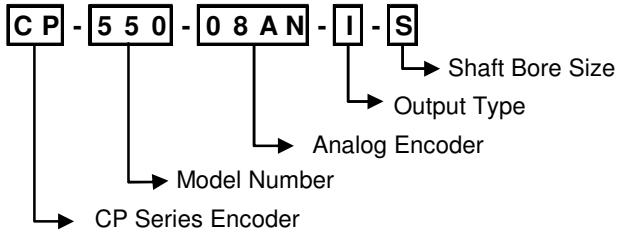
### MODEL NUMBERING — INCREMENTAL ENCODERS




| Output Type Options |
|---|
| L = Line Driver |
| T = TTL |
| O = Open Collector |

| Shaft Bore Sizes |
|---|
| Imperial: 5/32", 3/16", 1/4", 5/16", 3/8", 1/2" |
| Metric: 4, 5, 6, 8, 10, 11, 12 (mm) |

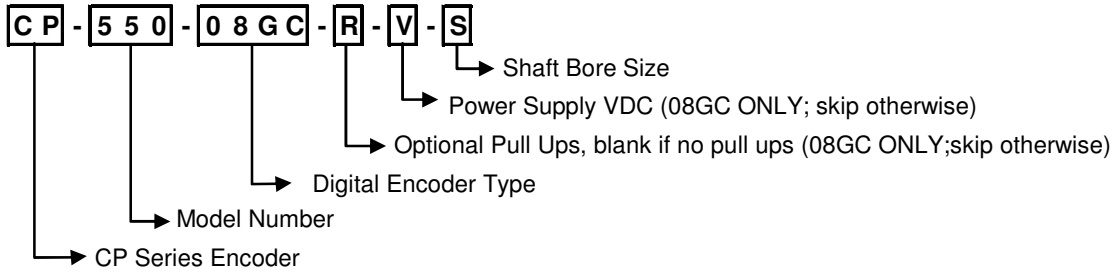
### MODEL NUMBERING — ABSOLUTE ANALOG ENCODERS




| Analog Output Type |
|---|
| V = Voltage (0 - 10 VDC) |
| I = Current (4 - 20 mA) |

| Shaft Bore Sizes |
|---|
| Imperial: 5/32", 3/16", 1/4", 5/16", 3/8", 1/2" |
| Metric: 4, 5, 6, 8, 10, 11, 12 (mm) |

### MODEL NUMBERING — ABSOLUTE DIGITAL ENCODERS




| Power Supply VDC |
|---|
| 5 = 5 VDC |
| 12 = 12 VDC |
| 24 = 24 VDC |

| Shaft Bore Sizes |
|---|
| Imperial: 5/32", 3/16", 1/4", 5/16", 3/8", 1/2" |
| Metric: 4, 5, 6, 8, 10, 11, 12 (mm) |